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Health System Transformation in the Education of Health Professionals

by

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Abstract

The need for health systems transformation is a health policy priority in Canada. Healthcare spending is growing at an unsustainable rate, and health systems ranks poorly in areas such as access to care, equity in care, and health outcomes. Policy makers are calling on health professionals to be accountable to health systems transformation, however, it is unknown whether their education prepares them for this call. This proposed study aims to understand the current state of the literature on health system transformation within the context of the education of health professionals through a two-phase explanatory mixed-methods study to address the following research questions:

- What is the current state of health system transformation in the education of health professionals?
- Based on the current state of the literature/evidence, what areas are important to consider for curriculum development and future programs of research on health system transformation in the education of health professionals?

The study included two phases. In Phase I, a scoping review identified 44 peer reviewed articles on the topic. In Phase II, I conducted a mixed-methods stakeholder consultation that included a one-time online survey (n=77) and key informant interviews (n=23) to enhance and validate the findings of my literature as well as identify stakeholders' concerns on the topic.

This research discusses the current state of health system transformation in the education of health professionals and describes key areas for future curriculum development and programs of research. Furthermore, this dissertation presents a comprehensive framework, grounded in the findings of an extensive mixed-methods stakeholder consultation, on the education of health professionals for health system transformation. Such knowledge will provide direction to stakeholders on the resources and activities needed to ensure that health professions education makes informed health systems transformation training decisions.

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List of Acronyms and Abbreviations

CNA	Canadian Nurses Association
CMA	Canadian Medical Association
CFPC	College of Family Physicians of Canada
COVID-19	Coronavirus Disease 2019
CPD	continuing professional development
NHS	National Health Service
OECD	Organization for Economic Cooperation and Development
WHO	World Health Organization

Chapter One: Introduction

This chapter lays the groundwork for a mixed-methods study delving into health system transformation in the education of health professionals. Initially, Chapter One offers an overview of the research problem under investigation, highlighting existing knowledge gaps regarding the role of health professionals in health system transformation. Following the delineation of the research topic, a comprehensive literature review is presented, encompassing discussions on health system transformation, health professions education, and the integration of health system transformation within the education of health professionals. This background information is essential for a nuanced exploration of health system transformation in health professions education, with a focus on the intersection of health professions education and health services research. Subsequently, a conceptual framework is introduced to elucidate the connections between the theoretical constructs that underpin this research. The study design and methods employed to address a series of research questions are discussed. Chapter One concludes with an outline, providing readers with a roadmap to navigate my dissertation and comprehend how each article presented in the subsequent sections contributes to the field of health professions education.

Researcher Positionality

In this dissertation, I draw upon my experience and perspective of eight years in health policy, working for national health professional associations, including the Canadian Nurses Association (CNA) and the Canadian Medical Association (CMA), where I presently work. Through this perspective working at the macro policy level, my dissertation approaches health system transformation and health professions education from this vantage point; however, unveils and explains the complexity of this topic from macro, meso, and micro levels, recognizing that gaps and solutions involve all levels and people in the system. My professional background is rooted in health services and policy research, complemented by a profound interest in unraveling the intricate web of factors that shape health and social circumstances. This interest is particularly centered on upstream prevention and the reduction of health disparities, reflecting my academic journey including a Bachelor of Science in Health Promotion and a Master of Science in Community Health and Epidemiology. This dissertation delves into the convergence of health services and policy research with health professions education. Against

the backdrop of escalating demands for health system transformation, exacerbated by the global impact of the COVID-19 pandemic, I am driven to investigate the pivotal role health professionals play in such transformation efforts. Simultaneously, there is a pressing need to address the disjunction observed between the expectations of policy makers and the concerns of health professionals within the sphere of health system transformation. Motivated by these disparities, my research focuses on the intersection of health services and policy research with health professions education where I comprehensively explored the existing literature on health system transformation within health professions education. This exploration served as a foundation for identifying potential areas for future curricular development and research program initiatives. As we navigate the evolving landscape of health policy and education, bridging the gap between policy expectations and the perspectives of health professionals becomes essential for fostering a cohesive and effective healthcare system.

Description of Study Problem

Health system transformation is the process of coordinating interventions aimed at systems-wide change affecting multiple organizations and health professionals (Best et al., 2012). Health system transformation is a health policy priority in Canada because health care spending is growing at an unsustainable rate. Despite having one of the highest per capita spending on healthcare among its peer countries, Canada's health system ranks poorly among other Organization for Economic Cooperation and Development (OECD) countries, in access to care, equity in care, and health outcomes (CIHI, 2017; Commonwealth fund, 2017). In addition, Canada's population is ageing, influencing how the population interacts with health systems (Tamblyn et al., 2016). Due to heavy workloads, demanding standards of training and practice, and complex working environments, Canada's health professionals (i.e., at all levels -learners to staff) are experiencing increased levels of burnout threatening the sustainability of health systems (CMA, 2017; Reed et al., 2018; Stelnicki et al., 2020). Policy makers are calling on health professionals to be accountable for health system transformation (Martin et al., 2018). Coordinated team-based care and quality improvement initiatives are essential features of effective health systems performance. There is also concern for disease prevention and population health. Moreover, systems-based practice, defined as actions that demonstrate both awareness and responsiveness to health systems and the ability to call on systems resources to provide high-value care, is increasing as competencies across health professions education

curricula. Through systems-based competencies, there is now an expectation that health professionals, across the education continuum, will improve health systems performance and contribute to health system transformation (Gonzalo et al., 2020; Onyura et al., 2019; Salmond & Echevarria, 2017).

In response to the demands of health systems, health professions education is incorporating topics and competencies related to health system transformation to enhance health professionals' development of skills in promoting systems reform in their practices and thinking. It includes an emphasis on contributing to the improvement of patient-centred care, the stewardship of health care resources, and demonstrating collaboration to enhance health care (Danilewitz & McLean, 2016; Salmond & Echevarria, 2017; Shaw et al., 2017). Albeit there is insufficient evidence to show the extent to which the competencies are occurring within health professions education. The delivery and assessment of these competencies is often fragmented (Danilewitz & McLean; Onyura et al., 2019; Salmond & Echevarria, 2017). Many barriers exist, including competing competencies, which prevent health professionals from engaging in activities that ultimately contribute to health system transformation (Butler et al., 2017; Danilewitz & McLean, 2016; Frich et al., 2015). Furthermore, health professionals in leadership roles have reported that they feel unprepared from their education and training in health system transformation, shedding light on a critical gap in health professions education (Hana & Rudebeck, 2011; Quinn & Perelli, 2016). To further add complexity, Danilewitz and Maclean (2016) explain that, in Canada, health systems curricula and opportunities are not well described in current Canadian medical education curricula (Danilewitz & McLean, 2016).

The need for health system transformation is a health policy priority in Canada. Policy makers are calling on health professionals to be accountable to health system transformation, however, it is unknown if health professions education prepares them for this call. While there has been attention to health system transformation and health professions education individually, little attention has been paid to how they interact. Similarly, research completed on the topic has been analyzed in silos by professions, such as medicine and nursing (Onyura et al., 2019; Salmond & Echevarria, 2017). With health professions experiencing increasingly formal expectations to be accountable to health system transformation, we require systematic knowledge through study about the current state of the literature on health system transformation in the context of health professions education.

Purpose and Research Questions

To address these gaps identified in my literature review, my doctoral research aims to investigate health system transformation within the context of the education of health professionals through a scoping review and consultation.

As such, I conducted a form of literature review known as a scoping review to understand the current state of the literature on health system transformation within the context of health professions education as well as identify areas to consider for future programs of research on health system transformation in the education of health care professionals. The following questions guided my scoping review:

1. What is the current state of health system transformation in the education of health professionals?
2. Based on the current state of the literature/evidence, what areas are important to consider for curriculum development and future programs of research on health system transformation in the education of health professionals?

Literature Review

First, I defined key concepts relevant to this area of research around health systems and health system transformation and their application to health professions education. To do this I did a theoretical search of the health services and policy research and health professions education literature to define overarching concepts for this study.

Health Systems

Health systems are extremely complex, comprising of diverse drivers such as resources, actors, and institutions related to the provision of health actions. Health actions are any set of activities whose primary intent is to improve or maintain health. The broad definition of health actions aims to include all actors and institutions that contribute to overall health systems performance. The defining goal of health systems is to ultimately improve the health of a population; if health systems do not meet this goal, they would not be meeting their purpose (Murray & Frenk, 2000). Thus, for the purpose of this thesis, the term health systems refer to organizations of people (such as communities), institutions (such as provincial/territorial ministries of health and hospitals), and resources (such as financial or public policies) that have the primary purpose of health actions that aim to improve or maintain health for populations.

There is wide variability in health outcomes between countries with similar income and education, and part of the reason for variabilities in health outcomes is due to health systems performance (Smith et al., 2009). In addition to health outcomes, differences in health systems determine other outcomes such as fairness and responsiveness. Fairness measures the extent to which people are protected from the financial burdens of illness (Murray & Frenk, 2000). Fairness is also an overarching health systems outcome that encompasses the equitable distribution of health status and system responsiveness across socioeconomic groups implying that everyone should have a fair opportunity to attain their full health potential (CIHI, 2013). The responsiveness of health systems refers to the capacity of health systems to respond to the needs and expectations of populations. Responsiveness also refers to populations' trust and confidence with health systems, including respect for persons (Murray & Frenk, 2000). It is important for the variabilities in health systems at all levels (micro, meso, and macro) be measured to identify factors that influence health systems performance. Health systems performance refers to the extent to which health systems achieve health, fairness, and responsiveness (Duran et al., 2012). Having comparable indicators on health systems performance and on key factors that explain health systems performance variation, can strengthen the evidence-based health policy that ultimately propels health system transformation (Murray & Frenk, 2000). Smith and colleagues (2009) conclude in their report on performance measurement for health system transformation that the goals of any performance measurement improvement are to promote accountability and to improve the performance of the health system, including accountability to health systems performance by health professionals (Smith et al., 2009).

Health system transformation

Health system transformation is the process of coordinating interventions aimed at systems-wide change affecting multiple organizations and health care professionals. The impetus of health system transformation is to improve the overall health systems performance through the principles of the Quintuple Aim framework that include the value of health systems delivery, quality of patient care, health care provider satisfaction, population health outcomes, and health equity (Best et al., 2012; Nundy et al., 2022). In 2022, The science of health system transformation is complex; it comprises clinical science, systems theory, psychology, and other fields (Institute for Healthcare Improvement, 2020).

In 2014, the National Health Service (NHS) in the United Kingdom, set out a five-year plan to transform their national health system. The plan aims to transform the health system under the Triple Aim framework, an earlier version of Quintuple Aim, with its focus on population health, effective patient-centred care, and per capita cost or care value. Maniatopoulos and colleagues (2020) explored factors shaping health system transformation implementation and its impact on multiple levels of context (e.g., macro, meso and micro) to understand the complexity at each level (Maniatopoulos et al., 2020). The study found that there is a need for a deeper understanding of the multiple levels of context that shape health system transformation in the NHS including the perceptions and the role of health professionals throughout this process (Maniatopoulos et al., 2020).

In Canada, health system transformation is influenced by escalating health care costs, demands including increase in health service use of an ageing population with multiple chronic conditions, increasing prevalence of multiple chronic health and social conditions, and increasing health inequities. These factors ultimately contribute to the unsustainability of health systems and a need for health system transformation (CIHI, 2017; Tamblyn et al., 2016). In 2021, the Canadian Institutes for Health Research, Institute of Health Services and Policy Research, launched its new strategic plan with a goal of accelerating health system transformation with an emphasis on achieving quadruple aim and health equity for all. Quadruple aim is an expansion on the Triple Aim framework and is used to guide the redesign and transformation of health systems (CIHR, 2021). The pandemic brought much needed attention to the lack of health equity across the world given socially marginalized populations experienced higher rates of COVID-19. This reinstated the significance of health equity in health system transformation. Health equity requires a more fundamental transformation toward addressing upstream determinants of health across all systems (Nundy et al., 2022). In addition, the political desire for health system transformation has escalated since the onset of the pandemic due to factors such as increasing prevalence of health professions burnout and health human resource shortages.

Health Professions Education

Health Professions Education is a specialized interdisciplinary study dedicated to the education of health professionals. Health professions education is comprised of many different types of professionals who provide a wide range of health care services in a wide variety of settings within health systems (Yudkowsky et al., 2019). Examples of health professionals

include physicians, nurses, pharmacists, physical therapists and many other professionals who provide health care or health-related services to patients or persons. In health professions education, health professionals must complete highly specialized and selective educational courses of study that typically include a blend of clinical or practical training as well as classroom instruction (Yudkowsky et al., 2019). Health professions education prepares health professionals to care for patients and persons; therefore, health professionals usually require a specialized license or other type of certificate to practice. Many health professions also have guidelines for continuing education amongst its professional members as it promotes high quality evidence-informed health care that keeps health professionals up to date on best practices in the field (Fletcher, 2007).

Currently, health professions education is evolving and undergoing a shift to reflect the realities of an evolving health system and needs of populations (Frenk et al., 2010; Thibault, 2020). Current and future trends in health professions education include a shift towards interprofessional education, integrated education that is patient and community oriented, education on the social determinants of health, an emphasis on life-long learning, a focus on the well-being of health professionals, a shift to competency-based models of education, and integrating digital health into the continuum of practice (Thibault, 2020). While these changes are all individually needed to catalyze health system change and better serve populations, all of these changes are dependent on each other for optimal health systems performance and will require leadership and culture change (Frenk et al., 2010; Thibault, 2020).

The COVID-19 pandemic (hereafter, I will refer to as the pandemic) has also disrupted health systems and the delivery of health professions education around the world. Examples of impacts on health professions education include disrupted training experiences, including the cancelling of non-urgent services for safety or redeployment to different services where care is necessary (D'Eon et al., 2020; Hall et al., 2020; Long et al., 2020). Additionally, the suspension of learners' rotations in hospitals and clinics has decreased their exposure to important teaching related to health system transformation. While the pandemic has disrupted health systems and the delivery of health professions education, there are some silver linings. The pandemic is catalyzing health system transformation and health professions education, including advances in virtual care, disease surveillance, artificial intelligence, and improving interprofessional collaboration (Langlois et al., 2020; Long et al., 2020). In Canada, technology for virtual care

has existed for quite some time; however, many barriers that prevented the uptake of virtual care in Canada were instantly removed with the onset of the pandemic (Glazier et al., 2021). During the first year of the pandemic, the College of Family Physicians of Canada (CFPC) reported from survey data of their members that virtual care was the norm with four out of five patient visits happening over the phone or through a video conference (CFPC, 2020). Similarly, health professions education experts propose that given the disruption of clinical duties, it is an opportune time for learners to further develop competencies in health systems (Long et al., 2020). Historically, disruptive events have advanced innovation in health care and within health professions education. Thus, given the need for health system transformation, there is an opportunity for health professionals and health professions education to prepare the current and future health workforce to be a part of the solution.

Health system transformation in the education of health professionals

Policy makers are calling on Canada's health care professionals to be accountable to the co-stewardship of health system transformation (Martin et al., 2018). As this transformation alters the delivery of health care access, safety, and quality of care, it is critical that health care professionals are actively engaged in interventions that promote reform (Butler et al., 2017; Martin et al., 2018; Onyura et al., 2019; Pepin et al., 2017). Thus, the scope and emphasis of health system transformation in the education of health professionals needs to adapt to prepare health professionals to propel health system transformation. As health system transformation is a growing priority for policy makers, there is also a paradigm shift in the education of health professionals to prepare health professionals to meet the needs of health systems and the transformation of them (Gonzalo et al., 2020; Salmond & Echevarria, 2017). To achieve health system transformation, roles within the systems need to change, including the role of the patient, physician, nurse, and other health professionals across the continuum of care (Plack et al., 2018). There is a growing concern for the increasing involvement of health professionals in discourses on health system transformation (Frich et al., 2015; Onyura et al., 2019; Pangaro, 2019; Plack et al., 2018). Driving the need for health system transformation is the challenges that the current health systems face, including growing costs, public expectations for high quality care, integration of new technology, a shifting demographic, and growing health inequities. Health professionals, regardless of role or level, are well-situated to be stewards in health system

transformation given their influence over quality improvement and resource utilization in clinical practice (Frenk et al., 2010; Martin et al., 2018).

The most profound connection between the health system and the education of health professionals in the literature came from the 2010 Lancet commission's report on health professions education sharing their vision for the future of health professions education to transform health systems globally. The commission came together 100 years after the Flexner report, a report that has predominately shaped the current state of medical education and health care internationally. One of the many critiques of the Flexner report is that it narrowed medical education towards treating disease and not the system or society beyond the disease and fail to address equity related issues that lead to poor health outcomes. The authors of the 2010 Lancet commission also defined that a key objective of their report would be to approach the education of health professionals from an integrated approach instead of addressing education in professional siloes that have occurred in the past that have prevented health professionals to optimize their role in health systems. Furthermore, Frenk and colleagues propose a novel framework that aims to understand the complexities and fundamental linkages between the health and education systems to ultimately improve patient and population health (Frenk et al., 2010). A key strength of this framework is that it situates the population driving both the education and health systems to best understand the needs of both systems.

Since 2010, aspects of health systems have been included in the education of health professionals globally, however it is still being addressed in fragments including professional silos and by area of care. Across the education of health professionals' curricula around the world, a variety of concepts are used to describe health systems roles for health professionals. For example, medical education competencies in American medical education programs are categorized as health systems science competencies. Health systems science domains include policy and economics, informatics, population health, value-based care, quality improvement, inter-professional care, evidence-based practice, professionalism, and systems thinking (Gonzalo et al., 2020). In Canada, health systems competencies are framed within the context of leadership with an impetus for continuous quality improvement and maintaining a high-quality health system (Shaw et al., 2017). Commonalities between the American and Canadian curricula include a focus on leadership across domains such as quality improvement, patient safety, team-based care, and population health. Fewer curricula focus on domains that are exclusively

examining health systems leadership at the macro level, such as policy, health equity, and systems thinking (Onyura et al., 2019). While health systems competencies exist, they are not well understood in medical education curricula by educators and students, which adds to the complexity of understanding the concepts in practice (Danilewitz & McLean, 2016). To add clarity to this research, I will define key terms that are used in health systems the education of health professionals.

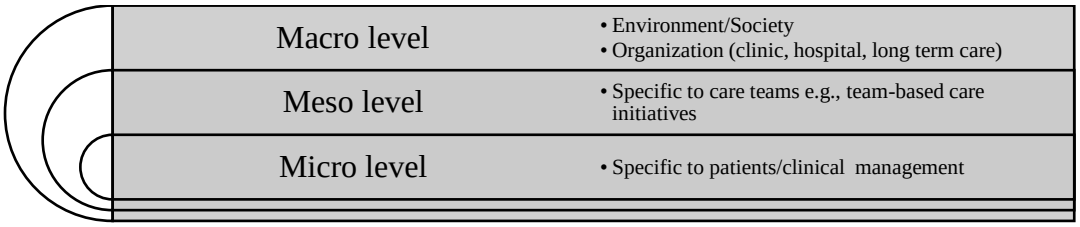
Three recent systematic reviews examining leadership in medical education programs have found that current medical education is not robust enough for health professionals to meet emerging health systems challenges (e.g., emerging diseases, ageing population, the shift from sick care to prevention) (Frich et al., 2015; Onyura et al., 2019; Sadowski et al., 2018). A 2019 systematic review assessing the efficacy of leadership education in postgraduate medical education curricula found that less than 15% of leadership curricula dealt with leadership at the health systems or macro level, such as policy, equity, and systems thinking (Onyura et al., 2019). A 2015 systematic review of 45 studies examining physician development programs found that the majority of programs (35) exclusively targeted physicians and focused primarily on skills training, technical and conceptual knowledge, while few programs focused beyond the individual level. Furthermore, few studies reported outcomes at a systems level, suggesting that future programs go beyond the individual level and focus more on health systems leadership (Frich et al., 2015). Similarly, a 2018 systematic review examining the effectiveness of leadership programs in medical education found that programs that provided small group health systems teaching, project-based learning mentoring, and coaching were more frequently used in higher quality studies. Additionally, longitudinal programs are more likely to be successful (Sadowski et al., 2018). A 2015 systematic review on leadership development within postgraduate medical education programs found that most of the outcomes in leadership education focus on the individual level versus the systems level (Frich et al., 2015). These reviews examining aspects of health system transformation in medical education align with studies examining health system transformation in nursing education, which suggest that new ways of thinking and practicing ought to be considered in the education of health professionals' curricula across micro, meso, and macro levels of health systems (Salmond & Echevarria; Pepin et al., 2017). While these reviews shed light onto gaps in understanding aspects of health system transformation in medical education the primary objectives of each of the three reviews is leadership, and there are no

known reviews that exclusively look at health system transformation in medical education. Furthermore, there are no known reviews that examine health system transformation more broadly in the education of health professionals warranting the need to better understand the state of the literature on health system transformation in the education of health professionals through a scoping review.

Furthermore, there is a paucity of existing literature on systems thinking in the education of health professionals, providing little guidance for educators to build appropriate content to address this gap in curricula (Plack et al., 2018). While there is a curricular gap that addresses health systems education, several studies have demonstrated that health professionals are eager for systems-level knowledge (Frich et al., 2015; Onyura et al., 2019; Pepin et al., 2017; Plack et al., 2018; Sadowski et al., 2018). Martinez and colleagues (2013) state that to achieve optimal health outcomes this century, all health professionals need to see themselves as a vital component of health systems. Swansen et al. (2012) make specific recommendations to the education of health professionals for health system transformation. Recommendations include that the education of health professionals should aim to implement competency-based health curricula and team-based learning that is continuously assessed to address the changing health needs of the community and health systems. Health systems that are adapting and evolving to reflect the needs of populations are commonly referred to as "learning health systems." Learning health systems are a key feature of the health system transformation and must be reflected in the curricula to effectively prepare health professionals to practice and think in evolving systems at all levels (See Figure 1) (Forrest et al., 2018; Plack et al., 2018). Similarly, the education of health professionals should promote interprofessional education (e.g., medicine, public health, nursing, and health policy) through learning through case studies and practical experiences that encourage collaboration across disciplines that break down traditional professional and disciplinary silos (Salmond & Echevarria, 2017; Swansen et al., 2012). Similarly, Pangaro warns that the role of physicians in shaping the future of health systems may be in jeopardy if medical education curricula do not adapt their pedagogy to meet the emerging challenges of the profession (Pangaro, 2019).

Figure 1

Levels of Health system transformation in the education of health professionals (Plack et al., 2019)



In a paper proposing a nursing education framework to promote health system transformation, Pepin and colleagues (2017) state that health professions education should make connections between education and health systems. The aim of a curricula with this approach is to enhance health professionals' responsiveness to populations' needs and prepare the future health workforce to be active stewards in the health system (Pepin et al., 2017). Moreover, in the context of increasingly decentralized health service delivery models (e.g., shift towards increased care in community settings), health professionals participating in health system transformation at the macro, meso and micro levels will require new competencies and plans for strategizing processes within the education of health professionals (WHO, 2014).

After an introductory review of the literature on health system transformation in the education of health professionals, below I will define key terms essential in understanding for the scoping review.

Transformative Learning and Interdependence. Transformative learning and interdependence are key components of the education of health professionals' curricula to promote health system transformation. Transformative learning is the process of transforming one's frames of reference such as their perspective on worldview and self to enhance their reflective ability to catalyze change. Transformative learning entails the development of leadership attributes that are necessary to be a change agent and include outcomes such as critical thinking, effective teamwork, and adaptation of global resources for local priorities. Interdependence is understanding how systems interact with one another. Further research is needed to understand the impact of educational interventions on patient and systems outcomes (Pepin et al., 2017; Plack et al., 2019).

Health Systems Thinking. The World Health Organization (WHO) defines health systems thinking as an approach to problem solving that involves understanding key features and characteristics of a system coupled with an understanding of how to think about that system, analyze it, and approach enhancing it. The practice of understanding the interrelationships among systems and structures and applying that complexity to care is the definition of systems-based practice and health systems leadership. To be effective at systems-based practice, one must understand the interrelated parts of the complex whole (De Savigny & Adam, 2009; Plack et al., 2019). Applying systems thinking in health care is valuable for complex events such as crises and disasters, preventing errors, enhancing patient safety and quality improvement, and facilitating the implementation of process changes (Plack et al., 2019; Swanson et al., 2012). Health systems thinking is the foundational construct of health systems leadership and it is necessary to achieve defined competencies such as contributing to the improvement of health care delivery and engaging in the stewardship of health resources (Plack et al., 2019).

Health Systems Stewardship. Health systems stewardship is the clarification of the practical components of governance within health systems. Brinkerhoff and colleagues (2019) define health systems stewardship as both a study and practice and combines an ethical and moral dimension where population health is an end goal (Alvarez-Rosete et al., 2013). The WHO describes the practice of health systems stewardship as a critical lever for health system transformation (Brinkerhoff et al., 2019). Furthermore, Alvarez-Rosete and colleagues describe health systems stewardship as the practice of reforming a system for the purpose of what is best for the welfare of populations and health systems over self-interest (Alvarez-Rosete et al., 2013).

Health Systems Leadership. Health systems leadership entails active participation in the stewardship and transformation of health care delivery, health policy, and health resources with an interest of the population. Health systems leadership also includes being aware of health systems challenges, including demographic shifts, rising income inequalities and technological advances. Onyura and colleagues describe the role physicians play in health systems leadership through their direct involvement in resource utilization and quality improvement (Onyura et al., 2019).

Health Systems Accountability. Emmanuel and Emmanuel (1996) discuss physician accountability within the concept of professionalism, emphasizing physicians' responsibility to patients, organizations, and colleagues, focusing on ethical and legal conduct. Further, Lesser

and colleagues (2010) view professionalism and accountability as opportunities to enhance the health system through education and systemic reforms aimed at improving patient outcomes. In 2011, the CMA and CNA issued a joint statement outlining principles for health system transformation, including a strong emphasis on accountability. According to the statement, accountability entails all stakeholders, including providers, ensuring the system's effectiveness and accountability through good governance, responsible use, robust public reporting, enforceability and redress, leadership and stewardship, and responsiveness (CMA & CNA, 2011).

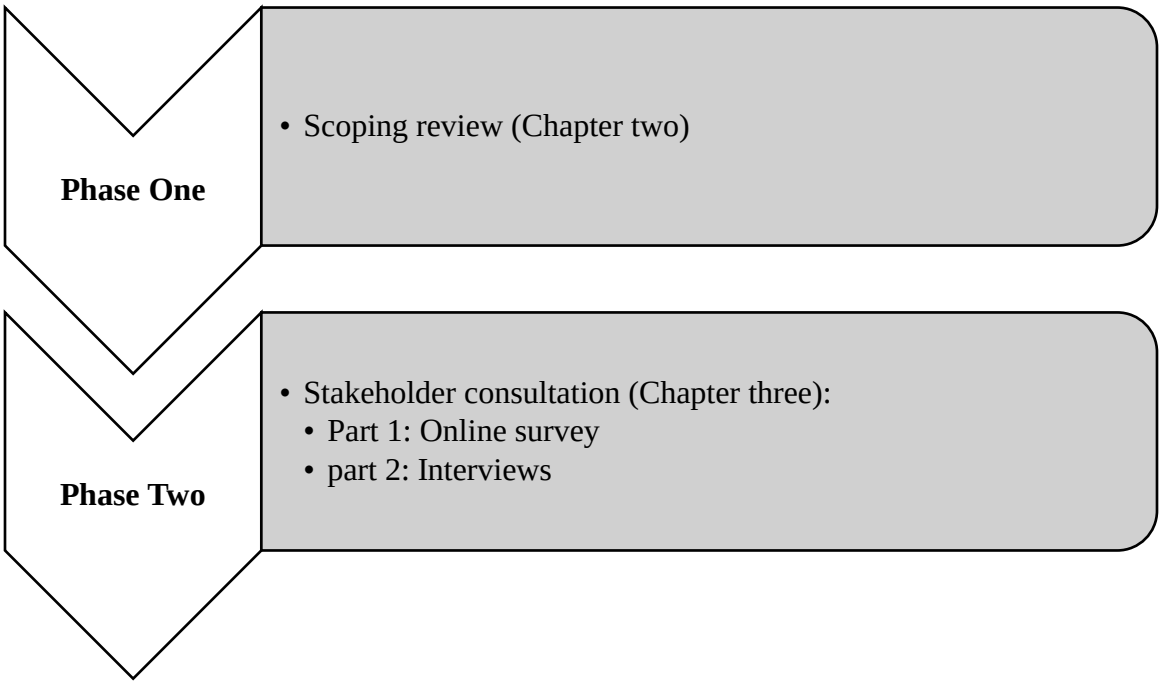
Previous research sheds light on an education gap of incorporating health system transformation into the education of health professionals. In 2018, Martin and colleagues called on health professions accountability to the stewardship of health system transformation. However, the education of health professionals needs to be enhanced before health professionals can actively engage in health system transformation.

Research Design and Methodology

This sequential mixed-methods study comprised of two phases including phase one, which consisted of a scoping review and phase two which consisted of an extensive mixed-methods stakeholder consultation. I conducted a scoping review following the first five steps of a scoping review as defined by Arksey and O'Malley (2005). As previously indicated, to describe the state of the literature on health system transformation in the education of health professionals I conducted a scoping review that included a stakeholder consultation exercise (step six) of this protocol (Arksey & O'Malley, 2005; Levac et al., 2010). Scoping reviews include six steps to examine the extent, range, and nature of research activity in a particular field when evidence in that field is only beginning to emerge, and systematic reviews of the topic do not yet exist. I included a compulsory consultation exercise to accompany the scoping review. Through consultation, the exercise both enhanced and validated the findings of my review. The consultation allowed me to identify stakeholders' concerns, delineate gaps in the literature and intimate recommendations for future programs of research based not solely on my interpretation of the literature but on the direct feedback of my participants. Figure 2 below presents a visual of the study design.

Figure 2

Study design: Sequential mixed-methods study



Conceptual Framework: Quintuple Aim

I utilized the conceptual framework known as the Quintuple Aim to guide this study. Derived from current literature on health system transformation, the Quintuple Aim serves as the desired outcome or "North Star" for such transformations. This framework comprises five key components: enhancing the value of health system delivery, improving the quality of patient care, promoting health professional well-being, advancing population health outcomes, and fostering health equity (Best et al., 2012; Nundy et al., 2022). Previously, these aims were perceived as competitive; however, they are now understood to be interdependent and mutually reinforcing. Although this study commenced prior to the introduction of the Quintuple Aim in 2022, an earlier version of this framework, the Quadruple Aim, guided this research across all three articles.

Ethical Considerations

I obtained approval for Phase II of this study from the Social Sciences and Humanities Research Ethics Board (REB) at the University of Ottawa (See Appendix B). All oral and written

communication with the study participants were outlined in the purpose of the research and discussed ethical concerns such as confidentiality, anonymity, and participants' rights to withdraw from the study. Participants in the study also consented to participation by signing a consent form that will contain the aforementioned information.

Research Contributions

This research holds significant implications for the education of health professionals, practice, and health policy. Firstly, the study findings enrich health professionals' education by offering insights that can guide the refinement of educational curricula. This includes the implementation of targeted interventions such as revising health professionals' competencies, curricula, and Continuing Professional Development (CPD) programs that actively promote health system transformation. Secondly, the scoping review establishes a foundation for future educational initiatives and research programs focusing on health professionals' education and CPD interventions, particularly those directed towards health system transformation. It sets the stage for ongoing exploration and development in these critical areas. Lastly, the study findings may exert an impact on both practice and policy by identifying barriers, facilitators, and opportunities for integrating emerging research and innovations into healthcare practices. The insights gleaned from this research could contribute to the formulation of strategies aimed at addressing future challenges related to educating health professionals on health system transformation. In essence, the study's outcomes have the potential to shape and improve the landscape of health professionals' education, inform evidence-based practice, and influence policy decisions in the realm of health system transformation.

Structure of the Dissertation

This dissertation consists of five chapters. This chapter served as an overview on the review of the current literature, study objectives, and methods for conducting this mixed-methods study. Chapters two to four are three interconnected articles that have equal weight and balance, which is important in understanding how each article subsequently builds on the findings of the next. Chapter two includes phase one of the study, a scoping review (steps one to five) on the topic to gain insights into the current state of the literature on health system transformation in the education of health professionals. Chapter three consists of a mixed-methods study (step six of the scoping review) where stakeholders articulate the experiences and

challenges linked to health system transformation in the education of health professionals. Chapter four proposes a framework for health system transformation in the education of health professionals based on the findings from chapters two and three. Finally, chapter five serves to synthesize chapters two through four and provides concluding notes.

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Chapter Two: Article 1

Health System Transformation in the Education of Health Professionals: A Scoping Review

Ashley Chisholm

Article type: Original Paper

Abstract

Context: Health system transformation is a health policy priority in Canada. With health professions experiencing increasingly formal expectations to be accountable to health system transformation, we require systematic knowledge about the current state of the literature on health system transformation in the context of the education of health professionals.

Objective: This study aims to understand the following research questions: (1) what is the current state of the literature on health system transformation in the education of health professionals? and (2) what areas are important to consider for future curricula development and programs of research on health system transformation in the education of health professionals?

Study Design: To address these research questions a two-phase study was conducted. Phase one was comprised of a scoping review following the first five steps of a scoping review as defined by Arksey and O'Malley.

Results: Systematic searches of four prominent databases identified 44 articles for analysis. Several major themes emerged on the current state of the education of health professionals on health system transformation: (1) existing approaches and curricula for health system transformation in the education of health professionals, (2) preparedness to participate in health system transformation, (3) attitudes toward health system transformation in the education of health professionals, (4) the role of health professionals, (5) the role of mentors and faculty, (6) impetus for health system transformation, and (7) disconnect between health and education systems. Areas of importance for future curricula development and programs of research include: (1) the culture of the education of health professionals, (2) interprofessional and collaborative approaches to health system transformation, (3) commitment to health equity and social accountability, and (4) the impact of COVID-19 on the education of health professionals.

Conclusions: The study's findings generate a deeper understanding of the current state of knowledge of health system transformation in the education of health professionals and how we can prepare health professionals to lead and participate in health system transformation.

Keywords: scoping review, health system transformation, health professions education

Introduction

Health system transformation is a growing health policy priority, especially as health systems globally are recovering from the COVID-19 pandemic. In Canada, health system transformation is influenced by escalating health care costs, increasing prevalence of multiple chronic health and social conditions, increasing health inequities, and high levels of health workforce burnout. These factors ultimately contribute to the unsustainability of health systems and a need for health system transformation.

Policy makers are calling on health professionals to be accountable for health system transformation; however, it is unknown if the education of health professionals prepares them for this call. Over the past 100 years, the education of health professionals has been shaped by three seminal reports (Flexner, Welch-Rose, and Goldman) ultimately preparing health professions to have a strong scientific foundation and highly developed clinical skills through competency-based education. While this approach to the education of health professionals was innovative at the time, considering scientific advancements in medicine over the past century and the role of health professionals to manage and treat disease of individual patients, it falls short in meeting today's population health needs and broader competencies and skills are required. Furthermore, the role of health professionals has evolved in the 21st century and health professionals are currently not prepared to face the systemic challenges that lay in front of them over 100 years later (Frenk et al., 2010; Frenk et al., 2022). In response to the demands of health systems and to better meet the needs of communities, the education of health professionals is undergoing a transformation, incorporating topics and competencies related to health systems to enhance health professionals' development of skills in catalyzing systems reform in their practices and thinking (Lucey, 2013). The problems faced today by patients and populations are systemic in nature and health professionals have not been prepared to treat patients and populations on the broader contextual conditions that ultimately influence health (Frenk et al., 2010; Singh et al., 2021).

The education of health professionals incorporates topics and competencies related to health system transformation to enhance health professionals' development of skills in promoting systems reform in their practices and thinking. Albeit there is insufficient evidence to show the extent to which the competencies are occurring within the education of health professionals. While there has been attention to health system transformation and the education of health

professionals individually, little attention has been paid to how they interact. Similarly, research completed on the topic has been analyzed in silos by professions, such as medicine and nursing or by area of care (Onyura et al., 2019; Salmond & Echevarria, 2017). With health professionals experiencing increasingly formal expectations to be accountable for health system transformation, we require systematic knowledge through study about the current state of health system transformation within the context of the education of health professionals.

Methods

To describe the state of the literature on health system transformation in the education of health professionals we deployed a scoping review methodology following Arksey & O'Malley's (2005) methodological framework (Arksey & O'Malley, 2005; Levac et al., 2010). For the purpose of this review the operational definition of 'health system transformation' is described as the process of coordinating interventions aimed at systems-wide change affecting multiple organizations and health professionals (Best et al., 2012). The education of health professionals is a specialized interdisciplinary study dedicated to the education of health professionals. The education of health professionals is comprised of many different types of professionals (e.g., physicians, nurses, pharmacists, physiotherapists) who provide a wide range of health care services in a wide variety of settings within health systems (Yudkowsky et al., 2019). A final protocol was pursued and registered under Open Science Framework registries (https://osf.io/kucz9/).

Step 1: Identifying the research question

To guide our inquiry, we identified the following research questions:

1. What is the current state of the literature on health system transformation in the education of health professionals?
2. Based on the current state of the literature/evidence, what areas are important to consider for curriculum development and future programs of research on health system transformation in the education of health care professionals?

Step 2: Identifying relevant studies (designing a search strategy)

To ensure an accurate inclusion of articles, the search strategy was applied to four large health or education databases: Education Resources Information Center - ERIC (OvidSP),

Cumulative Index of Nursing and Allied Health Literature - CINAHL (EBSCOHost), MEDLINE (OvidSP), and PsycINFO (OvidSP). In collaboration with the university librarian (P.L.), search strategies were developed for each database to enhance the quality of the searches (Appendix A). The search included keywords, exact phrases, and subject headings relevant to the education of health professionals on health system transformation. The subject heading terms were also used as keywords for a comprehensive search strategy. Limits were placed on the search and include articles that have been published in the past ten years (2021-2011) and had full-text in English. Limits were placed on the last ten years to reflect a recent growth in the literature during this time stemming from the publication of the Lancet Commission Education of Health Professionals for the 21st Century in late 2010 (Frenk et al., 2010). A final search using all identified keywords and index terms was done on October 28, 2021. The database searches resulted in 3,142 articles for screening. Of these, *Covidence* automatically identified and removed 94 articles as duplicates.

Step 3: Study Selection

I selected original articles that had a focus on health system transformation in the context of the education of health professionals. I established inclusion and exclusion criteria to ensure consistent and replicable decision-making is occurring throughout the screening process and ensure that only those articles that are addressing my research questions will be considered for inclusion (Appendix A).

Two reviewers (A.C., D.W.), independently screened all sources at the title and abstract levels. After the title and abstract screening, they reviewed the selected articles, and appraised the articles that were left following my full text review to confirm that they were appropriate to include in the study. Once articles were identified, the reviewers extracted data through a descriptive analytical method to assist in mapping the literature and subjectively collect data that included key information and main ideas from each article (Arksey & O'Malley, 2005; Levac et al., 2010).

Step 4: Charting the data

Once we identified the relevant literature, we extracted and charted the data through a descriptive analytical method (Arksey & O'Malley, 2005). This process aims to assist in mapping the literature and subjectively collect data that includes key information and main ideas from each article (Arksey & O'Malley, 2005; Levac et al., 2010). Charting was an iterative

process that evolved through familiarizing ourselves with the included articles. Common characteristics from each study, such as authors' names, publication dates, locations, population features (e.g., identifying health profession), study aims, and themes, were recorded during this process. When discrepancies arose, we consulted a third team member (K.M.) to make a final decision about the extracted information.

Step 5: Collating, summarizing, and reporting of results

As a team we collated, summarized, and reported data within the results section of the scoping review through two components: the presentation of a descriptive summary of the numerical findings from Step 5 and the presentation of the articles' emerging themes. Common characteristics from each study, such as authors' names, publication dates, locations, population features (e.g., identifying health profession), study aims, and themes were recorded during this process. A.C. reviewed all charted data and resolved any discrepancies until consensus was reached.

Data Analysis

One author (A.C.) summarize and reported data within the results section of the scoping review through two components: the presentation of a descriptive summary of the numerical findings and the presentation of the articles' emerging themes. A.C., calculated frequencies of country of origin, publication date, population studied, and the type of article. Once data was charted prominent themes were developed through thematic analysis into topic summaries mapping onto the two research questions guiding this scoping review.

Results

Figure S1 (Appendix A) presents the article screening and selection process in the form of a PRISMA[1] flow diagram. After reviewing this scoping review identified 44 articles for final inclusion on the topic of health system transformation in the education of health professionals.

Characteristics of included articles

Out of the 44 articles included in the review, 37 originated in the United States of America, 4 in Canada, and one in each Australia, Saudi Arabia, and one multi-country study across the region of Europe. The articles spanned a range of publication dates between 2011 and 2021 as per the inclusion criteria of articles published in the last 10 years. Over 75% of the

[1] Preferred Reporting Items for Systematic Reviews and Meta-Analyses (Moher, Liberati, Tetzlaff, & The PRISMA Group, 2009)

articles included in this study were published in the last 5 years demonstrating a growth in this topic area in recent years. The journal types represented a range of the health professions however only 6 articles looked at the topic area across the health professions. Articles primarily focused on medical education representing 29 of the included articles. Other health professions that were studied in silos included nursing with 7 articles, and dentistry and psychology with one article included for each. The article type fell into two broad groups: empirical studies (n=17) and commentaries or position papers (n=27).

The commentary or position papers (n=27) addressed a wide range of topics relevant to health system transformation in the education of health professionals. For example, they included a paper on the skills and training nurses need to be stewards of the health care system (Berwick, 2011), a paper proposing a framework to better implement a health system science curriculum in medical education (Borkan et al., 2021), and paper on the role gaming science can play in incorporating health systems topics in medical education (White et al., 2018). Many of the papers were written in response to Frenk and colleagues 2010 Lancet Commission report on the education of health professionals. Given my underlying research questions, my interest was in those sections of the articles that pertained to aspects of approaches to how health system transformation is being approached in the education of health professionals. Below, I present the themes that correspond to the two research questions guiding the scoping review.

Research Question 1: The current state of the literature on health system transformation in the education of health professionals

Existing approaches and curricula for health system transformation in the education of health professionals. Twenty-eight studies specifically mention existing curricula or specific approaches were mentioned as part of the literature on health system transformation in the education of health professionals. Review of the literature revealed that there are several educational approaches to incorporating health system transformation into health professional education, including interprofessional education, problem-based learning, simulation-based education, service learning, and curriculum integration. The most prominent approach studied is the health system science curriculum, also commonly referred to as the science of health care delivery, comprising of 16 studies in the review. The health system science curriculum is specific to medical education and is being implemented widely throughout the United States with a focus on developing the necessary skills to drive quadruple aim. Competencies of health system

science include population health (social determinants of health and health equity), value-based care, health care policy and economics, interprofessional skills, informatics, and health system improvement (Borkan et al., 2021; Davis & Gonzalo, 2019; Essary & Wade, 2016; Gonzalo et al., 2018; Gonzalo et al., 2017a; Gonzalo et al., 2020a, Gonzalo et al., 2020b; Gonzalo et al., 2017b; Gonzalo et al., 2016; Gonzalo & Ogrinic, 2019; Gonzalo et al., 2017c; Lawson et al., 2019; Lin et al., 2017; Singh et al., 2021; Starr et al., 2017; and White et al., 2018). Other programs exclusive to medical education that either support or expand on the health system science curriculum include Value-Added Medical Education, Stanford Healthcare Innovations and Experiential Learning Directive, and Perspectives on the Changing Health Care System curriculum (Lin et al., 2015; Lin et al., 2017; Martinez et al., 2013). Three programs in the review pertaining to medical education were exclusive to transforming primary care, two were through academic learning collaboratives and one was through learning and practicing in a patient-centered medical home model (Bitton et al., 2014; Kim et al., 2017; Koch et al., 2017). From an interprofessional perspective, three articles outline interprofessional programs for health system transformation across the education of health professionals. They include an accredited interprofessional education in health care improvement science, a commentary on the Veterans Affairs Quality Scholars program competencies, and the assessment of a health system leadership fellowship in Canada (MacRae et al., 2016; Hortsman et al., 2021; Philippon et al., 2018). Outside of formal programs aimed specifically at achieving health system transformation, three articles discuss how quality and safety improvement initiatives embedded in nursing curricula prepare students for leadership in health system transformation (Hoyle & Johnson, 2015; Harmin et al., 2016; Oliver et al, 2017).

Preparedness to participate in health system transformation. Out of the articles that have commented and evaluated educational approaches to health system transformation in the education of health professionals, preparedness to participate in health system transformation arose as a theme in these papers. Preparedness of health professionals fell into two overarching categories, 1) how health professionals are currently not prepared to participate in system transformation activities and 2) how the education of health professionals and suggested curricula can prepare health professionals to participate and lead in a transforming health system. Berwick (2011) stated that most graduates of health professional educational program have low levels of functional literacy about the systems in which they work or the tools to become

competent at systems-based practice (Berwick, 2011). Similarly, Martinez and colleagues state that with on-going changes in health care, it is crucial that medical education prepares residents to be competent in systems-based practice (Martinez et al., 2013). Outcomes of an empirical study found that following an eight-week program on health system transformation and leadership following principles of health system science, participants demonstrated significant improvement in knowledge and confidence in participating in quality improvement initiatives in the health system (Lawson et al., 2019). Similarly, another study found that the Science of Health Care Delivery curriculum in undergraduate medical education is necessary to successfully prepare physicians to ensure the best clinical outcomes and patient experience of care, at the lowest cost (Starr et all., 2017). Finally, Harmin and colleagues found that nursing faculty can better prepare students by engaging them in population and system level thinking (Harmin et al., 2016).

Current attitudes toward health system transformation in the education of health professionals. Attitudes towards health system transformation was a dominant theme across the selected literature. Attitudes from health professional trainees including the perceived importance and relevance of health system transformation, competition between clinical science curricula, preference for usable testable facts over systems complexity and uncertainty (Gonzalo et al., 2020). Davis & Gonzalo (2019) state that another challenge is that not all students believe health systems topics are worth learning in medical school because they simply do not believe it improves their ability to practice medicine or that it may not be of value until many years later (Davis & Gonzalo, 2019; Gonzalo & Ogrinic, 2019). Several articles have reported attitudes from students and faculty members that state health systems competencies are only required once in leadership positions and not necessary in undergraduate training (Davis & Gonzalo, 2019). Students have also identified perceptions of barriers including there is an attitude stemming from licensing examinations that basic science as core and systems concepts are important but not essential, students lack sufficient knowledge to perform systems roles, and that students perceive that the culture of medical education and clinical systems does not support systems education. Students perceive health systems education as important however, are faced with the tension of needing to perform on licensing exams and matching into preferred residencies which focus on clinical excellence (Gonzalo et al, 2016; Martinez et al., 2013).

The role of health professionals. The role of health professionals in health system transformation was included in most articles however the role varied at micro, meso, and macro levels across the health system. Some articles focused on micro level activities related directly to clinical practice, such as quality improvement initiatives and patient safety activities (Kirch & Ast, 2017; Flynn et al., 2017; Oliver et al., 2017). While other articles focused on meso or macro level roles such as health professionals being agents of change within their practice setting, master learners, or a 'system citizens' who are effective stewards of the health care system in the context of health system transformation (Berwick, 2011; Essary & Wade, 2016; Borkan et al, 2021). Furthermore, some articles refer to role of health professionals at the marco or leadership level and overseeing the direction of health system transformation initiatives (Phillipon et al., 2018; Berwick, 2011; Hoyle & Johnson, 2015). Mac Rae et al., take a more comprehensive approach suggesting that health systems education is relevant to professionals at all stages of their professional development in whatever part of the health care system they work (Mac Rae et al., 2016).

The role of mentors and faculty. It was apparent in the selected literature that mentors and faculty play a crucial role in advancing health system transformation in health professional education as they are responsible for providing guidance, support, and direction to students as they navigate the complexities of the health care system and learn about the role students can play in transforming it. Albeit it was conveyed across the literature that health system transformation in the education of health professionals were at the discretion of the faculty and students' experiences would be dependent on whether or not they valued it as an important part of their education (Gonzalo & Orgrinic, 2019; Makeen, 2015; Singh et al., 2021). Faculty not being engaged in health system transformation in the education of health professionals was primarily due to perceived importance in becoming a competent health professional or due to gaps in knowledge in the subject matter. To address these gaps, six studies specifically addressed training faculty or mentors on health system transformation related topics in the education of health professionals (Singh et al., 2021; Hortsman et al., 2021; Gonzalo, 2020a; Gonzalo 2018; Philippon et al., 2018; Makeen, 2015). Studies found specific training on health system transformation gave faculty or mentors the confidence to better be prepared to be leaders in their respective health systems, ensure future graduates have the expertise to effect health system transformation, and providing students with opportunities to engage in health system transformation activities (Philippon et al., 2018; Singh et al., 2021; Hortsman et al., 202;

Gonzaolo et al., 2020a). Studies also suggest that future work in this area should focus on further studying competencies for faculty or mentors that support students in health system (Gonzalo 2018; Makeen, 2015; Singh et al., 2021; Philippon et al., 2018).

Impetus for health system transformation. Most studies in the review describe the goal of health system transformation in health professionals' education as aligned with the principles of the Institute for Healthcare Improvement's iteration of the triple or quadruple aim framework. This framework emphasizes enhancing patient experiences, improving population health, lowering costs, improving provider satisfaction (Borkan etal., 2021; Carney, 2015, Davis & Rayburn, 2016; Essary & Wade, 2016; Gonzalo et al. 2018; Gonzalo et al., 2020a). To achieve these goals, it is crucial for health professionals to be competent in each aim, which requires engaging faculty and students who are prepared to practice, educate, and lead in each of the four aims. Those with stake in the education of health professionals and health system leaders have identified the need for health professionals to focus on the quadruple aim across the learning continuum, from undergraduate education to continuing professional development (Lawson et al., 2019, Gonzalo et al., 2017; Gonzalo & Ogrinic, 2019; Gonzalo et al., 2020a; Gonzalo et al., 2020b; Gonzalo et al., 2018). Findings revealed that the quadruple aim framework is the north star for health system transformation in the education of health professionals.

Disconnect between health and education systems. A dominant theme across the selected literature revolved around the disconnect between the current state of health and education systems. Several authors note that both systems are interdependent of each other, however transformation efforts have been occurring in health and education systems independently. Across the articles authors suggest that this phenomenon is primarily due to fragmented transformational efforts in both health and education system as a response to episodic events in each system and therefore the goals of each systems transformation are not aligned. Authors also suggest that the education of health professionals has not evolved with new knowledge around health system science because of the emphasis of curricula on clinical science (Berwick, 2011; Makeen, 2015).

Research Question 2: Areas to consider for curriculum development and future programs of research on health system transformation in the education of health professionals

The culture of the education of health professionals. Most studies acknowledge the current tensions in the education of health professionals in balancing educating health professionals who are competent in both the clinical sciences while also being competent in the systems in which they work in. This tension is largely due to the historical emphasis in curricula on developing health professionals who are experts in treating disease that is engrained in the education of health professionals. The focus of this emphasis in medical education is shaped by the Flexner Report from 1910, which recommended a narrow set of competencies for physicians that focused on clinical sciences. While this model was innovative at the time, it has not evolved with the evidence to adequately meet the current population and health system challenges, leading to a push towards a more collaborative, patient centered, team-based care model. Furthermore, several articles describe how the focus on biomedical research and tertiary care persists in medical education resulting in training physicians who are poorly prepared to meet broader societal needs (Bitton et al, 2014; Gonzalo et al., 2016; Starr et al., 2017).

Health professional programs must restructure their views of basic and clinical science and workplace learning to give equal emphasis to the science and skills needed to practice in and lead in complex systems (Lucey, 2013). Authors of the selected literature describe the misalignment of the education of health professionals competencies to patient and population health needs due to a lack of teamwork across the health professions, persistence of gender stratification in professional roles, specialization in technical responsibilities without broader contextual understanding, a focus on episodic care versus continuous care, a focus on hospital care versus upstream primary health care, and a leadership for improving health systems (Borkan et al., 2021). As a result, selected articles suggest health professional programs must restructure their focus to give equal emphasis to both the science and skills needed to practice and lead in complex health systems.

Interprofessional and collaborative approaches to health system transformation.
Articles addressing health system transformation in the education of health professionals were predominantly written and studied in professional siloes, except for six (Brownie et al., 2014; Essary & Wade, 2016; Horstman et al., 2021; Lutfiyya et al., 2016, MacRae et al., 2016; Philippon et al., 2018). While only six studies addressed health system transformation in the education of health professionals from an interprofessional perspective, other studies highlighted

the benefit of interprofessional approaches to the education of health professionals. Interprofessional and collaborative approaches to health system transformation aim to break down silos and encourage health professionals to work together to address the complex challenges facing the health care system and optimize their role in the system. This approach is important as education flows into the existing workforce to effect change in the culture of health professions and health care (Brownie, 2014; Lin et al., 2017; Lankshear & Limoges, 2021). These interprofessional and collaborative approaches to health system transformation are critical for preparing future health care providers to work effectively in the complex and evolving health care landscape.

Commitment to health equity and social accountability. A commitment to health equity and social accountability was paramount across the selected articles when describing aspirations for health system transformation and the role of health professionals. One article in the Canadian context suggests that social accountability forms the necessary bridge between the education of health professionals to the health system (Wood et al., 2021). Other articles argue that professional social accountability and commitment to health is needed to mitigate the existing racial inequities that were underscored throughout the COVID-19 pandemic. The need for health system transformation to achieve health equity demonstrating the importance of the need for future health professionals to acquire skills to transform health systems that are equitable (Lankshear & Limoges, 2021; Singh et al., 2021; Borkan et al., 2021; White et al., 2018). The education of health professionals is particularly important as health system transformation is needed to address health disparity and pandemic recovery (Singh et al., 2021; Wilkes et al., 2018).

Impact of COVID-19 Pandemic on the education of health professionals. Out of the articles published after 2020, authors discussed how the COVID-19 impacted the education of health professionals and how there is an opportunity for better integration of health system transformation in the education of health professionals as we look towards pandemic recovery (Borkan et al., 2021; Singh et al., 2021; Lankshear & Limoges, 2021). As a result of the pandemic, health systems are rapidly undergoing transformation to meet with current population health demands placed on health systems (Borkan et al., 2021). The widespread implementation of technology in both the delivery of the education of health professionals and in the delivery of health care have permanently changed how both systems function. Some studies commented on

when disruptions to traditional methods of medical education occurred during the first wave of the pandemic it allowed for collaboration between students across the health professions, educational institutions, and health systems to find solutions to the complex health system problems that didn't exist in previous curricula (Singh et al., 2021; Lankshear & Limoeges, 2021). These experiences also shed light onto opportunities for students to see themselves engaged in health systems activities that were limited in the education of health professionals before the pandemic.

Research gaps to consider for future curricula and programs of research

This scoping review identified 44 peer-reviewed articles addressing health system transformation in the education of health professionals. Of the included articles, existing research gaps pertinent to health system transformation in the education of health professionals are summarized into five categories.

First there is a lack of original research that evaluates health system transformation in the education of health professionals. Out of the studies included in the review over half (n=27) were commentaries or position papers. While thought leadership in this area is important, we need to better understand the current evidence of programs aiming to educate health professionals on health system transformation. Of the papers that study the evidence of existing programs, outcomes are only evaluated short-term, and no studies measure outcomes longitudinally. To better understand how curricula impacts the role of health professionals in health system transformation, we need better evidence to understand how current approaches to health system transformation in the education of health professionals are performing.

Second, the synthesis indicates that there is a paucity of research on interprofessional approaches to health system transformation in the education of health professionals. Out of the 44 articles included in the review only six articles address health system transformation in the education of health professionals from an interprofessional perspective (Brownie et al., 2014; Essary & Wade, 2016; Hortsman et al., 2021; Lutfiyya et al., 2016, MacRae et al., 2016; Philippon et al., 2018). Out of these six studies, only one article was an empirical study analyzing an interprofessional approach to education around health system transformation (Essary & Wade, 2016). More research needs to analyze and evaluate interprofessional

approaches to the education of health professionals as it continues to be a strong recommendation for health system transformation in health profession education.

Third, there is lack of a standard curriculum including competencies and terms used to describe health system curricula in the education of health professionals. As a result, measuring the impact of health system transformation in the education of health professionals is fragmented. Outside of the health system science competencies that are specific to medical education in the United States, there is no common set of competencies across the health professions which makes health system transformation in the education of health professionals difficult to measure.

Fourth, this topic area not only bridges together the areas of research of health services research with the education of health professionals, but it also looks at this relationship in professional silos that each has their own language to describe health systems related terms. This may result in a broad range of terminology being used to describe similar concepts. As a result, a research gap of this work may include over or underestimating themes in the literature due to language nuances by profession or the discipline the research was intended to serve.

Last, the findings should be interpreted considering its limitations. It is possible that a relevant study was unintentionally missed. With recent calls towards health system transformation and the education of health professionals reform, in response to COVID-19 pandemic recovery, it is likely that new literature on the topic may have advanced by the date of this publication. The ability to evaluate the quality of evidence is another limitation as information was gathered from a range of study designs and methodologies. Despite best efforts to include multiple reviewers in the data gathering processes and to report findings transparently, selection bias may still have occurred.

Discussion

A fragmented state of education on health system transformation

Through this scoping review, it is apparent that the current state of the literature on health system transformation in health professions educated is rapidly evolving. While the literature on the topic is growing, the review reveals that research is fragmented across the health professions, areas of care, and by geographic location. As a result, the language used to describe related

health system transformation concepts varied widely which may further be complicating the understanding of this emerging area in the education of health professionals.

Despite most articles in the review occurring professional silos, a common feature across most articles was the goal that health system transformation in the education of health professionals being centered around iterations of the quadruple aim framework and health equity. Since the review was completed, the "quintuple aim" framework was introduced in the scholarly literature with a fifth pillar being added to the framework, health equity (Nundy, 2022). Having a clear framework as a north star may potentially aid in bridging together fragmented approaches to health system transformation across professions.

While little is known about interprofessional approaches to health system transformation across the health professions, the body of evidence is better understood in the context of medical education. The widespread implementation of the health system science curricula in medical education across the United States is arguably the most substantial world leading curricula in medical education and shows promise to develop health professionals who are competent to work and lead in a transforming health system to achieve quintuple aim. As the body of evidence around the health system science curricula evolves, understanding factors such as how health system science became successful and part of curricula across the United States will be important to understanding for implementation success in other countries and across other professions. Very little is known about the implementation of health system transformation in the education of health professionals in other professions outside of medicine. Given the widespread uptake of health system science in the United States, it may also be worth investigating the appropriateness of health system science for health professions such as nursing or pharmacy.

The implementation of health system transformation in the education of health professionals remains limited in the current state of research. This may be due to perceptions of the curricula by health professionals or the culture within the education of health professionals that emphasizes clinical skill development. While clinical skill development is essential in the education of health professionals, a paradigm shift is needed in the education of health professionals that also emphasizes the importance of health systems-based knowledge on patient and population health. Future research needs to focus on the leadership level to better understand

approaches to developing faculty and mentors to lead health system transformation in the education of health professionals.

A window of opportunity for future curricula development and programs of research

Given the recent focus on health system transformation as health systems globally recover from the impacts of the COVID-19 pandemic, that have amplified existing health system issues, the opportunity is ripe for widespread implementation of health system transformation in the education of health professionals. While the need for health system transformation in the education of health professionals was apparent before the pandemic, the pandemic shed light onto existing societal and system related gaps on populations that were not traditionally viewed as an extension of the health system or in the realm of scope of the health professionals (Frenk et al., 2022). The interactions between the health and education systems are clearer than ever before warranting the need for curricula on health system transformation in the education of health professionals. However, further research needs to better understand the impact of change management fatigue on health system transformation during this period.

Finally, evidence is evolving, with 75% of articles on the selected topic published in the last 5 years. It will be important that future programs of research continue to evaluate and measure interprofessional approaches to health system transformation in the education of health professionals. This recent growth in literature shows promise for the future of health system transformation in the education of health professionals. Future studies should aim to address research limitations addressed in the current body of limit including measuring the impact of health system transformation in the education of health professionals longitudinally.

Conclusion

The state of health system transformation in the education of health professionals is growing globally, especially in recent years given pressures on health systems following the COVID-19 pandemic that uncovered existing flaws in the system. Over the past decade the state of evidence has evolved, presenting benefits and challenges of current approaches. This scoping review identified gaps in the current evidence and provides recommendations for future curricula and programs of research pertaining to health system transformation in the education of health professionals. This research serves as the foundation for future programs of research and in

health care settings to ultimately prepare health professionals to participate and lead this transformation.

Practice Points

- The current delivery of education on health system transformation is fragmented resulting in a varying degree of approaches and curricula across the health professions.
- Future programs of research needs should focus on interprofessional approaches to health system transformation in the education of health professionals including the development of a set of interprofessional competencies.
- Future programs of research should measure the impact of health system transformation in the education of health professionals longitudinally.
- There needs to be a paradigm shift in health care culture in which that health system transformation in the education of health professionals is viewed as valuable in terms of improving patient and population health.

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Chapter Three: Article 2

Title: An Explanatory Sequential Mixed-methods Study on Health System Transformation in the Education of Health Professionals

Ashley Chisholm

Article type: Original Paper

Abstract

Background: Health system transformation is a health policy priority in Canada. With health professions experiencing increasingly formal expectations to be accountable to health system transformation, we require systematic knowledge about the current state of health system transformation in the context of the education of health professionals. **Methods:** I conducted a two-phase, sequential, explanatory mixed-methods study on the current state of health system transformation in the education of health professionals and considerations for future curriculum development and programs of research. In Part 1, a one-time online survey was administered to stakeholders (n=77). To elucidate their experiences, in Part 2, 23 stakeholders were interviewed on health system transformation in the education of health professionals. Survey data were analyzed using SPSS® and interview data were coded following thematic analysis. **Results:** In Part 1, 48 (63.2%) of stakeholders reported that fundamental changes are needed in the organization and delivery of health care as a theme in the literature that was 'completely relevant' to them, and 19 (25%) suggested that there is a curriculum that best addresses health system transformation in the education of health professionals. In Part 2, 23 interviewees raised eight themes related to the current state of health system transformation in the education of health professionals including: hierarchy of roles for health professionals in health system transformation, dichotomy of health professionals as subjects and objects of change, health system transformation is not a part of health professions' professional identity, influence of clinical and basic sciences in the education of health professionals, strong understanding of the content but not the context, challenges with sustaining progress, burnout and change management fatigue resulting from the pandemic, and the current implementation of health system transformation in the education of health professionals. Interviews also raised two factors related to the future education of health professionals on health system transformation including comprehensive and inclusive education and priority areas for future research. **Conclusion:** This research discusses the current state of health system transformation in the education of health professionals and describes key areas for future curriculum development and programs of research. This research provides direction to stakeholders on the resources and activities needed to ensure that informed health system transformation training decisions are made.

Keywords: Mixed-methods, Health System Transformation, Health Professions Education.

Introduction

Health system transformation is a critical process that aims to bring about systems-wide change in health care through coordinated interventions that involve multiple organizations and health care professionals. In Canada, health care spending is escalating at an unsustainable rate, and the country ranks poorly among other countries from the Organization for Economic Cooperation and Development (OECD) in terms of access to care, equity in care, and health outcomes. Aging demographics also pose challenges to health care delivery, and health care professionals at all levels are experiencing increased levels of burnout (Commonwealth Fund, 2017). To address these issues, policy makers are calling for health care professionals to be accountable for health system transformation (Martin et al., 2018). However, incorporating topics and competencies related to health system transformation in the education of health professionals is complex. There is also a broad range of topics and competencies related to health system transformation such as systems thinking, population health, health informatics, health policy, and health system stewardship among many more that are not commonly standardized and formalized in curricula across the education of health professionals (Frenk et al., 2010; Gonzalo 2020). There is also limited evidence on the extent to which these competencies are being taught and assessed. Competing competencies, lack of leadership preparedness, and inadequate curricula further hinder progress (Frenk et al., 2022; Gonzlao et al., 2020). Furthermore, COVID-19 has brought about significant changes in the education of health professionals, accelerating the adoption of innovative technologies, and teaching methods, emphasizing interprofessional collaboration and teamwork, and promoting health care professionals' well-being and resilience. These changes are likely to have long-lasting effects on the education of health professionals and contribute to the ongoing transformation of health systems.

A scoping review conducted by Chisholm et al. (n.d.), identified gaps in the current evidence and provides recommendations for future curricula and programs of research pertaining to health system transformation in the education of health professionals. Several major themes emerged on the current state of health system transformation in the education of health professionals: (1) existing approaches and curricula for health system transformation in the education of health professionals, (2) preparedness to participate in health system transformation, (3) attitudes toward health system transformation in the education of health professionals, (4) the

role of health professionals, (5) the role of mentors and faculty, (6) impetus for health system transformation, and (7) disconnect between health and education systems. Areas of importance for future curricula development and programs of research include: (1) the culture of the education of health professionals, (2) interprofessional and collaborative approaches to health system transformation, (3) commitment to health equity and social accountability, and (4) the impact of COVID-19 on the education of health professionals. Despite the growing body of literature on health system transformation in the education of health professionals' researchers have yet to unpack this topic in this new area in the education of health professionals, especially from an integrated perspective across professions. Thus, in this mixed-methods study I sought to answer the following four questions:

Part 1: Survey

1. To what extent do themes from the scholarly literature resonate with experts in health system transformation and the education of health professionals?
2. What is the current state of health system transformation in the education of health professionals?

Part 2: Interviews

3. What are the key issues, voiced by experts in health systems and the education of health professionals, on the current state of health system transformation in the education of health professionals?
4. What factors are important for consideration for future curricula development and programs of research on health system transformation in the education of health professionals?

Methods

A two-part stakeholder consultation was conducted to identify stakeholders' concerns, delineate gaps in the literature and intimate recommendations for future programs of research based not solely on my interpretation of the literature but on the direct feedback of my participants conducted the consultation by employing a mixed-methods approach. A mixed-methods approach focuses on the complementary role of bridging the quantitative and qualitative components to answer a complex multi-faceted question (Creswell & Plano Clark, 2018). Mixed-

methods shed light onto different layers of the phenomenon that one method alone may not be able to unveil. An epistemological lens of pragmatism has helped delineate the scope of an explanatory study.

Part 1

Participants. Study eligibility for participating in Part 1 and Part 2 of this study was based on the following criteria: 1) key authors/researchers who had published on the topic of health system transformation in the education of health professionals; 2) stakeholders with expertise on health system transformation; 3) stakeholders with expertise on the education of health professionals. Key authors were identified through a scoping review on health system transformation in the education of health professionals that was conducted prior to this study (Chisholm et al., n.d.). In addition to key authors, stakeholders were also included if they had expertise in the subject area of the research questions, health system transformation or the education of health professionals to also situate the topic area in the context of health system transformation and the education of health professionals. By having stakeholders representing three groups (or a combination of the three groups), I aimed to eliminate any bias that might have resulted from exclusively including authors publishing on this emerging field of study or those who exclusively have expertise in the education of health professionals, or health system transformation. Key authors and stakeholders were identified through correspondence sections of published articles and through public websites.

Instrument development and data collection (Part 1). To better understand the current state of health system transformation in the education of health professionals, a one-time online survey was developed and administered through *Survey Monkey* in English (Appendix C). The 18-item stakeholder survey consisted of structured and unstructured response formats, including demographic questions to identify the respondent's primary stakeholder affiliation (i.e., administrator, regulator, or researcher). The content of the survey was developed based off key themes from the scoping review to better understand the current state of health system transformation in health professions education and to better understand existing gaps in the literature. Question one was a screening question to ensure that the participant filling out the survey was eligible for the study. Questions two through eight were developed to validate scoping review findings on the current state of the literature on health system transformation in health professions education, and questions nine through thirteen were developed to validate

findings and provide recommendations on considerations for curriculum development and future programs of research on the topic area. Finally questions fourteen through 18 were demographic questions designed to better understand the study population for publication (Appendix D). The survey items were designed to determine the relevance of the reviewed literature from the literature to stakeholders in addition to their preferred areas for future research. Specifically, questions explored themes related to the current state of health system transformation in the education of health professionals including level of agreement with challenges with this topic area in the education of health professionals (5-point Likert scale; 0 = strongly disagree, 1 = disagree, 2 = neither disagree or agree, 3 = agree, 4 = strongly agree), relevance of themes in the literature to stakeholders (5-point Likert scale; 0 = completely irrelevant, 1 = irrelevant, 2 = neutral, 3 = relevant, 4 = completely relevant), level of preparedness of health professionals to participate in health system transformation activities (5-point Likert scale; 0 = not at all prepared, 1 = slightly prepared, 2 = somewhat prepared, 3 = moderately prepared, 4 = extremely prepared), familiarity with current curricula that address health system transformation in the education of health professionals, and how current curricula aims to achieve quadruple aim and health equity. Survey questions also sought out to understand recommendations for future curricula development and programs of research including ranking priority areas for future research (1-5), understanding how the COVID-19 pandemic has influence this topic, and an open-ended question requesting stakeholders' inputs on questions that they would like to see answer on this topic (See Appendix C-D).

I piloted the survey with five health professionals knowledgeable in the areas of questionnaire design, the education of health professionals, and health system transformation, who are not members of the stakeholder groups, therefore, ineligible to participate in the study. I revised the survey based on the feedback obtained by piloting the survey to estimate the completion time, fine-tune the wording (enhancing its comprehensibility), and confirm that no essential questions were missing. The survey pilot was complete in February 2022. I also developed a table of specifications to ensure alignment between each survey item and my underlying research questions.

I recruited participants via email invitations to complete the electronic, web-based survey hosted through *Survey Monkey*. I obtained participants' email information through corresponding author sections on selected articles and through public websites. A study information letter (see

Appendix E) outlining the study procedures and participant obligations accompanied the invitation email. Consent to participate in the study was implied by the participants' electronic submission of their completed questionnaires. Data occurred over a 30-day period beginning in May 2022. To maximize participation in the study, I sent reminder emails at predetermined intervals (days 14 and 28) to non-responders stressing the importance of their participation and highlighting the study's end date (Dillman, 2007). To recruit potential participants for Part 2, I asked survey respondents to indicate their interest in obtaining additional information and potentially participating in Part 2. Survey data collection officially closed on August 1, 2022.

Data analysis (Part 1). I analyzed all closed-ended survey responses in IBM SPSS® v.26 using descriptive statistics (i.e., frequencies, percentages for dichotomous rating items) and analyzed text-based responses following qualitative content analysis (Neuendorf, 2002).

Part 2

Participants. I used a convenience sample approach to identify stakeholders for Part 2, of the study. I sent email invitations to eligible participants who on their survey expressed interest to participate in the interview phase of the study (Appendix F).

Instrument development and data collection (Part 1). I utilized the findings from a scoping review (Chisholm et al., n.d.) and Part 1 to inform the development of the semi-structured interview guides. The scoping review and survey both highlighted and validated key themes surrounding the current state of health system transformation in the education of health professionals. From this analysis, I aimed to learn more about the current state of health system transformation in the education of health professionals (through questions two through five), including the role of health professionals participating in health system transformation, the barriers, facilitators, and perceptions around health system transformation in health professions education, and the linkage of this topic area to achieving the quintuple aim. Similarly, questions around curriculum development and future programs of research were developed (questions six through eight) to better understand gaps in areas of research on health system transformation in the education of health professionals and how to better demonstrate the value of this topic area. These questions stemmed from findings in the scoping review that highlighted both a methodological gap (that there are limited empirical studies on this topic area) and that the topic area has mixed perceived importance by those involved in the education of health professionals, including students and faculty. Question seven examined how health system issues amplified by

the COVID-19 pandemic impacted health system transformation in the education of health professionals. This question was influenced by the published literature that highlighted the impact of the COVID-19 pandemic on the topic area, primarily focused on the first year of the pandemic. However, I aimed to learn more about this relationship that I could not understand from the literature and survey, such as the sustainability of transformation efforts in both education and the health systems. The guide consisted of a script to introduce what was discussed in the interview and then included 9 open-ended questions (See Appendix G). I piloted the script with two stakeholders who were ineligible for the study. After the pilot, I ask the participant about the appropriateness, comprehensiveness, and feasibility of the interview questions and revised the interview guide based on their responses.

Data collection procedures and analysis (Part 2). Due to this study taking place in the context of a pandemic, with social distancing guidance in place, I conducted the interviews using Zoom videoconferencing. Zoom is a viable tool for the collection of qualitative data because of its relative ease of use, cost-effectiveness, data management features and security options. Additionally, through videoconferencing, I was able to observe non-verbal cues that I would not have picked up on over a phone interview (Archibald et al., 2019). I audio-recorded each interview. I emailed each participant a participant information letter and obtained informed consent from each participant prior to the interview (refer to Appendix H). Between September 29, 2022, and November 16, 2022, A.C., received verbal informed consent to conduct interviews in English with stakeholders. The length of the interviews ranged from 17 to 55 minutes. All interviews were audio recorded, professionally transcribed verbatim, and anonymized prior to analyses. I used NVivo 11 to store and organize the data from the interviews and facilitate the analysis following Miles' and colleagues' (2018) process, including data reduction, data analysis, conclusions, and verifications. After each interview, I used the audio recordings and notes to develop emerging themes and began the data reduction process through developing a coding system. The codes for this system were based on my notes, deduced from a scoping review conducted by Chisholm et al., (n.d.) and the objectives of this study. Next, K.M. and I independently read the interview transcripts multiple times to understand data, phrases within the script, and code the transcripts using the coding system. At this time, I made a note of any codes that were not identified *a priori* however have emerged from the data. Then we met to compare and discuss the coding, resolve any discrepancies in the coding, and revise the original coding

system to reflect changes with the emerging codes. With the revised coding system, then read through the transcript multiple times, rework the analysis, and identify examples of each theme for reporting. These examples, in addition to the combined coding will ensure rigour and trustworthiness of the analysis (Miles et al., 2018).

Integration of study phases. After conducting the initial separate analysis of Part 1 and 2, I integrated my findings through a weaving approach (Fetters et al., 2013). This approach involved the presentation of findings quantitative and qualitative results together. Through this process, I was able to integrate findings together organized by theme or concept. To strengthen my analysis, I linked the findings to my conceptual framework and considered any additional explanations for my results (Fetters et al., 2013).

Ethical Considerations

I obtained approval for Part 1 and Part 2 of this study from the Social Sciences and Humanities Research Ethics Board (REB) at the University of Ottawa [ID: S-02-22-7709] (See Appendix B). All oral and written communication with the study participants outlined the purpose of the research and discussed ethical concerns such as confidentiality, anonymity, and participants' rights to withdraw from the study. Participants in the study also had the opportunity to consent to participation through verbal communication at the onset of Part 2 that contained the aforementioned information.

Results

Part 1: Survey Findings

Demographics

A total of 77 survey responses were gathered (28% overall response rate): all of which included informed consent and met study eligibility at the time of survey. Table 1 demonstrates stakeholder demographics including their area of expertise, country where they work, employment jurisdiction and how many years they have been working in the topic area of health system transformation in the education of health professionals. The distribution of the sample was spread out between the three groups including, key authors, those with expertise in health system transformation, and those with expertise in the education of health professionals.

Table 1

Stakeholder Demographics

Stakeholder group	*N*	*n*	*%*
Which of the following stakeholder groups do you primarily represent?	77		
I am an author, researcher and/or educator with an interest in health system transformation in health professions education		23	29.9
I am a stakeholder in the field of health professions education (e.g., university faculty, health professional association, regulator, researcher, clinician)		29	37.7
I am a health system stakeholder with an interest in health system transformation (e.g., government, professional association, policymaker, researcher, clinician)		25	32.5
In what country do you work?	76		
Canada		59	77.6
United States		14	18.4
United Kingdom		2	2.6
Other		1	1.3
Missing		1	1.3
What is your employment jurisdiction?	77		
National		17	22.1
Provincial/territorial/state		12	15.6
Municipal/community		2	2.6
University		41	53.3
Private sector		2	2.6
Other		3	3.9
How many years have you been working in a position that involves the subject matter of health system transformation in health professions education?	77		
Less than 5 years		14	18.2
5-9 years		18	23.4
10-14 years		11	14.3
15 years or more		32	41.6
I prefer not to say		2	2.6

To what extent do themes from the scholarly literature resonate with experts in health system transformation and the education of health professionals?

Out of the stakeholders surveyed, 43 (56.6%) disagreed or strongly disagreed that education on health system transformation is supported by the current culture of the education of health professionals. Of the 77 stakeholders surveyed, 53 (69.7%) disagreed or strongly disagreed that health system transformation concepts are well defined and described in the education of health professionals and 41 (76.4%) disagreed or strongly disagreed that health system transformation concepts are easily applied for the clinical environment where learning

takes place. Stakeholders (n= 57 or 75%) disagreed or strongly disagreed that faculty/preceptors have in-depth knowledge about health system transformation. Out of the stakeholders surveyed, 29 (38.2%) disagreed or strongly disagreed and 28 (36.8%) agreed or strongly agreed that students believe that health system transformation concepts are important and essential. Table 2 provides a summary of stakeholders' agreement with challenges to health system transformation in the education of health professionals.

Table 2

Agreement with challenges to health system transformation in health professional education

Challenges	*N*	*n*	*%*
Education on health system transformation is supported by the current culture of health professions education	76		
Strongly disagree		10	13.2
Disagree		33	43.4
Neither disagree nor agree		12	15.8
Agree		19	25.0
Strongly Agree		2	2.6
Certification exams include health system transformation as a core component	76		
Strongly disagree		13	17.1
Disagree		41	54.0
Neither disagree nor agree		14	18.4
Agree		8	10.5
Strongly Agree		0	0.0
Students believe that health system transformation concepts are important/essential	76		
Strongly disagree		5	6.6
Disagree		24	31.6
Neither disagree nor agree		19	25
Agree		26	34.2
Strongly Agree		2	2.6
Faculty/preceptors consider health system transformation as core to health professions education	76		
Strongly disagree		5	6.6
Disagree		36	47.4
Neither disagree nor agree		11	14.5
Agree		23	30.3
Strongly Agree		1	1.3
Faculty/preceptors have in-depth knowledge about health system transformation	76		
Strongly disagree		17	22.4
Disagree		40	52.6
Neither disagree nor agree		13	17.1
Agree		4	5.3
Strongly Agree		2	2.6
Stakeholders can measure the impact that health system transformation in health professions education has on patients and populations	76		
Strongly disagree		20	26.3
Disagree		36	47.4
Neither disagree nor agree		9	11.8

Agree		11	14.5
Strongly Agree		0	0.0
Health system transformation concepts are well defined and described in health professions education	76		
Strongly disagree		16	21.0
Disagree		37	48.7
Neither disagree nor agree		14	18.4
Agree		8	10.5
Strongly Agree		1	1.3

Out of those who completed the survey, 48 (63.2%) stakeholders reported that fundamental changes are needed in the organization and delivery of health care as a theme in the literature that was 'completely relevant' to them. Similarly, 40 (52.6 %) stakeholders reported future curricula development must involve partnering with communities and stakeholders to collective work to address their priorities to achieve health system transformation as 'completely relevant.' Stakeholders (n=39, 51.3%) also reported that future research needs to demonstrate the value of health system transformation in the education of health professionals as 'completely relevant' to them. In terms of key themes in the scholarly literature on health system transformation in the education of health professionals, Table 3 presents self-reported ratings of the relevance of themes to stakeholders.

Table 3

To what extent do you think these conversations in the scholarly literature are relevant to you?

Themes in the literature	*N*	*n*	*%*
Fundamental changes are needed in the organization and delivery of health care.	76		
Completely irrelevant		0	0.0
Irrelevant		0	0.0
Neutral		4	5.3
Relevant		24	31.6
Completely relevant		48	63.2
Graduates of most health professions education programs have limited functional literacy about the systems in which they work.	76		
Completely irrelevant		0	0.0
Irrelevant		1	1.3
Neutral		11	14.7
Relevant		33	44.0
Completely relevant		30	40.0
Health professions education must restructure the emphasis of basic and clinical science to give equal emphasis to the science and skills needed to practice in complex systems.	76		
Completely irrelevant		0	0.0

Irrelevant		3	4.0
Neutral		13	17.1
Relevant		27	35.5
Completely relevant		33	43.4
Health professions education must restructure the emphasis of basic and clinical science to give equal emphasis to the science and skills needed to lead complex systems.	76		
Completely irrelevant		0	0.0
Irrelevant		6	8.0
Neutral		13	17.3
Relevant		28	37.3
Completely relevant		28	37.3
Future research needs to demonstrate the value of health system transformation in health professions education.	76		
Completely irrelevant		0	0.0
Irrelevant		3	4.0
Neutral		11	14.5
Relevant		23	30.3
Completely relevant		39	51.3
Future curricula development must involve partnering with communities and stakeholders to collectively work to address their health priorities to achieve health system transformation.	76		
Completely irrelevant		0	0.0
Irrelevant		7	9.2
Neutral		4	5.3
Relevant		25	32.9
Completely relevant		40	52.6

What is the current state of health system transformation in the education of health professionals?

When asked about the level of preparedness to participate in related health system transformation activities from their training, 50 (66%) stakeholders reported that health economics to be the activity that health professionals are least prepared to participate in post education. Stakeholders (n=42, 55.2%) reported interprofessional/team-based care to be an aspect of health system transformation that health professionals are moderately or extremely prepared to participate in from their training. Systems thinking, health systems stewardship, value-based care, health informatics and health policy were all activities in which the majority of stakeholders found health professionals were not prepared to participate in after their training. Subject areas including population health and quality improvement received more diverse responses to level of preparedness. Please refer to Appendix A for full results on levels of preparedness.

In terms of existing curricula, the survey assessed stakeholders' knowledge on curricula addressing health system transformation in the education of health professionals. Out of the stakeholders surveyed, 19 (25%) suggested that there is a curriculum that best addresses health system transformation in the education of health professionals. When stakeholders were asked to identify the program, respondents were split between Health System Science, Veterans Affairs Quality Scholars, LEADS Canada, and other. When asked about if current curricula were sufficient for preparing health professionals to transform a system that achieves Quadruple Aim or health equity, most respondents stated "no" or "unsure." Please refer to Appendix A for full results on stakeholders' knowledge on curricula addressing health system transformation in the education of health professionals.

Part 2: Interview Findings

For Part 2, 23 stakeholders consented and completed a semi-structured interview, this proved to be sufficient for study saturation on this topic area. The distribution of the sample was spread out between the three groups including, key authors, those with expertise in health system transformation, and those with expertise in the education of health professionals. Their perspectives that represented geographic regions from Canada, United States, and Scotland.

To unpack the current state of health system transformation in the education of health professionals, stakeholders delved into their perspectives on the current state of health system transformation in the education of health professionals and the future. During this process, stakeholders alluded to themes around the current role of health professionals in health system transformation, the current state of health system transformation in the education of health professionals, and areas for consideration for curriculum development and future programs of research on health system transformation in the education of health care professionals. Their perspectives are captured in the following four subheadings related to health system transformation in the education of health professionals:

What are the key issues, voiced by experts in health systems and the education of health professionals, on the current state of health system transformation in the education of health professionals?

Stakeholders described the current state of health system transformation in the education of health professionals through the following seven themes:

Theme 1: The hierarchy of roles for health professionals in health system transformation. When describing the current role of health system transformation in the education of health professionals' stakeholders described roles occurring at multiple levels because the role of health professionals is not only to care about the health of patients but the system in which patients receive care. They described how health system transformation requires a multi-level approach, considering changes at the micro (individual or practice), meso (institutional), and macro (structural) levels which was outlined in this stakeholder's description: "So I think it's kind of multi-level which is probably why it seems so like all over the place. I think everybody can be engaged in health care transformation" (Stakeholder 7). Stakeholders also expressed that health professionals can contribute to HST without needing to hold top leadership positions within hierarchies. Individual health professionals in practice settings can still influence macro level health system transformation despite not being in a formal paid leadership position. One stakeholder expressed this multi-layer phenomenon through the following quotation describing how there are multiple levels in which health professionals can be involved in transformation and engaging in health system transformation:

> I'm just identifying there's three layers, three ways for transformation to happen and there's a fourth at the policy level, but a person very much at the at the frontline could call their senator could write a paper could, you know have a town hall and get that information across if they're really interested in transforming things (Stakeholder 7).

However, stakeholders also expressed that there is a tension that exists in which health professionals outside of those in leadership positions do not necessarily feel like they have the power to transform the system. Stakeholders continued to describe how despite there being multiple levels where transformation can happen in the system, the direction of health system transformation leadership tends to be top-down from governments and clinicians in formal paid leadership roles. Stakeholders also describe that most roles that lead health system transformation including those outside of the direct provision of care are primarily led by health professionals, and typically earn leadership positions for demonstrating clinical excellence, however, do not have any form of formalized training in transforming health systems.

Stakeholders expressed how the area of care in which a health professional work can greatly alter the type of transformational activities they participate in at the micro or clinical level. Stakeholders discussed how different areas of care have different levers that health

professionals can influence to transform the health system whether it is focused on quality improvement in acute care settings or better care integration in home and community care. A stakeholder described the activities by area of care through the following quotation describing health system transformation activities tailored to each care setting:

> For those who are working in acute hospital settings, there tends to be a strong focus on safety and on flow, as the main entry points for their work on redesign and transformation of care. For those who are working in a community setting, I think they're probably closer to the integrated care space where they're looking more at continuity, coordination of care, and personalization of care (Stakeholder 1).

When stakeholders talked about areas of care, primary care and health professionals working in primary care were often regarded as key catalysts for driving health system transformation. As the first point of contact for patients, primary care providers have a unique vantage point to identify systemic issues, advocate for patient-centered care, and facilitate coordination and integration of health care services. One stakeholder stated, “we see primary care, as being in some ways, the engine in front of transformational change as we think of health care more broadly” when discussing the role of their colleagues in primary care contributing towards health system transformation (Stakeholder 2).

Theme 2: The dichotomy of health professionals as subjects and objects of change. Participants described health professionals as being both subjects of change, adapting to evolving roles and scopes of practice, and objects of change, being affected by external transformations imposed by the health system. One stakeholder described health professionals participating in health system transformation through the following:

> Sometimes they're kind of treated like this homogeneous group…just one big group that needs to be changed. That's when I'm thinking about them as objects of change. But other times when I'm in the health professions education world…then I'll hear a lot more about health professionals as advocates as system changers themselves…So then I see them more as agents and having more agency and sometimes they meet in the middle around clinical leadership positions (Stakeholder 16).

Stakeholders expressed this dichotomy in how they described the current role of health professionals in health system transformation where some stakeholders described policy to

expand scopes of practice for health professionals to transform a system where others explained specific activities health professionals can participate in to transform the system in their everyday practice. One stakeholder described health professionals as an object of change through describing the expansion of clinical skills of health professionals that will optimize health professionals in areas of care that are foundational and are experiencing gaps:

> How do I create curriculum that prepares a nurse to take her rightful role in primary care, and in home care, because those are the foundation of our system. If we don't make those foundations strong with proper nursing skill set, everything else will be the symptom of that gap (Stakeholder 13).

Theme 3: health system transformation is not a part of health professions' professional identity. Stakeholders described how the traditional professional identity of health professionals, focused on intelligence, diagnostic skills, altruism, and compassion, may need to be re-evaluated and situated within the broader ecosystem of patient and health system needs to facilitate effective transformation. Stakeholders voiced that this is particularly important as patient health is becoming more complex. This sentiment was expressed by a stakeholder through the following:

> In some ways, there's a tension that exists between the professional role of being an acute diagnostician being very smart clinical acumen, all the internal traits of altruism, compassion, respect. But the patient's life matters and the health system, the health of the health system matters to so how do you reconcile the professional role in that ecosystem? (Stakeholder 20)

Similarly, there was shared consensus around the role of health professionals being involved in health system transformation to be engrained in that identity. However, stakeholders describe the disconnect that health professionals currently do not see health system transformation as part of their identity. This was described in the following quotation:

> There's a tension there, because a lot of clinicians right now do not believe that it is their role to contribute in any way to health system transformation. Because their job as a professional was to be really smart, be very good for an orthopedic surgeon and understand those skills, that is somebody else's job, to health systems job to be figuring out this piece (Stakeholder 7).

Theme 4: The influence of clinical and basic sciences in the education of health professionals. Stakeholders described how the current state of health system transformation in the education of health professionals to be very much informed by the origin story and influence of curricula over the past 100 years. The Flexner Report had a strong influence of clinical and basic sciences across the education of health professionals. This was expressed by the following stakeholder:

> The physician's role really has been based upon those two tenets, basic and clinical sciences, you know, good diagnostics, good therapeutics. But even when you look in the literature…there were these other things that people thought, you know, it's not enough, we, we got to be thinking about high value care, we need to think about interprofessional education, collaboration skills (Stakeholder 20).

Stakeholders also noted that today, there is a growing shift in the education of health professionals to balance clinical science, basic science, and system science in the education of health professionals to ultimately improve the health of patients. Stakeholders also expressed the need for integrating non-clinical aspects into the education of health professionals including the professional identity of the health professional, "we need to coalesce and begin to integrate it holistically into curriculum, into learning environments, into assessments and at the apex of that pyramid, into the identity of the physician" (Stakeholder 2). Furthermore, stating that the understanding of how health systems work needs to be better integrated into the education of health professionals like clinical and basic sciences.

*Theme 5: A strong understanding of the content but not the context***.** Stakeholders described the link to health system transformation in the education of health professionals is made more tangible through connecting the influence of health through shifting the conversation to health equity and population-level understanding including understanding of the workforce that can promote health equity which is more engrained in the mental model of the role of health professionals in recent years. One stakeholder described this experience through the following:

> So when you start shifting the conversation towards creating health equity, reducing inequalities, that's when you start, I think, to see the light bulb going on, and the understanding that there's a limit to force the clinician can do in their own sphere of influence, but what can they do to reach out and work collaboratively with other professionals, but more importantly other partners in the community. (Stakeholder 1)

Stakeholders also express the importance of how health professionals need to be able to master skills associated with understanding how health is influenced by the systems in which they work as essential in terms of caring for patients, “it’s not enough for a health professional to master the content of his or her practice…he or she also needs to master and understand the context...and by context, we mean the organizational and systemic context in which you practice” (Stakeholder 22). This sentiment was echoed by a stakeholder who voiced, “it is our job as physicians to not only to take care of the patient in front of us, but to also improve the system in which it works…it’s not a choice” (Stakeholder 20). This is further underscored by stakeholders’ description of the importance of understanding how health is maintained across the system to be able to treat patients at the clinical level, “this idea back to this professional analogy, I gave you the idea that, that patients spend 99.8% of their lives outside of the health care system, all the factors, their context, or communities that come into our health system need to be understood” (Stakeholder 20).

Theme 6: Challenges with sustaining progress. Stakeholders expressed their encouragement in the progress made in the past ten to twenty years when it comes to health system transformation in the education of health professionals. There was an overall sentiment of encouragement from stakeholders interviewed as health system transformation is becoming more integrated into the education of health professionals more broadly. Some stakeholders reflected on how far curricula has evolved since their own education and training which they described as promising. To build on this theme, stakeholders described how the value of champions, research, and the science of health system transformation in the education of health professionals in recent years as pivotal in supporting the uptake and sustainability across the education of health professionals. One stakeholder described this progress through the following:

> Are we better off than where we were 20 years ago? Absolutely. Why we've got the work of people like Jed Gonzalo…we at least now have, you know, science around it, we've got content. Now we have some assessment tools we can use; folks have tried some modest curricular interventions (Stakeholder 5).

Regardless of the optimism around the progress of health system transformation in the education of health professionals, stakeholders describe that barriers persist that prevent the uptake and sustainability of health system transformation in the education of health professionals. While health system concepts are better understood today one of the barriers that prevents health

system transformation being implemented in the education of health professionals is a lack of training for faculty. This was explained by a stakeholder through the following:

> Systems-based practice has been around the states for 20 years, actually, inculcating it implementing it into training programs has been a huge challenge. Part of the reason is, the folks that are on the frontlines of education have just not kind of had the proper training or faculty development. And there really hasn't been this kind of connection with health services or systems signing science in a way that has been fully effective (Stakeholder 5).

Similarly, to gaps in faculty preparedness to teach and support health system transformation in the education of health professionals, despite the recognition it is important stakeholders describe that there are gaps in building skills to implement this awareness into practice. Stakeholders describe the critical role faculty and department heads play in what health professionals learn with respect to health system transformation. Stakeholders described that faculty are aware that the current system does not work and increasing willingness of people who want to change the system however they have not developed the necessary skills to transform the health system. This was sentiment was echoed by a stakeholder through the following, “So you can tell people you should be able to change the system, but you don't teach them how to do change, management or quality improvement or train those people, then you're basically…leaving them short, skilled” (Stakeholder 1). Stakeholders also described how the need for intentional changes in the education of health professionals, curricula as the hidden curriculum were the primary mechanism for health system transformation. While progress is occurring to formalize what stakeholders described as lucky instances of coming across health system transformation opportunities in the education of health professionals, there is a need to better integrate health system transformation in the formal curriculum. Moreover, another challenge stakeholders expressed is that it is extremely difficult to disrupt and sustain disruption in large complex systems. One stakeholder described this through the following, “there's so much…inertia in the system, so much resistance to change and…it can be so difficult sometimes to create changes within really complex systems and to be willing to sort of invest in that process of innovation” (Stakeholder 2). Similarly, with respect to inertia in the system, stakeholders described how the system still works for a lot of people, especially those in positions of power, that further exacerbates resistance to change.

Theme 7: Burnout and change management fatigue resulting from the pandemic. Stakeholders voiced how the pandemic was a catalyst for health system transformation including within the education of health professionals, especially in the early days of the pandemic. However, stakeholders described that both health system transformation activities in practice and in education regressed from where they peaked earlier in the pandemic because of burnout and change management fatigue. One stakeholder described this through the following description of a curve:

> I would draw a curve…and the curve would be very high in March of 2020…and then it would trend down, and then trend down further to today…soon as the pandemic hit, we, we were teaching them all this health system stuff in the classroom, the pandemic hits, and they're pulled from clinical environments…So the curve there was high and then we kind of regressed back in many ways (Stakeholder 20).

When describing the COVID-19 pandemic as an opportunity, stakeholders acknowledged that health professional burnout needs to be addressed to further any transformational efforts in the system. A stakeholder described this phenomenon through the following quotation:

> From a health professions perspective, I feel bad going and asking a nurse or a physician or someone to help with some type of project, because they're just so they're so burned out, they've done so much. They have so much on their plate, they haven't had a break…we're kind of like going into a slump it's hard to keep up that momentum, because no one's had a break for two and a half years. (Stakeholder 10).

Similarly, stakeholders discussed how the extensive change throughout the pandemic has shed light on capacity issues with respect to change management among health professionals and that there needs to be greater considerations for change management in future health system transformation efforts. One stakeholder voiced this through the following describing the gap in change management expertise and skills involved in pandemic transformational activities:

> I think that everyone is reeling from COVID-19 and is still trying to just get by. I think that the capacity issues and particularly in northern rural and remote communities and particularly in northern Ontario, you know, we're just trying to keep our head above water…there's major change management considerations that I would say the people that are implementing those changes don't necessarily have the toolbox or the skill set, to be able to manage all of the pieces (Stakeholder 3).

Stakeholders noted that it is important to address change management fatigue, burnout, and build capacity that takes into consideration change management to build upon the progress that has been made during the pandemic.

Theme 8: The current implementation of health system transformation in the education of health professionals. Throughout the interviews stakeholders described various approaches for the implementation of health system transformation within the education of health professionals that further enhances health professionals' ability to participate in health system transformation. This includes the implementation of health system transformation in the education of health professionals' curricula including the significance of integrating competencies (e.g., system-level thinking, health policy, and quality improvement) into clinical practice. They described health system transformation as more than a one-off competency and integrated into how a health professional conducts their practice.

Stakeholders also described how there is a growing shift towards implementation science in curricula and saw this as a promising step for health system transformation in the education of health professionals. One stakeholder described how implementation science provides a framework for translating research into practice and can be a valuable tool for health professionals to facilitate health system transformation initiatives effectively, "implementation science, is becoming more ingrained, as well as many hospitals having centers for, you know, health care delivery or something like that, that actually do, you know, focus largely through grant funded work often on, on health care transformation" (Stakeholder 16). Stakeholders discussed how health professionals are playing a role in health system transformation through entrepreneurship, such as developing innovative technologies, design thinking, or collaborating with companies that drive positive change in health care delivery. Another stakeholder shared how content and exposure around entrepreneurship is growing within the education of health professionals while in the past it was up to the individual health professional to seek out these types of roles within the system.

Finally, stakeholders also described how advocacy, social accountability, and addressing health disparities is a mechanism within the education of health professionals that currently prepares health professionals to participate in health system transformation. However, one stakeholder also expressed that it is not always valued and supported along the educational continuum or is only achievable for health professionals at a micro-level, "the stuff that I'm

seeing is far more micro about advocating for my individual patient for advocating for resources for the family I'm working with, or maybe even advocating for more of my profession" highlighting the reality of implementation at the individual level (Stakeholder 16).

What factors are important for consideration for future curricula development and programs of research in the education of health professionals?

Factor 1: Comprehensive and Inclusive Education. Stakeholders voiced the need for a comprehensive and inclusive curriculum when asked about areas for future curriculum development and programs of research. Stakeholders recognized the need for the education system to be transformed from a closed system to one that is bridged with the health system and educating health professionals when they are out in the system for life. One stakeholder described this through the following:

> Educational institutions need to stop thinking of themselves as closed systems, which is what they are now, you have an input, which we'll call admissions, you have a throughput, which is the educational process itself. And then you have an output, and we call that is graduation, right…what we're saying is you need we need to think of education institutions, as open systems, no longer limited to educating people during a particular period of their life, but throughout their entire life (Stakeholder 22).

Stakeholders describe how there needs to be a paradigm shift to working in interprofessional teams. Currently the training of health professionals occurs in silos and for health system transformation to be comprehensive in the education of health professionals there should be a greater emphasis on teamwork.

> We have such a physician centric society and health system and to really value health system transformation, we need to really emphasize teamwork, interprofessional teams and interprofessional education. I think creating equity among health professionals would be valuable…Nursing education comes from a completely different framework than medical education…having that interprofessional focus would be valuable in trying to highlight the importance of health system transformation (Stakeholder 3).

When describing inclusive curriculum, stakeholders also brought up the notion of psychological safety. Stakeholders noted psychological safety as essential in terms of facilitating an inclusive

system where all health professionals can contribute to health system transformation. This was expressed in this description by a stakeholder:

> People need to feel like they can be safe psychologically…where they can share their grumblings of why the system isn't working so that people can then take that to the next level, or they themselves can take it to the next level. I just don't I just don't think that if you have a space where you're telling people to shut up and just do your work, then clearly that transformation is going to be stunted, because people aren't going to feel like they can you know, they can say something (Stakeholder 7).

Stakeholders also discussed how the language around health system transformation is fragmented by area of care or by area of expertise and there needs to be more work towards creating a comprehensive language so all players can contribute to a common goal, "currently language is really driven towards administrators. And decision makers are policy makers versus health professionals…so in terms of research priorities…what we need is to develop a common language around it" (Stakeholder 3). Furthermore, Stakeholders discussed how strengthening primary care is essential for improving access, equity, continuity, and quality of care while promoting preventive measures and managing chronic conditions effectively across the health system. Recognizing the pivotal role of primary care in HST is vital to ensure comprehensive and sustainable transformations within the health care system, "we see primary care, as being in some ways, the engine in front of transformational change as we think of health care more broadly" (Stakeholder 16). When discussing the comprehensiveness of health system transformation in the education of health professionals, stakeholders stated how the inclusion of health system science and other non-clinical components in curricula are critical in this process. The current health system structure often hinders health professionals' active participation in transformation efforts. A stakeholder described how it is essential to create an enabling environment that empowers health professionals to be actively involved in health system transformation and viewed as part of their role of a health professional through the following description of being a system citizen:

> We need to be rethinking the evolution of the identity of the physician or the health care professional, to be one that includes this expertise. But what we have termed citizenship, this idea of system citizen, the idea that you're a citizen of this health care system, and

> you have obligations, and you need to be contributing to the work of this process because it's improving patient health outcomes (Stakeholder 20).

Finally, stakeholders voiced that the education of health professionals alone will not be sufficient to drive health system transformation however recognize it as a critical component that contributes to health system transformation. One stakeholder expressed this sentiment through the following, "If we just educate people will that happen? Well, the answer to that is no education alone will never fix anything. It has to be at that policy level. It has to be at that practical level as well" (Stakeholder 7). This statement further acknowledges that a multi-pronged approach, with the inclusion of education, will be necessary for health system transformation.

Factor 2: Priority areas for future research. A key area of discussion for stakeholders was around the insufficiencies of methods used in this area of research. Stakeholders discussed how health system transformation in the education of health professionals is bridging together two different fields of research and as a result a narrow methodological focus has been applied to research in this complex area. One stakeholder described this through the following, "we're studying packages, in order to study the package, it is going to require different ways of thinking around the research, and particularly embracing kind of complexity models for research, mixed-methods" emphasizing the need for new research methods to better understand this interdisciplinary field of study (Stakeholder 3). Stakeholders called for more applied research methods that embrace the complexity of systems that are currently not being used to measure the education of health professionals. Interventions that, "embrace the messiness of this type of research" are needed as one stakeholder (Stakeholder 5) described it. Stakeholders also discussed how the influence of the hierarchy of evidence in medicine has been a barrier to embracing more complex methods such as implementation science and learning health systems that have not been traditionally taught. This sentiment was expressed through the following:

> The methodological piece is quite interesting, especially in the context of medicine, where, you know, the hierarchy of evidence is so ingrained into the profession where RCT is at the top and then trickles down. And like implementation science, complexity science in Canada is a growing and interest in learning health systems…so I think kind of embedding that in research questions around health services and the education of health professionals (Stakeholder 3).

Stakeholders also expressed that more rigour needs to be applied to the research around the education of health professionals and research that studies health system transformation, similarly to how clinical interventions are studied in health care. Furthermore, stakeholders noted the need for more longitudinal studies in the education of health professionals. Stakeholders discussed how most studies look at outcomes shortly after the intervention is applied however it is rarely studied once health professionals are working in the system which further heightens the gap between the education and health systems. One stakeholder voiced the need for longitudinal studies through the following reflection on research:

> I do think one area here that could be helpful is to do more kinds of educational outcomes research…What happens when they leave the institution? What does that experience look like, as they are making a transition into practice? What's their performance actually look like? We just don't have much of that… and I think education has got to get out of that mindset and think more longitudinally (Stakeholder 22).

Stakeholders also discussed the need to better demonstrate how health system transformation in the education of health professionals needs to better demonstrate the value on patient health through translational research studies. Stakeholders noted how increasing awareness through the failures of the COVID-19 pandemic and the light shed on health inequities during this period emphasized the need for system change in both health and education systems to improve patient outcomes. Stakeholders voiced that measuring education interventions aimed to improve health equity will improve the widespread implementation of health system transformation in the education of health professionals.

Discussion

The present study includes a deep exploration and understanding of health system transformation in the education of health professionals. Through interviews and surveys, this research explored perspectives on the current state of health system transformation in the education of health professionals. While data sources were organized into meta-interpretations this study also acknowledges the strong interdependencies and relationships between study findings recognizing the complexity in both health and education systems (Frenk et al., 2010). Through this study, most stakeholders agreed that the key themes noted in the literature on health system transformation in the education of health professionals were relevant or completely relevant to them. Similarly, most stakeholders agreed that the key theme around fundamental

changes are needed in the organization and delivery of health care to be relevant or very relevant to them signaling the overall relevance of this topic area to those who have stake in both health and education systems.

The study unveiled a notable divergence in stakeholder responses regarding the vision of health system transformation within the realm of health professionals' education. This disparity emerged prominently in the qualitative data. Stakeholders possessing specific expertise in crafting curricula related to health systems education, such as health systems science in the United States, exhibited a more precise understanding of health system transformation activities. They grounded their responses in a deep comprehension of the underlying science. Conversely, those less acquainted with current curricula held less structured perspectives on the focal points for health professionals. This division among stakeholders also mirrors a broader dichotomy regarding the roles of health professionals in health system transformation. Stakeholders described health professionals as both subjects of change, actively adapting to novel roles and practices, and objects of change, passively affected by external transformations imposed by the health system. This dichotomy accentuates the imperative of viewing health professionals not merely as recipients of change but as proactive agents with the potential to shape the transformation process. The active engagement of health professionals as advocates and catalysts plays a pivotal role in the overall success of health system transformation initiatives (Frenk et al., 2010). Furthermore, the study unveiled the potential for expanding the scope of practice among health professionals to amplify their capacity to lead transformative changes in their daily roles. This illustrates that beyond educational reforms, policy levers and other strategies can augment the role of health professionals in contributing to health system transformation. Understanding how various stakeholders perceive the role of health professionals in health system transformation, whether as objects or subjects, enriches our insights into the impact of education on achieving transformative health care systems.

Multi-level approaches to system transformation, highlights the complexity of health system transformation and the diverse roles health professionals play at different levels, especially when it is tailored to the area of care. Stakeholders emphasized that health professionals should not only focus on patient care but also consider the broader health system within which they operate. This necessitates a multi-level approach, encompassing micro, meso, and macro levels of change (Plack et al., 2019). Health professionals are seen as agents for

improvement, responsible for making the health system more effective and patient centered (Naccarella et al., 2016). The data also revealed that health professionals can drive transformation from various positions, not solely confined to formal leadership roles. Despite this potential, there is an acknowledgment of the inertia from top-down structures that may limit health professionals' influence in the transformation process. To overcome this, there is a need to redefine structures (e.g., enhance systems that promote psychological safety among health professionals) to incentivize and support transformational activities and promote opportunities where health professionals feel safe to participate in health system transformation at all levels (Singh et al., 2021).

Stakeholders also described the disconnect between professional identity with health system transformation, delving into the tensions that exist between the traditional professional identity of health professionals and the need for broader engagement in health system transformation. This was reflected in stakeholders' responses where less than half agreed that students believe health system transformation concepts are important and essential. Stakeholders emphasized the importance of re-evaluating the traditional attributes of health professionals, such as intelligence, diagnostic skills, altruism, and compassion, and aligning them with the broader ecosystem of patient and health system needs as a "system citizen." This shift in perspective can facilitate more effective and meaningful contributions of health professionals to health system transformation and potentially contribute to shifting the culture of the education of the education of health professionals to one that encompasses broader roles for health professionals.

The insights formed by stakeholders on the historical influence of clinical and basic sciences in the education of health professionals reveals a significant impact of the Flexner Report, which established basic and clinical sciences as the central domains in medical education nearly a century ago (Wilkes, 2018; Frenk et al., 2010). Over the decades, health professionals' roles have been predominantly shaped by these two tenets, focusing on diagnostics and therapeutics. However, stakeholders have observed a recent and promising shift towards the inclusion of system science in the education of health professionals. They emphasized the necessity of integrating these diverse components holistically into curricula, learning environments, assessments, and ultimately, into the physician's identity. The analysis of interview themes and survey results revealed a different story, that most stakeholders acknowledged the need for fundamental changes in the organization and delivery of health care

to remain relevant. A sizable portion of stakeholders also recognized the importance of health system transformation concepts for students. However, it was noted by stakeholders that a considerable number of students and faculty do not prioritize the balance between clinical and health system competencies in curricula. This suggests there is a disconnect between the perceived importance of health system transformation and its integration into the education of health professional programs.

Stakeholders emphasized the need to enhance health professionals' literacy of the broader systems and context in which they work, crucial for health system transformation in the education of health professionals. In Part 1, most stakeholders (84%) reported the theme of stakeholders lacking functional literacy of the systems in which they work to be relevant or completely relevant to them. This aligns to findings in Part 2 in which stakeholders described that it is no longer enough for health professional to understand the content of their practice, but they must also broaden their perspective to better understand the context in which they work. They highlighted the tangible link between health system transformation and health equity, stressing the importance of addressing population-level understanding and reducing inequities. Shifting the conversation towards health equity deepened health professionals' awareness of their limited individual influence, underlining the significance of mastering organizational and systemic context alongside clinical content for effective patient care. Stakeholders recognized health professionals' role in improving the entire health care system and stressed the importance of understanding how health is maintained across the system to provide comprehensive clinical care. These insights underscore the importance of integrating population-level perspectives and systemic understanding into the education of health professionals, preparing future professionals for active participation in health system transformation (Frenk et al., 2022). Notably, stakeholders identified that most graduates lack functional literacy about the systems they will work in, hindering their contribution to health system transformation and ultimately health equity. Additionally, they highlighted the need for faculty education and development in health system transformation to address this knowledge gap effectively.

Stakeholders provided valuable insights into the recent progress and challenges in the education of health professionals regarding health system transformation. Encouragingly, stakeholders noted significant progress over the past decade or two, with a growing emphasis on integrating discussions and courses on health systems and transformation into educational

programs. This represents a departure from the historical focus solely on clinical and basic sciences. However, challenges persist, with the lack of faculty training identified in Part 1 and Part 2 as a key barrier to implementing health system transformation in curricula effectively. Moreover, stakeholders acknowledged the complexity and inertia within the health care system, that makes it difficult for health professionals to disrupt and innovate within the existing structures. The COVID-19 pandemic was a catalyst for health system transformation initially, however; stakeholders noted that much of the progress made, eventually regressed in the education of health professionals, highlighting the issue of burnout among health professionals, and underscoring the need for addressing health professional burnout to sustain transformation efforts. Additionally, stakeholders recognized the need for greater considerations in change management and intentional changes in curricula to formalize health system transformation within the educational system. Integrating health system transformation more holistically into the formal curriculum remains a critical focus to ensure comprehensive and sustainable progress in the education of health professionals (Wilkes et al., 2018).

Stakeholders identified diverse approaches in the education of health professionals that enhance health professionals' capacity for health system transformation. While there is momentum in terms of content on health system transformation such as systems-based practice, one crucial gap is integrating health system transformation into curricula, emphasizing system-level thinking within clinical practice rather than a standalone competency (Lucey, 2013). Another significant mechanism is the growing emphasis on implementation science, providing a framework for translating research into effective practice and supporting transformation initiatives. Additionally, stakeholders recognized health professionals' role in entrepreneurship, fostering innovation and positive change in health care delivery. Stakeholders describe how recent progress made around social accountability and addressing health disparities through advocacy helps prepare health professionals for their role in health system transformation. However, the value and support for these mechanisms vary along the educational continuum, necessitating more consistent recognition and encouragement from faculty and health system players (Wood et al., 2021). This study identified a lack of standardization and integration in implementing health system transformation across the education of health professionals globally, urging a comprehensive approach in curricula and faculty development. These mechanisms play

a crucial role in preparing health professionals for meaningful health system transformation efforts.

The findings presented in this study provide valuable insights into the areas that are crucial to consider for future curriculum development and research programs focused on health system transformation in the education of health care professionals. The study aimed to identify priority areas to bridge the gap between current education practices and the requirements for achieving the Quadruple Aim and health equity. Two key themes that emerged from the data are the needs for comprehensive and inclusive education. Respondents overwhelmingly emphasized that current curricula are both fragmented and inadequate in preparing health professionals for transformative roles in the health care system. This indicates a pressing need to revisit educational programs and incorporate concepts related to health system transformation more effectively. To address this issue, stakeholders in both Part 1 and 2 suggested that concepts around health system transformation should be integrated into the continuum of learning and should be incentivized through the systems in which they work. This recommendation highlights the importance of ensuring that health professionals possess the necessary knowledge and skills related to health system transformation. Moreover, the study underscores the significance of community engagement and stakeholder collaboration in future curricula development to best meet the needs of the people who interact with health systems. This approach recognizes the interdependence between health professionals and the communities they serve. By partnering with communities and stakeholders, educational programs can better align their priorities with the health needs of the population, leading to more relevant and impactful health system transformation efforts (Szumacher, 2019; Rowland et al., 2019).

This study also emphasized the need for demonstrating the value of health system transformation in the education of health professionals through future studies. Survey respondents in Part 1 (51.3%) reported that future research needs to demonstrate the value of health system transformation in the education of health professionals as ‘completely relevant’ to them. While stakeholders recognized the importance of incorporating health system concepts into curricula, there is a call for evidence that supports the effectiveness and impact of these educational interventions. Such research can provide valuable insights into best practices for teaching health system transformation, as implementation was described as a substantial gap in current practice (Lutfiyya et al., 2016). Another critical gap highlighted in the data is the lack of

methods to measure the impact of health system transformation in the education of health professionals on patients and populations especially given the current levels of perceived importance by students and faculty. Understanding the outcomes and effects of these educational initiatives longitudinally is vital to assess their success and identify areas for improvement. Future research endeavors should focus on developing robust evaluation methods in a learning health system that can effectively assess the complexity of education and health systems.

Relevance to Current Literature

This research on health system transformation in the education of health professionals substantiate previous research on the topic are and contributes to the literature in terms of recommending areas for future curriculum development and programs of research.

The results of this study underscore the importance of the health equity and social accountability in framing a comprehensive curriculum for the education of health professionals aligning with previous research in this area (Singh et al., 2021; Wilkes et al., 2018). This study's results suggest that the current state of the education of health professionals is not preparing health professionals to work in a system that contributes to quadruple aim. Over the course of the pandemic much progress has been made to shed light on equity related issues in the education of health professionals, including stakeholders perceived importance in this area. To bridge this gap health equity and social justice should be essential elements to help health professionals understand the significance of health system transformation in curricula, leading to improved patient outcomes.

The study's results emphasize the inertia in both health and education systems that perpetuates the status quo and silos in the education of health professionals aligning with other published studies discussing the impact of the Flexner report on medical education. This engrained perspective may limit health professionals' roles in the health system due to lower ranking within the system (e.g., early career) or due to engrained perceptions of professional identity, hindering the inclusion of a broader societal perspective in their role (Bitton et al., 2014; Gonzalo et al., 2016; Starr et al., 2017). As a pivotal player in driving system transformation, the education of health professionals must implement structural changes to break away from traditional constraints and adapt to the evolving needs of health care and society. Furthermore, this research validates the need for a paradigm shift in the culture of the education of health

professionals in which that health system transformation in the education of health professionals is viewed as valuable in terms of improving patient and population health.

Additionally, this study sheds light on the unique impacts of the COVID-19 pandemic on health system transformation and the education of health professionals. Previous studies have suggested that transformation that occurred in the education of health professionals throughout the pandemic suggested promise for sustained change (Borkan et al., 2021; Singh et al., 2021; Lankshear & Limoges, 2021). This study builds on previous research by providing a comprehensive understanding of the sustainability of transformation efforts during and after the pandemic. The study highlights challenges such as change management fatigue and the tendency to revert to previous routines, leading to regression in health system transformation progress. This study adds to the literature by recommending that addressing health professions wellness and managing change fatigue is crucial to sustaining progress during this critical moment in the education of health professionals.

Furthermore, through a comprehensive scoping review Chisholm et al. (n.d.) demonstrate that the current state of health system transformation in the education of health professionals is gaining prominence in academic literature, but fundamental gaps persist. The study recommends key areas for future research, such as measuring the education interventions on individuals and populations, understanding implementation strategies in an interprofessional context, measuring longitudinal outcomes, and considering complexity in health and education systems. By addressing these research gaps, future studies can contribute to achieving the quintuple aim. Moreover, this study aligns with the current literature and contributes valuable insights into health system transformation in the education of health professionals. By emphasizing the importance of the quintuple aim and addressing the impacts of the COVID-19 pandemic, it provides a framework for sustainable progress and guides future research to fill existing gaps in health system transformation in the education of health professionals.

Strengths and Limitations

Through this investigation, valuable insights were gained on the exploration of the current state of health system transformation in the education of health professionals and important considerations for curriculum development and programs of research. Major strengths of the study include: 1) transferability of findings are supported by the input of stakeholders with

expertise in health system transformation or the education of health professionals globally, 2) rich reflections on the current state of health system transformation in the education of health professionals during a critical time of disruption in both systems, and 3) triangulation of multiple data sources to identify and explain patterns about health system transformation in the education of health professionals.

These findings should be interpreted considering these methodological limitations: 1) interdependencies between themes, 2) limited or varied understanding of health system transformation in the education of health professionals outside of stakeholder's context in which they practice (e.g., place of care, institution, or country), 3) results are dependent on the integrity of self-reported responses, and 4) some survey questions had low-response rate demonstrating survey fatigue in Part 1 of the study.

Conclusion

The current state of health system transformation in the education of health professionals is rapidly evolving and garnering increasing importance among students, faculty, and stakeholders. This evolving state can be understood through eight interdependent themes around health system transformation and the education of health professionals. Given the current fragmented delivery and understanding of health system transformation in the education of health professionals, it is evident that future curricula development should prioritize a comprehensive approach across all health professions. This emphasis on comprehensive curricula is crucial to preparing students for the changing landscape of health care and equipping them with the necessary skills to thrive in an evolving health system. For future programs of research, research should focus on measure the impact of education interventions on health outcomes. Understanding the effectiveness of these interventions is vital to improving the quality of education and its impact on patient care. Research should also focus on understanding the implementation strategies within an interprofessional context, as collaboration between various health professions is increasingly important in health care settings. To gain insights into the long-term effects of health system transformation, measuring longitudinal outcomes becomes imperative. Tracking changes over time will help identify the sustainability and long-lasting impacts of educational interventions. Moreover, considering the complexity inherent in health and education systems is essential for shaping effective transformation initiatives.

Acknowledging the interconnectedness of these systems and addressing their complexities will lead to more informed decision-making and successful implementation. Overall, this research offers valuable direction to stakeholders, guiding them in allocating resources and designing activities that support informed decisions for health system transformation in the education of health professionals. By addressing these recommendations, the education of health professionals can better prepare future professionals to meet the challenges and opportunities of a rapidly transforming health system.

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Chapter Four: Article 3

Title: Preparing Health Professionals for Health System Transformation:

A Framework for Health System Transformation for the Education of Health Professionals

Ashley Chisholm

Article type: Original Paper

Abstract

Policy makers are calling on health professionals to be accountable for health system transformation. However, current the education of health professionals does not adequately prepare them for this imperative. This discussion paper presents a comprehensive framework, grounded in the findings of an extensive mixed-methods stakeholder consultation, on the education of health professionals for health system transformation. Our proposed framework addresses the critical need to bridge the gap between education and practice in health care, catering to the evolving global needs of health systems. This framework is designed for health professionals, educators, policymakers, patient-partners, and researchers invested in reshaping the education of health professionals to align with health system transformation. Based on the outcomes of a mixed-methods stakeholder consultation, we propose eight elements for a robust framework:

1. Patient and Community Engagement
2. Embed in a Learning Health System
3. Bridge Education and Health Systems
4. Develop a Set of Common Interprofessional Competencies
5. Identify Roles for Health Professionals at Micro, Meso, and Macro Levels
6. Train and Educate Faculty
7. Foster a Culture that Supports Transformation
8. Education for Life

Aligned with the Quintuple Aim, our framework aims to enhance health care quality, improve population health, reduce costs, enhance the work-life of health care professionals, and ensure a satisfying patient experience. This comprehensive approach contributes to the transformation of the education of health professionals for health system evolution. By fostering collaboration between educational institutions and health systems, our proposed framework aims to enhance the preparedness of health professionals for the complexities of modern health care delivery.

Keywords: Health System Transformation, Health Professions Education, Quintuple aim.

Introduction

The impetus driving health system transformation lies in the pursuit of achieving a comprehensive set of goals, collectively known as the quintuple aim. These objectives encompass enhancing the patient experience, improving population health, reducing the costs of health care, enhancing the well-being of health care professionals, and advancing health equity. The ultimate vision of health system transformation in the education of health professionals is to equip health professionals with the skills and knowledge required not only to function effectively within evolving health care systems but also to lead their evolution within the system. However, current efforts towards health systems in the education of health professionals often fall short.

The onset of the COVID-19 pandemic has intensified the urgency for health system transformation. The pandemic exposed systemic failures, from health workforce shortages to disparities in primary care access and troubling gaps in health equity. While the call for transformation resonates louder than ever, a significant void exists within the education of health professionals, where inadequate preparations for these transformations among health professionals persist. Notably, there has been some progress, particularly in the United States, with the integration of health system science competencies into medical education and recent progress in implementing health system science for interprofessional teams (Gonzalo et al., 2022; Gonzalo et al., 2023). Furthermore, a global assessment by Frenk and colleagues in 2022, in response to the COVID-19 pandemic, advocated for an "education for life" approach in the education of health professionals. This approach ultimately recognizes the ever-evolving landscape of continuous learning for system improvement which ultimately reflects in better patient outcomes. Despite pockets of promise scattered across the education of health professionals worldwide, there is no established set of competencies spanning across health care professions, aimed at equipping health care professionals with the essential skills to effectively function within and lead health system transformation.

This article seeks to delve into the existing gaps within the education of health professionals concerning health system transformation and propose a framework for preparing health professionals for health system transformation through the education of health professionals. It also aims to offer potential avenues for implementation and avenues for further research. The insights gleaned from this exploration will serve as a compass for relevant stakeholders, including policymakers, health care professionals, and curriculum designers. It will

guide their decisions on the allocation of resources and the development of educational activities necessary to ensure that informed choices are made regarding health system transformation training.

Theoretical underpinnings of health system transformation in the education of health professionals

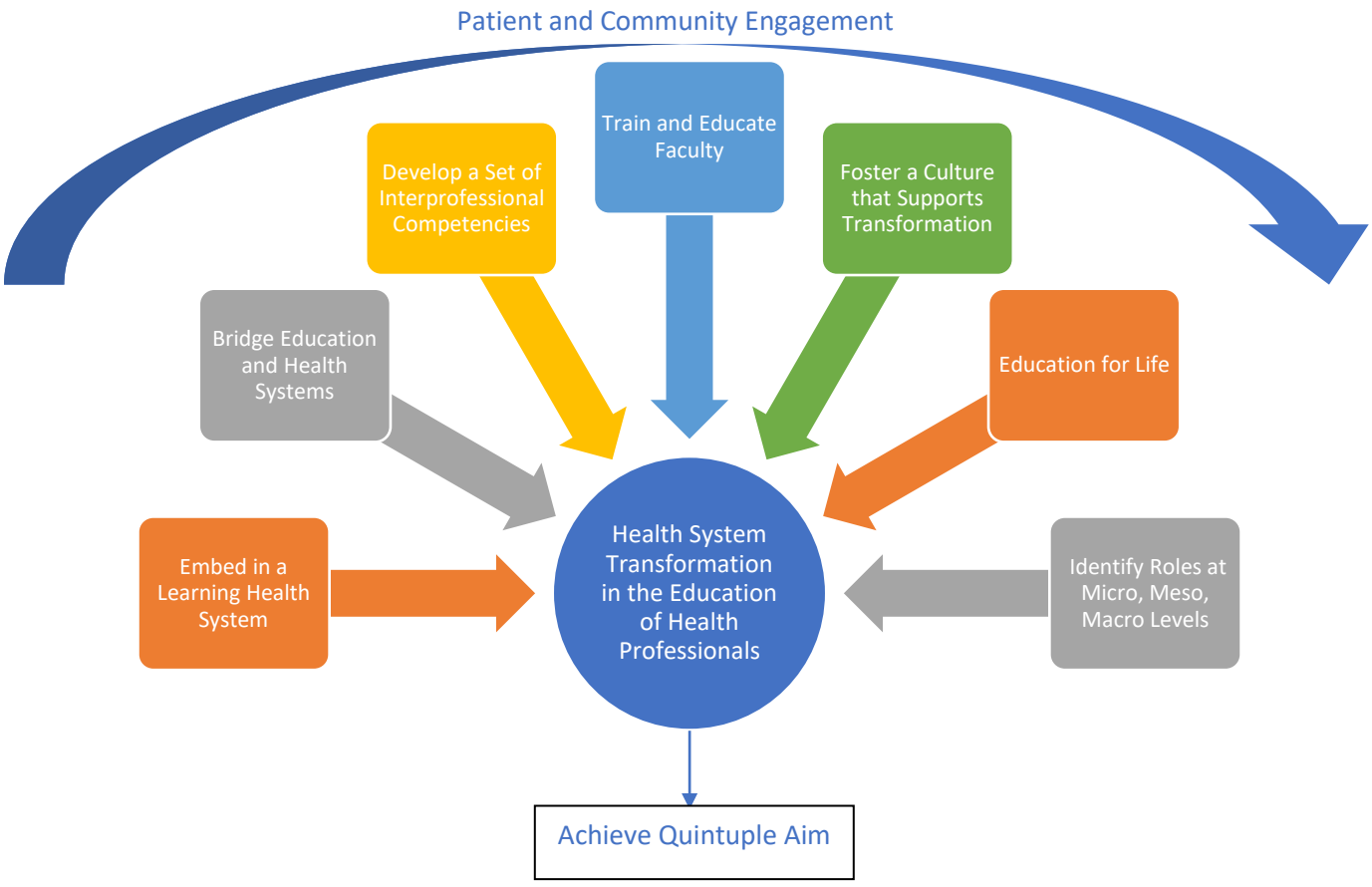
Over the last century, the landscape of the education of health professionals has been significantly influenced by three pivotal reports—Flexner, Welch-Rose, and Goldman. These reports aimed to equip health professionals with a robust scientific foundation and advanced clinical skills through a competency-based education model. While this approach was groundbreaking in its time, considering the progress in medical science and the evolving role of health professionals in individual patient care, it now falls short of addressing contemporary population health needs. The 21st-century has witnessed a transformation in the role of health professionals, and the current education system fails to adequately prepare them for the systemic challenges they face today, as highlighted by Frenk et al. (2010; 2022). Responding to the evolving demands of health systems and the imperative to better serve communities, the education of health professionals is undergoing a fundamental transformation. This includes integrating topics and competencies related to health systems, enabling health professionals to develop the skills necessary for catalyzing systemic reform in both their practices and mindset (Lucey, 2013). Today's health challenges are inherently systemic, and health professionals must be equipped to address patients and populations within the broader contextual conditions that significantly influence health outcomes (Frenk et al., 2010; Singh et al., 2021).

Frenk and colleagues (2010) in the Lancet commission on Education of Health Professionals for the 21st Century, outline the interdependencies between education and health systems with people’s needs being the driver of both systems. The education of health professionals is a mechanism of how we can bridge the education and health systems together ultimately driving transformation in both sectors but also being responsive to their education and health needs. In the current state, the disconnect between education and health systems have led workforce shortages and a failure to meet population health needs that underscore the need for transformation and better connection between both systems. For example, in Canada it was estimated over 4.7 million people do not have access to a regular primary care provider, the average number of patients that a family physician can see per year is decreasing, and medical

schools' growth rate for producing family physicians is slowing from 12.9% between 2012 and 2016 to 7.7% between 2017 and 2021 (Statistics Canada, 2024; Rudoler et al., 2022; Duong & Vogel, 2023). In attempt to better understand the current state of health system transformation in the education of health professionals, Chisholm et al. (n.d.) discerned elements specific to the education of health professionals. In this scoping review, several major themes emerged on the current state of the education of health professionals on health system transformation and areas of importance for future curricula development and programs of research including the fragmented state of education on health system transformation and the opportunity for curricula development and programs of research. Through the scoping review and a mixed-methods stakeholder consultation (Chisholm et al., n.d.) we propose eight elements for a framework for health system transformation in the education of health professionals (See Figure 3). This framework serves as a tool to succinctly disseminate knowledge from the aforementioned study (Chisholm et al., n.d.) on health system transformation in health professions education. The eight elements of the framework were developed from a weaving approach integrating quantitative and qualitative data and through engaging with patient partners in research (Fetters et al., 2013). The intention of this framework is to lay the foundation for future programs of research and curriculum development in this topic area.

Figure 3

A Framework for Health System Transformation in the education of health professionals



A Proposed Framework for Health System Transformation in the Education of Health Professionals

In the following section I will break down each of the eight elements in the framework for health system transformation in the education of health professionals:

Patient and Community Engagement. In crafting a comprehensive framework for health system transformation in health professionals' education, the integration of patient and community engagement emerges as a paramount consideration for all elements of the framework. The education of health professionals should emphasize the pivotal role of patient-partnered care, emphasizing shared decision-making and an awareness of social determinants of health. Notably, a significant 85% of stakeholders in health systems and the education of health professionals advocate for a trajectory that involves collaborative efforts with communities and

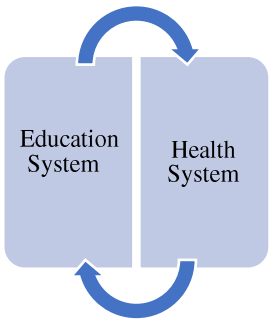
patients to collectively address health care priorities and contribute to health care system transformation (Chisholm et al., n.d.). This recommendation is reflected in the realm of curriculum development. Stakeholders stress that future research should underscore the value of health system transformation in the education of health professionals, emphasizing the active involvement of patients and communities in this research. Recognizing the importance of incorporating the perspectives of patients and communities, this approach ensures that the outcomes of the study, focused on the education of health professionals, extend benefits not only to health professionals but also to patients and communities at large.

Embed in a Learning Health System. The incorporation of a Learning Health System (LHS) stands as a fundamental element in establishing a comprehensive framework for health system transformation within health professionals' education. The LHS seamlessly integrates innovation, research, education, and practice, fostering a continuous cycle of improvement and evaluation (Tamblyn et al., 2016; Forrest et al., 2018). This model highlights the active role of educational institutions in generating evidence and improving health care quality, promoting a perpetual learning cycle. In the context of a rapidly evolving digital landscape, innovation, especially artificial intelligence is occurring at an unprecedented scale. Therefore, it is crucial to embed mechanisms in both education and health systems to evaluate new knowledge, especially concerning how innovations impact patient health. This also supports the evaluation of new care delivery methods, potentially shifting care from hospitals to community settings. The current landscape of health system transformation in the education of health professionals exposes a deficiency in original research evaluating health system transformation in health professionals' education (Chisholm, n.d.). The LHS is also grounded in attributes for meaningful impact that can improve social accountability through community and patient engagement that can enhance social conditions for the people the system is for and in turn improve outcomes such as health equity and community health (Wood et al., 2021). There is an urgent need to gain a deeper understanding of existing programs aimed at educating health professionals on health system transformation. Future research efforts should prioritize the development of effective evaluation methods within the LHS, capable of assessing the intricate dynamics of education and health systems. This prioritization is essential for facilitating the identification of successful strategies and areas requiring improvement.

Bridge Education and Health Systems. Within the framework aimed at transforming health professionals' education and the broader health system, it is imperative to rectify the existing gap between education and practice. This necessitates close collaboration between the education and health systems. While health and education systems are inherently interdependent, a notable disparity exists, as transformation efforts in these domains often operate in isolation, neglecting their interrelated nature. This fragmentation arises from isolated events within each system, resulting in a misalignment of their respective transformation goals (Frenk et al., 2010). The education of health professionals holds significant potential to integrate new knowledge related to health system science, thereby addressing the prevalent focus of curricula on clinical and basic sciences. Similarly, better bridging of education and health systems can improve gaps related to where health professionals work in the system and the diversity of health professions that in turn promotes a more inclusive system (Frenk et al., 2022; Pittman et al., 2021). Addressing this misalignment and adapting curricula are essential measures for fostering a more cohesive and effective health system transformation within health professionals' education (See figure 4).

Figure 4

Demonstrating the interdependent nature of health and education systems



Develop a Set of Common Interprofessional Competencies. Within the comprehensive framework for health system transformation in the education of health professionals, we advocate for the establishment of a universally agreed-upon set of competencies that all health care professionals should acquire during their education that focus on health system transformation. The current lack of a standardized set of competencies and consistent terminology to describe health system transformation in health professionals' education contributes to a fragmented understanding of this transformation and the potential roles of health

professionals. This may include building upon established interprofessional frameworks such as the Canadian Interprofessional Health Collaborative Framework for advancing collaboration to include health system competencies (CIHC, 2024). In the United States, the prominence of Health System Science curricula is noteworthy, aiming to achieve the quintuple aim by expanding beyond clinical and basic sciences, incorporating competencies related to social determinants of health, population health, interprofessional collaboration, high-value care, and systems thinking (Gonzalo et al., 2023). This approach shows promise in developing competencies to better prepare health professionals for health system transformation.

While health system science competencies are established in medical education, recent expansion into nursing education suggests potential for interprofessional education. However, a significant gap exists in the absence of a common set of competencies across various health professions, posing a challenge in assessing and quantifying the effectiveness of health system transformation initiatives in health professionals' education. The establishment of such universal competencies is crucial for fostering a cohesive and measurable approach to health system transformation across diverse health care professions.

Within the framework for health system transformation in the education of health professionals, an interprofessional approach, emphasizing collaboration among health care professionals from diverse backgrounds, is integral. This approach is designed to foster effective communication, shared decision-making, and ultimately enhance patient outcomes. However, the synthesis of existing literature underscores a notable gap in research on interprofessional approaches to health system transformation in health professionals' education. The scarcity of empirical research emphasizes the need for further investigation and evaluation of interprofessional approaches within health professionals' education, as it remains a crucial recommendation for effective health system transformation in this domain. Addressing this gap is imperative to enhance the understanding and implementation of interprofessional collaboration in the context of health professionals' education and its role in driving transformative changes in health care systems.

Foster a Culture That Supports Transformation. Within the framework it is crucial to cultivate a culture that promotes health system transformation in the education of health professionals. This involves a fundamental re-evaluation of traditional attributes defining health professionals' identity, such as intelligence, diagnostic skills, and altruism. Aligning these

attributes with the broader ecosystem of patient and health system needs fosters a perspective of health professionals as "system citizens" (Gonzalo et al., 2023). This paradigm shift becomes pivotal for enabling health professionals to contribute more effectively and meaningfully to health system transformation, potentially instigating a cultural shift in the education of health professionals that encompasses broader roles in line with evolving health care demands (Frenk et al., 2022).

Faculty champions and individuals in positions of influence within health systems play a paramount role in fostering a transformative culture (Gonzalo & Orgrinic, 2019; Makeen, 2015; Singh et al., 2021).). A crucial element of supporting a culture conducive to health system transformation involves promoting psychological safety. This entails creating an environment where both students and health care professionals feel empowered to voice concerns, ask questions, and propose innovations without fear of retribution, thereby nurturing a culture of continuous improvement (Chisholm et al., n.d.). Research underscores the critical need for a paradigm shift in the cultural perspective of health professional education, where health system transformation is acknowledged as valuable for enhancing patient and population health (Gonzalo & Orgrinic, 2019; Makeen, 2015; Singh et al., 2021). Particularly, the concept of psychological safety is highlighted in discussions about inclusive curricula, emphasizing its importance in facilitating a system where all health professionals can actively contribute to health system transformation. This underscores the significance of establishing a culture that not only encourages open communication and innovation but also ensures that individuals feel psychologically secure to actively engage in transformative efforts within health professional education.

Train and Educate Faculty. In the context of the framework for health system transformation in health professional education, a pivotal aspect involves the continuous provision of training and education to faculty members. This training spans teaching methodologies, interprofessional collaboration, and research, ensuring that educators possess the tools to deliver contemporary and innovative curricula. Mentors and faculty play a crucial role in advancing health system transformation within health professional education, providing guidance, support, and direction to students navigating the complexities of the health care system. The success of health system transformation in the education of health professionals significantly relies on the discretion of faculty, shaping students' experiences based on the

importance assigned to this transformation in their education (Gonzalo & Orgrinic, 2019; Makeen, 2015; Singh et al., 2021). However, faculty engagement in health system transformation faces challenges related to perceived importance in developing competence as a health professional or existing knowledge gaps. The key lies in training faculty or mentors in health system transformation topics, instilling in them the confidence to assume leadership roles in their health systems. This approach ensures that graduates are well-prepared for transformative roles, and students have opportunities to actively participate in related activities. Effectively supporting students in health system transformation endeavors hinges on empowering faculty and mentors with the necessary skills and perspectives, reinforcing the symbiotic relationship between faculty engagement and successful health system transformation in health professional education.

Education for Life. In the context of a comprehensive framework for health system transformation in the education of health professionals, a fundamental principle is recognizing education as a lifelong journey rather than a one-time event. It advocates for a culture of continuous learning and professional development, urging health professionals to remain adaptable and open to change throughout their careers. Traditionally in the education of health professionals, education has been a closed system or a “one-off” event, this framework encourages open systems that are designed to meet the constant needs for new competencies throughout the careers of health professionals (Frenk et al., 2022).

Identify Roles for Health Professionals at Micro, Meso, and Macro Levels. Within the framework for health system transformation in health professionals' education, it is crucial for health professionals to acknowledge their role in reshaping health systems, regardless of their position within the system's hierarchy. This idea extends to the concept of health professionals as "system citizens" (Berwick, 2011; Essary & Wade, 2016; Borkan et al, 2021). The roles they undertake in health system transformation are diverse, encompassing micro, meso, and macro levels within the health care system. Some professionals concentrate on micro-level activities intricately connected to clinical practice, such as actively participating in quality improvement initiatives and patient safety activities. Others broaden their impact to meso or macro levels, emphasizing roles as change agents, perpetual learners, or effective stewards of the health care system, overseeing the direction of health system transformation initiatives. Emphasizing the significance of health systems education for health professionals at every stage of their

development within any part of the health care system is vital. This education is integral throughout their entire professional journey, highlighting that everyone in the system plays a role in contributing to health system transformation. This holistic perspective underscores the interconnectedness of roles across the spectrum of health care, emphasizing the collective responsibility of all health professionals in driving and sustaining positive transformation within the health system.

Achieving "Quintuple Aim" through the education of health professionals

In addition to improving health care quality, the framework should align to achieve Quintuple Aim, focusing on improving population health, reducing health care costs, enhancing the work-life of health care professionals, ensuring a satisfying patient experience, and improving health equity (Nundy et al., 2022). The shared goal of health system transformation among health professionals is to ultimately achieve quintuple aim. Having a clear framework as a "north star" may potentially aid in bridging together fragmented approaches to health system transformation across professions.

Optimizing health system transformation in the education of health professionals

Addressing the evident gap in the journey toward health system transformation requires more than just educating health professionals; it demands a holistic approach. This article proposes an innovative framework designed to equip health professionals with the skills needed for imminent changes. However, acknowledging that education alone cannot catalyze a complete overhaul of the health system is paramount. For a comprehensive transformation, active involvement from institutional administration, governments, policymakers, patients, and various stakeholders is essential. Creating a culture conducive to systemic change demands collective efforts and alignment. To fully comprehend the impact of curricula on the roles of health professionals in health system transformation, robust evidence is crucial to evaluate the performance of current educational approaches. Complexity science serves as a valuable lens for understanding the intricacies of interprofessional teams, which play a pivotal role in the effectiveness of health system transformation. These insights extend to the complexity of learning health systems, where interprofessional teams continue to be crucial in driving effective health system transformation. As we advocate for a transformative framework in the education of health professionals, it becomes imperative to underscore the importance of ongoing evaluation and research. A robust evidence base not only validates the efficacy of current educational strategies but also guides the

evolution of frameworks, ensuring they remain adaptive and responsive to the dynamic landscape of health care.

Conclusion

The urgent need for a comprehensive framework for health system transformation in health professional education cannot be overstated. By embracing these proposed elements, we can foster a transformative educational experience that aligns health care education with the evolving needs of the health care system, benefiting patients, communities, and health care professionals alike. It is imperative that educational institutions, health care systems, policymakers, and stakeholders collaborate to bring about this much-needed change and create a health care workforce that is well-prepared for the challenges of the 21st century.

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Singh, M. K., Gullett, H. L., & Thomas, P. A. (2021). Using Kern's 6-Step Approach to Integrate Health Systems Science Curricula into Medical Education. Academic Medicine, 1282–1290. https://doi.org/10.1097/ACM.0000000000004141

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Wood, B., Fitzgerald, M., Kendall, C., & Cameron, E. (2021). Integrating socially accountable health professional education and learning health systems to transform community health and health systems. In Learning Health Systems (Vol. 5, Issue 3, p. 1). John Wiley and Sons Inc. https://doi.org/10.1002/lrh2.10277

Chapter Five: Conclusion

This study marks the initial examination of health system transformation within the realm of health professionals' education. The three articles included in this dissertation aim to illustrate an evolving comprehension of the status of health system transformation in health professionals' education, as well as identify potential areas for future advancement. More precisely, I investigated the phenomenon of health system transformation in health professionals' education by addressing the following research questions:

- What is the current state of the literature on health system transformation in the education of health professionals?
- Based on the current state of the literature/evidence, what areas are important to consider for curriculum development and future programs of research on health system transformation in the education of health professionals?

Therefore, this Coda is designed to critically examine the findings of a multi-phase study and broaden our understanding by introducing new perspectives on health system transformation in the education of health professionals.

Research Summary

Chapter Two conducts a scoping review of the literature to gain insights into the current state of the literature regarding health system transformation within the context of health professionals' education. This review also delves into critical areas for future consideration in curricula development and research programs focused on health system transformation in the education of health professionals.

In Chapter Three, I articulate the experiences and challenges associated with health system transformation in health professionals' education. The results are derived from surveys and interviews conducted with stakeholders possessing expertise in either health system transformation or the education of health professionals. These findings shed light on the present landscape of health system transformation in health professionals' education and highlight factors relevant to the future education of health professionals in this context.

Chapter Four contributes to the scholarly discourse by proposing a framework for health system transformation in the education of health professionals. Informed by both the literature and the findings from this study, the chapter introduces eight essential elements for a robust framework aimed at achieving the quintuple aim.

In essence, Table 4 offers a summary of the research objectives or questions, evidence sources, and key messages outlined in Chapters Two to Four. Subsequently, a discussion unfolds, clarifying the correlation between each research question and the findings derived from this dissertation.

Table 4.

Summary of Chapters Two to Four

Research objectives	**Evidence**	**Findings/Deliverables**
Chapter 2: Scoping review • What is the current state of the literature on health system transformation in health professions education? • What areas are important to consider for future curricula development and programs of research on health system transformation in the education of health professionals?	44 peer reviewed articles (37 US, 4 CAN, 1 EU, 2 other)	The study's findings generate a deeper understanding of the current state of literature on health system transformation in health professions education and how we can prepare health professionals to lead and participate in health system transformation.
Chapter 3: Stakeholder survey and interviews • To what extent do themes from the scholarly literature resonate with experts in health system transformation and the education of health professionals? • What is the current state of health system transformation in the education of health professionals? • What are the key issues, voiced by experts in health systems and the education of health professionals, on the current state of health system transformation in the education of health professionals? • What factors are important for consideration for future curricula development and programs of research in the education of health professionals?	77 online survey responses, 23 stakeholder interviews (59 CAN, 14 US, 2 UK, 2 Other)	This research discusses the current state of health system transformation in the education of health professionals and describes key areas for future curriculum development and programs of research. This research provides direction to stakeholders on the resources and activities needed to ensure that informed health system transformation training decisions are made.
Chapter 4: A framework for health professionals • This discussion paper presents a comprehensive framework, grounded in the findings of an extensive mixed-methods stakeholder consultation, on the education of health professionals for health system transformation.	Empirical literature, results from Chapters 2 and 3	The proposed framework addresses the critical need to bridge the gap between education and practice in health care, catering to the evolving global needs of health systems. This framework is designed for health professionals, educators, policymakers, patient-partners, and researchers invested in reshaping the education of health professionals.

Integration of Study Findings

I undertook this thesis with the aim of gaining a deeper insight into how health professionals perceive their role in health system transformation, with a specific focus on examining how they acquire knowledge about health system transformation through their education. By triangulating multiple evidence sources, I have cultivated a comprehensive understanding of the present state of health system transformation in health professionals' education. Additionally, Table 5 provides a comparative analysis of the research findings from each article concerning the foundational research questions that guided this study.

Table 5.

Overarching Research Questions and Key Findings by Article

Research Question	Integration of Study Findings
1. What is the current state of health system transformation in the education of health professionals?	Article 1: The current delivery of education on health system transformation is fragmented resulting in a varying degree of approaches and curricula across the health professions. Article 2: Most stakeholders found themes in the scholarly literature to be relevant to them. There is a divergence in views of how health professionals can contribute to health system transformation. Article 3: The current state of the education of health professionals is not adequately preparing health professionals for health system transformation and a unified approach is warranted.
2. Based on the current state of the literature/evidence, what areas are important to consider for curriculum development and future programs of research on health system transformation in the education of health professionals?	Article 1: There needs to be a paradigm shift in the culture of health professions education in which that health system transformation in the education of health professionals is viewed as valuable in terms of improving patient and population health. Article 2: This research identified two factors related to the future education of health professionals on health system transformation including comprehensive and inclusive education and priority areas for future research. Article 3: A framework is required to guide the delivery of future curricula and is studied to adapt to prepare health professionals for the challenges of the

	21st Century.

Implications for the education of health professionals on health system transformation

This study aimed to comprehend the current state of health system transformation in the education of health professionals. By synthesizing insights from three articles, we gained a profound understanding derived from existing literature and stakeholder experiences. This understanding led us to propose a framework consisting of eight elements for health professionals' education, facilitating the realization of the quintuple aim. Through this comprehensive investigation, including diverse sources of evidence, we identified gaps and opportunities in the domain of health system transformation within health professionals' education.

Despite the increasing demand for health professionals to play a role in health system transformation, our research indicates that the current state of their education does not adequately prepare them for this responsibility. Various factors, uncovered through literature analysis and stakeholder interviews, elucidate why health professionals often lack the preparation for health system transformation. Although there is a growing body of literature, expertise, and initiatives in this field, it remains fragmented and compartmentalized by professions, further widening the gap between health systems and educational systems. Furthermore, future research may benefit from the exploration of change management leadership in other disciplines outside of health and education such business or information technology sectors to apply learnings from sector integration for health.

In conclusion, we propose a framework that embraces all health professionals, fostering a unified approach to health system transformation in their education. This framework serves as an initial guide for an evidence-informed approach, comprising eight key elements identified through a scoping review and stakeholder consultations. While this proposed framework provides a starting point, it should be adaptable as new knowledge emerges and should be embedded within a learning health system.

Culture emerges as a significant challenge influencing the success of health system transformation in health professionals' education. Addressing culture involves recognizing historical norms in the education of health professionals rooted in clinical and basic sciences, as well as leveraging it as a facilitator through faculty champions and institutional support

demonstrating knowledge around health system transformation is essential for improving health outcomes. Cultivating a culture conducive to health system transformation within the education system is crucial for achieving the quintuple aim and transforming health systems globally.

Design Reflections

In reflecting on the study design of this explanatory sequential mixed-methods research, it is evident that adopting a top-down approach, initially examining the problem from a policy or system level perspective, has been instrumental in providing a comprehensive understanding of the complexities within health system transformation in health professions education. This approach allowed me to grasp the broader context and identify overarching issues that impact health system transformation in health professions education by those who are directly involved and have expertise in those two areas of study. However, as I delved deeper into the investigation, it became increasingly apparent that solely relying on a top-down perspective may overlook crucial insights that can only be gleaned from those directly involved in health care delivery such as health professionals, those health professions education learners, and ultimately the people who health systems transformation is for, patients and communities.

Furthermore, a notable difference between Phase One and Phase Two of this study is the geographic composition between the two phases. In Phase One, 37 out of the 44 articles included in the scoping review originated from the United States, with 4 from Canada. In Phase Two, 59 out of 77 participants were from Canada, and 14 were from the United States. This discrepancy highlights inconsistent geographic representation across the study phases. Despite variations in health systems and health professions education between countries, integrating data from both phases provides a comprehensive overview of health system transformation in health professions education across the United States and Canada.

Another significant limitation of this study design is the inherent interdependencies between health professions education and health system transformation. While health professions education plays a crucial role in shaping the future workforce and fostering innovation within the healthcare system, it alone cannot drive systemic policy change. Recognizing this limitation, future research endeavors should aim to explore more integrated approaches that bridge the gap between education and policy, thereby fostering more holistic and sustainable transformations within the health system.

Next Steps

Recognizing the importance of incorporating a bottom-up approach, next steps for dissemination of initial study results will include working with patient-advisors in research to help lay the foundation for future programs of research on this topic area. This is being done in partnership with the Patient Expertise in Research Collaboration (PERC) Advisory Board members as part of a fellowship I am pursuing through Transdisciplinary Understanding and Training on Research in Primary Health Care (TUTOR-PHC) program to ensure concerted efforts to include patient-partners are involved in research on this topic area. By actively engaging with those who are most affected by health system transformation, we can better capture firsthand experiences, perspectives, and priorities that might otherwise have been overlooked. This participatory approach not only enhances the relevance and applicability of our findings but also promotes a sense of ownership and empowerment among stakeholders.

Concluding Notes

This thesis significantly contributes to the foundational knowledge regarding health system transformation in the education of health professionals. It not only provides insights into the current state of understanding but also charts a course for future research programs and educational initiatives. The inception of this project coincided with a period of global health system transformation, driven by the dynamic needs of evolving population health during a pandemic.

During this critical time, health professionals were called upon to assume new roles within health systems, leading unprecedented change management processes crucial for global health. The pandemic has underscored existing gaps in health systems worldwide, necessitating comprehensive addressing to better serve populations in need of health care. Health professionals have demonstrated their capacity to catalyze transformative change, yet their full potential in achieving the quintuple aim remains untapped.

As policymakers, health system administrators, researchers, educational institutions, and patient-partners seek solutions to transform global health systems, the education of health professionals emerges as a critical factor in ensuring success. This thesis not only enhances our understanding of the current landscape but also provides a roadmap for leveraging the potential of health professionals to fully transform systems and achieve the quintuple aim.

Appendix A: Supplementary Material

Table S1

Preliminary search strategy and search terms

Database: MEDLINE

Set #	Search Query	Results
1	Health care reform/	32,882
2	((health care or health care or primary care) adj3 (reform* or transform* or improvement* or innovation* or reappraisal* or amendment*)).ti,ab	19,261
3	(health system* adj3 (reform* or transform* or improvement* or innovation* or reappraisal* or amendment*)).ti,ab	2,259
4	Or/1-3	46,950
5	exp education, professional/	306,352
6	exp students, health occupations/	73,070
7	((medical or dental or nursing or pharmacy or health occupation* or health profession*) adj3 (education or student*)).ti,ab	134,910
8	Or/5-7	379,260
9	4 and 8	2,709

Database: CINAHL (via EBSCO)

Set #	Search Query	Results
1	(MM "Health Care Reform+") OR (MH "Quality of Health Care") OR (MH "Health Care Delivery") OR "transformation OR transform OR reform OR improvement AND “health care” OR “health system” OR “health systems”"	144,827
2	MH "Education, Health Sciences" OR "Schools, Health Occupations" OR MH "Students, Health Occupations" OR MH "Faculty, Health Occupations" OR TI ((Nursing OR medical OR "allied health" OR chiropractic OR dental OR midwifery OR pharmacy OR "public health" OR podiatry) AND (education OR school OR schools OR student OR students OR faculty)) OR AB ((Nursing	325,466

	OR medical OR "allied health" OR chiropractic OR dental OR midwifery OR pharmacy OR "public health" OR podiatry) AND (education OR school OR schools OR student OR students OR faculty))	
3	#1 AND #2	3,230

Database: ERIC (via OVID)

Set #	Search Query	Results
1	((health care or healthcare or primary care) adj3 (reform* or transform* or improvement* or innovation* or reappraisal* or amendment*)).ti,ab.	385
2	(health system* adj3 (reform* or transform* or improvement* or innovation* or reappraisal* or amendment*)).ti,ab.	11
3	or/1-2	395
4	((medical or dental or nursing or pharmacy or health occupation* or health profession*) adj3 (education or student*)).ti,ab	12,949
5	3 and 4	53

Database: PsycINFO (via OVID)

Set #	**Search Query**	**Results**
1	health care reform	1176
2	((health care or healthcare or primary care) adj3 (reform* or transform* or improvement* or innovation* or reappraisal* or amendment*)).mp.	4244
3	(health system* adj3 (reform* or transform* or improvement* or innovation* or reappraisal* or amendment*)).mp.	152
4	or/1-3	4395
5	education, professional.mp. [mp=full text, byline text]	291
6	((medical or dental or nursing or pharmacy or health occupation* or health profession*) adj3 (education or student*)).mp.	18627

7	or/5-6	18864
8	4 and 7	1561

Strategies informed by:

Best, A., Greenhalgh, T., Lewis, S., Saul, J. E., Carroll, S., & Bitz, J. (2012). Large-system transformation in health care: a realist review. The Milbank Quarterly, 90(3), 421-456.

De Gagne, J. C., Park, H. K., Hall, K., Woodward, A., Yamane, S., & Kim, S. S. (2019). Microlearning in health professions education: scoping review. JMIR medical education, 5(2), e13997.

Table S2

Preliminary inclusion and exclusion criteria for Phase One, Step 3: Study Selection

	Inclusion criteria	**Exclusion criteria**
Field/Discipline	all health professions eligible	study involves a non-health-related profession
Level	student to practicing clinician (all levels eligible)	N/A
Setting	All settings where health professions work and learn	N/A
Publication date	Within past 10 years	Study is older than 10 years
Language	study is published in English	study is published in a language other than English

Figure S1

PRISMA Flow Diagram for a Scoping Review of the Literature on Health System Transformation in the Education of Health Professionals

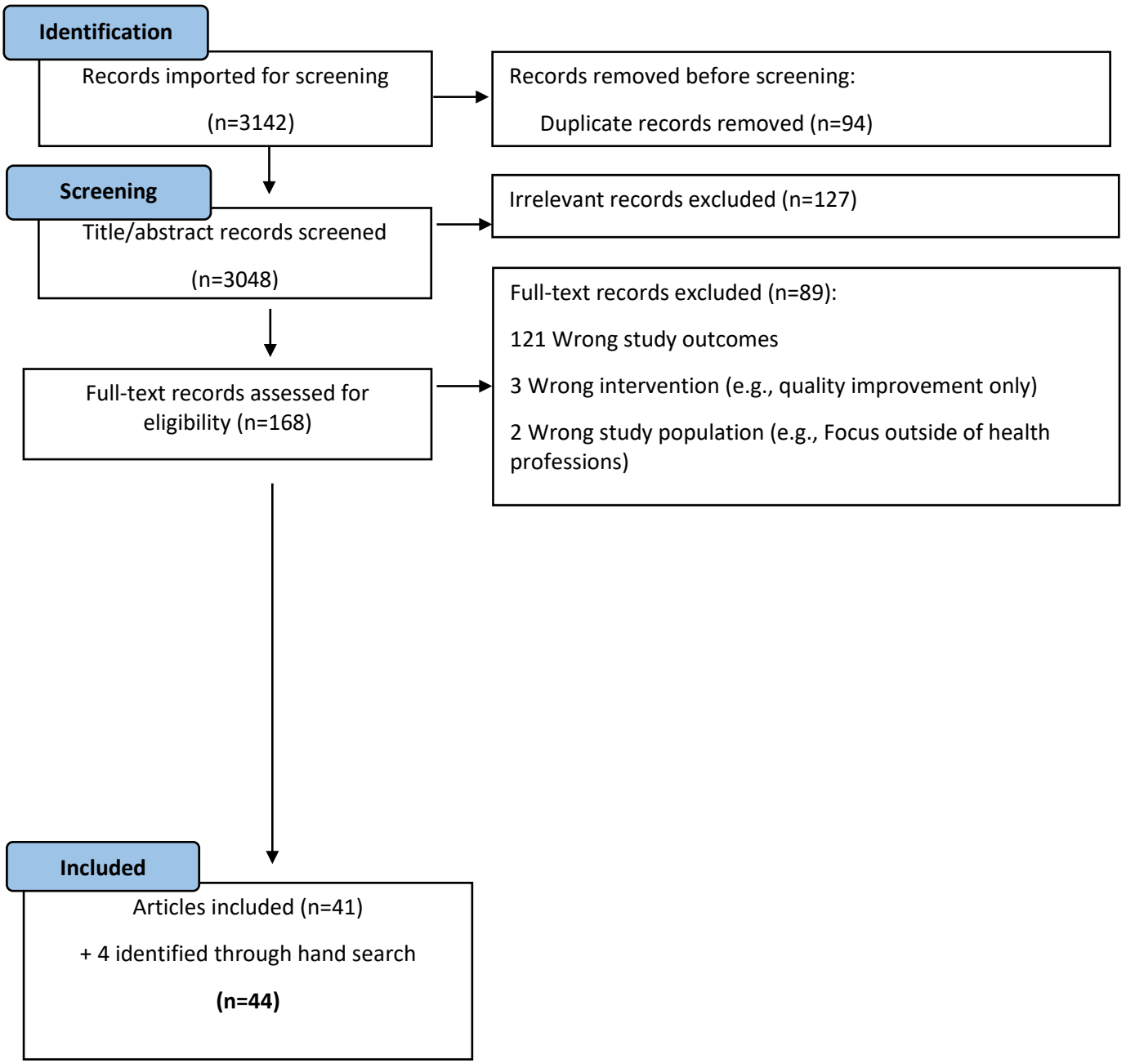

Table 3S

Scoping review: summary table of included studies

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
1.	Berwick	2011	United States	The following article argues that preparing nurses for participation in, and more importantly leadership of, system-level transformation requires new skills, new knowledge, and a new perspective on how complex health care organizations operate.	Nursing	Commentary Nursing education united states	Not well described. Chasm report for improvement 1. Safety: reducing harm from care 2. Effectiveness: increasing the reliability of alignment between scientific evidence and practice, reducing both underuse of effective practices and overuse of ineffective ones 3. Patient-centeredness: offering patients and their loved ones more control, choice, self-efficacy, and individualization of care 4. Timeliness (reducing delays that are not instrumental, in-tended, and informative 5. Efficiency (reducing waste in all its forms); and 6. Equity (closing racial and socioeconomic gaps in quality, access, and health outcomes)	The capacity for nurses to contribute to health system transformation includes two elements: 1) personal skills and 2) a context of leadership and management that al-lows those skills to thrive in action. Deming's four "profound knowledge" categories offer a useful framework for education goals and achievements for nurses capable of helping to improve systems: 1. Knowledge of Systems 2. Knowledge of Variation 3. Knowledge of Psychology 4. Knowledge of How to Gain Knowledge Nursing education is poised to accelerate progress by embedding health care improvement skills in all phases of professional formation.	One of the keys to this new perspective is an understanding of how the different parts and the different people in health care work together currently, and how they will need to work together in the future to effect positive change. Nursing education, through both traditional and emerging channels, should equip all nurses with the tools they need to be leaders and engaged partners in the hard work of system redesign Arguably, most graduates of most health professional educational program suffer from considerable "functional illiteracy" about the systems in which they work.
2.	Bitton, Ellner, Pabo, Stout, Sugarman, Sevin, Goodell, Bassett, Phillips	2014	United States	Our principal aims were to create a learning community focused on continuously improving systems for primary care practice and education; achieve sustainable improvements in the experience of care for patients and trainees; and improve health care value.	Primary care Graduate medical education (family medicine residency program)	In 2012, the Harvard Medical School Center for Primary Care, in partnership with local AMCs, established an **Academic Innovations Collaborative (AIC)** with the goal of transforming primary care education and practice. This novel two-year learning collaborative consisted of hospital- and community-based primary care teaching practices, committed to building highly functional teams, managing populations, and engaging patients. The AIC built on models developed by Qualis Health and the Institute	Not well described, loosely describes triple aim. The AIC focused on four key areas: (1) establishing high-functioning interprofessional teams, (2) proactively managing populations, (3) identifying and providing tailored care to medically and psycho-socially complex patients, and (4) promoting patient engagement and empowerment. These content areas correspond to the theory of PCMH, for which there is mounting evidence of improvement in costs and quality of patient care.	Validated self-reports by transformation teams showed that practices made substantial improvement across all areas of change. Important factors for success included leadership development, practice-level resources, and engaging patients and trainees	The AIC model shows promise as a path for AMCs to catalyze health system transformation through primary care improvement. In addition to further evaluating the impact of practice transformation, expansion will require support from AMCs and payers, and the application of similar approaches on a broader scale

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
						for Healthcare Improvement, optimized for the local AMC context. Foundational elements included leadership engagement and development, application of rapid-cycle process improvement, and the creation of teams to care for defined patient populations. Nineteen practices across six AMCs participated, with nearly 260,000 patients and 450 resident learners. The collaborative offered three 1.5-day learning sessions each year featuring shared learning, practice coaches, and improvement measures, along with monthly data reporting, webinars, and site visits.			
3	Borkan, Hammoud, Nelson, Oyler, Lawson, Starr, Gonzalo	2021	United States	The authors propose a framework for the twenty-first century physician that includes an expectation of new competency in health systems science (HSS), creating 'system citizens' who are effective stewards of the health care system.	Medical Education	Commentary paper	Triple aim Upstream	New definitions of professionalism in medicine are needed and must include the importance of caring for the health system in congruence with the Triple Aim. Health systems science education and competencies should be required of all medical students and trainees. Health systems science education requires commitment from medical schools and their associated health systems. Challenges to HSS adoption include competing priorities for learners and the need for faculty development. Experiential educational strategies, in addition to knowledge-centered learning, are critically important for students to develop systems citizenship.	Experiential educational strategies, in addition to knowledge-centered learning, are critically important for students to develop their professional identity as system citizens working alongside interprofessional colleagues. Challenges to HSS adoption range from competing priorities for learners, to the need for faculty development, to the necessity for buy-in by medical schools and their associated health care systems. Ultimately, success will depend on our ability to articulate, encourage, support, and evaluate system citizenship and its impact on health care and health care systems.

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
								The ultimate expression of a new professionalism is the demonstration of systems citizenship.	
4	Brownie, Thomas, McAllister, Groves	2014	Australia	This report summarizes the requirements for developing a culture of interprofessional practice within the context of Australian healthcare reforms. It also highlights the role of well-developed interprofessional competency frameworks to support envisaged changes in practice.	The education of health professionals - Interprofessional teams	Commentary	Not well described. Australian health care reforms: include: • Better support and healthcare management for patients with chronic disease; • A greater emphasis on multi-disciplinary care; • Well-coordinated and integrated continuity of care, • Especially for those with multiple, ongoing and complex conditions; • High-quality education and training systems for both the incoming and existing healthcare workforce; • An embedded culture of interprofessional practice	Structural reform is a partial step in addressing the issues; however, success is also dependent upon fundamental changes in the manner in which the health professionals work together to deliver those services. Significant changes are required both in terms of future health professional education, and the way in which this education flows into the existing workforce to effect change in the culture of health professions and healthcare.	Significant changes are required both in terms of future health professional education, and the way in which this education flows into the existing workforce to effect change in the culture of health professions and healthcare.
5	Burrow	2011	United States	Summary report on healthcare reform and medical education.	Medicine/Medical Education	Commentary/editorial	Not well described 'Health care reform': The passage of the health care reform bill, with the prospect of adding millions of people to the system, lends urgency to current conversations among medical educators about transforming the health care curriculum. Tomorrow's doctors will likely be employed by larger health corporations, working in multidisciplinary teams with decision making enhanced by electronic medical records and rapid access to the world's medical literature. At the same time, they will be compensated less and be more accountable for their mistakes.	The emerging physician today needs to be flexible and able to adapt to the profound changes occurring in medicine. Educating intellectually curious physicians in the best university tradition who are able to respond to new challenges is what schools of medicine do well	Meaningful transformation of medical education requires the development of core competencies in using evidence-based practice and integrating basic research and clinical research, as well as patient values to provide optimal care. The program should be committed to quality improvement, measuring quality in terms of structure, process, and outcome. All these competencies are directed to patient centered care and involve identifying, respecting, and caring about patient needs.
6	Carney	2015	United states	The scope and scale of developments in health care redesign have not been sufficiently adopted in primary care residency programs.	Primary Care, Internal Medicine, Pediatric Graduate medical education (Residency training)	Program evaluation The interdisciplinary Primary Care Faculty Development Initiative was created to teach faculty how to accelerate revisions in primary care residency training. The program focused on skill development in teamwork, change management,	Triple Aim. The explicit goals of these models are producing better care experiences and better health outcomes at lower costs (the "Triple Aim"). These efforts use strategies that enhance patient relationships, provider competencies, and organizational functions in the health system.	The percentage of participants rating intention to implement what was learned as "very likely to" or "absolutely will" was 16/32 (50%) for leadership, 24/33 (72.7%) for change management, 23/33 (69.7%) for systems thinking, 25/32 (75.8%) for population management, 28/33 (84.9%) for teamwork, 29/33 (87.8%) for competency	To date, we have learned that primary care residencies have substantial interest in transforming their programs, shared needs, and an untapped ability to collaborate across the three primary care physician specialties. Participants were generally satisfied with the initial content

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
						leadership, population management, clinical microsystems, and competency assessment.		assessment, and 30/31 (96.7%) for patient centeredness. Content analysis revealed five key themes: leadership skills are key drivers of change, but program faculty face big challenges in changing culture and engaging stakeholders; access to data from electronic health records for population management is a universal challenge; readiness to change varies among the three disciplines and among residencies within each discipline; focusing on patients and their needs galvanizes collaborative efforts across disciplines and within residencies; and collaboration among disciplines to develop and use shared measures of residency programs and learner outcomes can guide and inspire program changes and urgently needed educational research.	of the program.
7	Davis, Gonzalo	2019	United States	This article draws upon the first author's (CRD's) experience as a medical student immersed in a comprehensive **HSS curriculum** and the second author's (JDG's) experience as a medical educator focused on advancing HSS programming to (1) describe the HSS pillar of medical education and the systems citizenship professional identity it espouses, (2) highlight how HSS competencies facilitate alignment between medical schools and communities, and (3) explore the student perspective on challenges to implementing HSS curricula.	Medical education	Commentary paper on Health systems science curriculum in the US	No clear definition. Draws on concepts through health systems Science- health care policy, public and population health, interprofessional collaboration, value-based care, health system improvement, and systems thinking.	The changing health care landscape necessitates a change in the way physicians are educated. Such a change needs to incorporate HSS competencies into medical education curricula, which will better prepare future physicians to be systems citizens who are able to contribute to the team-based, high-value care that will be expected of them.	Traditional focus areas of medical education are insufficient for preparing future clinicians to function well in the rapidly evolving US health care system. Health systems science (HSS), which includes health care policy, public and population health, interprofessional collaboration, value-based care, health system improvement, and systems thinking.
8	Davis, Rayburn	2016	United States	Academic medicine has moved in two directions: (1) system-wide reform using	Medical education	Commentary	Triple Aim	The authors call for a better union between these two parallel pathways through four pillars of	With these pillars supporting the total integration of their clinical members' CPD with health

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
				electronic health records, practice networks, and widespread data applications (a macro pathway); and (2) professional development of individual clinicians through continuous performance improvement (a micro pathway). Both pathways exist to improve patient care and population health, yet each suffers from limitations in widespread implementation. The authors call for a better union between these two parallel pathways through four pillars of support.				support: (1) an acknowledgment that both pathways are essential to each other and to the final outcome they intend to achieve, (2) a strong faculty commitment to educate about quality improvement and patient safety at all education levels, (3) a reengineering of tools for professional development to serve as effective change agents, and (4) the development of standards to sustain this alignment of pathways.	system reform, we envision a more outcomes-oriented and a mutually supportive academic health center and learning health system. This effort should lead to better system functioning, improved metrics and value, and most important, more optimal patient care and population health
9	Essary, Wade	2016	United States	The paper describes the science of health care program aimed to promote health care transformation that meets the needs of a diverse patient and community population.	Health professions education	Observational study evaluating 3 years of admissions data and 1 year of graduate data to assess program outcomes and inform current graduate level curricula. In order to continually improve outcomes involving team-based learning, curriculum, and student success, the data were used to create or strengthen team-based assignments, faculty mentoring, professional seminars, and capstone projects within this cohort-based graduate program.	Triple Aim. This accelerated curriculum is grounded in the principles of the Triple Aim (improved experience of care, improved health of populations, and reduced costs of health care per capita), and framed around six key conceptual domains: leadership, population health, information science, systems engineering, health care management, and health economics and policy.	Defined as the study and design of systems, processes, leadership and management used to optimize health care delivery and health for all, the Science of Health Care Delivery will prepare the next generation of creative, diverse, pioneering leaders in health care.	The Science of Health Care Delivery program provides students a seamless learning experience that prepares them to be solutions-oriented leaders proficient in the business of health care, change management, innovation, and data-driven decision making
10	Flynn, Scott, Rotter, Hartfield	2017	Canada	A discussion of how nurses can contribute to and lead improvement science activities in health care.	Nursing	Discussion paper. How the discipline of nursing and the nursing profession possesses many strengths that enable nurses to lead and to play an integral role in improvement science activities. There are insufficiencies in nursing education that require attention for nurses to truly contribute to and lead improvement science in health care.		This paper highlights how nurses have the philosophical, theoretical, political and ethical positioning to contribute to and lead improvement science activities. However up to now, the potential for nurses to lead improvement science activities has not been fully used.	We suggest that one starting point is to include improvement science in nursing education curricula. Specifically, there needs to be increased focus on the nursing roles and skills needed to contribute to and lead healthcare improvement science activities. Undergraduate nursing education needs to transform so that novice providers have the knowledge, skills and

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
									attitudes to be competent in improvement science and to provide high quality and safe care. QI principles and skills should be a required and core component of the educational curriculum for undergraduate nurses.
11	Gonzalo, Ahluwalia, Hamilton, Wolf, Wolpaw, Thompson	2018	United States	To develop a potential competency framework for faculty development programs aligned with the needs of faculty in academic health centers.	Primarily Medicine (Academic health centers includes health professions schools, graduate medical education, affiliated teaching hospitals)	In 2014 and 2015, the authors interviewed 23 health system leaders and analyzed transcripts using constant comparative analysis and thematic analysis. They coded competencies and curricular concepts into subcategories. Lead investigators reviewed drafts of the categorization themes and subthemes related to gaps in faculty knowledge and skills, collapsed and combined competency domains, and resolved disagreements via discussion	Quadruple Aim	Through analysis, the authors identified four themes. The first was core functional competencies and curricular domains for conceptual learning, including patient-centered care, health care processes, clinical informatics, population and public health, policy and payment, value-based care, and health system improvement. The second was the need for foundational competency domains, including systems thinking, change agency/management, teaming, and leadership. The third theme was paradigm shifts in how academic faculty should approach health care, categorized into four areas: delivery, transformation, provider characteristics and skills, and education. The fourth theme was the need for faculty to be aware of challenges in the culture of AHCs as an influential context for change	Aligning education with health system transformation through faculty competencies. This broad competency framework for faculty development programs expands existing curricula by including a comprehensive scope of health systems science content and skills. Leaders can use these results to better align faculty education with the real-time needs of their health systems. Future work should focus on optimal prioritization and methods for teaching.
12	Gonzalo, Baxley, Brokan, Dekhtyar, Hawkins, Lawson, Starr, Skochelak	2017	United States	In this report of a working conference using thematic analysis of workshop recommendations and experiences from 11 U.S. medical schools, the authors describe seven priority areas for the successful integration and sustainment of **HSS** in educational programs, and associated challenges and potential solutions.	Medicine (undergraduate medical education)	In this report of a working conference using thematic analysis of workshop recommendations and experiences from 11 U.S. medical schools, the authors describe seven priority areas for the successful integration and sustainment of HSS in educational programs, and associated challenges and potential solutions.	Triple Aim	In 2015, following regular HSS workgroup phone calls and an Accelerating Change in Medical Education consortium-wide meeting, the authors identified the priority areas: partner with licensing, certifying, and accrediting bodies; develop comprehensive, standardized, and integrated curricula; develop, standardize, and align assessments; improve the UME to GME transition; enhance teachers' knowledge and skills, and incentives for teachers; demonstrate	These priority areas and their potential solutions can be used by individual schools and HSS education collaboratives to further outline and delineate the steps needed to create, deliver, study, and sustain effective HSS curricula with an eye toward integration with the basic and clinical sciences curricula.

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								value added to the health system; and address the hidden curriculum.	
13	Gonzalo, Chuang, Glod, McGillen, Munyon, Wolpaw	2020	United States	This Perspective article explores the conceptualization and opportunities to effectively link GIM with healthcare and medical education transformation.	Medicine- General Internal Medicine	Perspective article	Quadruple aim	General internal medicine is uniquely poised to contribute to the healthcare and medical education transformation that is already underway. This transformation is occurring at multiple levels, from the way that we educate physicians to the way we care for patients and populations, and it depends significantly on the emerging field of health systems science. GIM faculty work in the "control center" of systems of care and have the potential to impact learners at all levels.	We believe that IM-trained faculty physician-educators are in a key position in health system and educational transformation. General internal medicine leaders are well positioned to align with health systems, departments, and medical schools to develop opportunities for faculty development and career enhancement in HSS.
14	Gonzolo, Davis, Thompson, Haidet	2020	United States	How do students perceive **health systems science curricula** across all four years, and how do such perceptions inform the reasons for mixed quality ratings?	Medicine- medical students	Following large-scale health systems science curricular changes in their medical school, we used students' open-ended comments obtained from course evaluations related to 1st-, 2nd-, and 4th-year courses and performed a qualitative thematic analysis to explore students 'perceptions. We identified themes, synthesized findings into a conceptual figure, and agreed upon results and quotations.	Quadruple Aim	Five themes were identified: (1) perceived importance and relevance of health systems science education, (2) tension between traditional and evolving health systems science-related professional identity, (3) dissatisfaction with redundancy of topics, (4) competition with basic and clinical science curricula, and, (5) preference for discrete, usable, testable facts over complexity and uncertainty. The relationship between themes is described along a continuum of competing agendas between students traditional mindset (which focuses on basic/clinical science) and an emerging medical education approach(which focuses on basic, clinical, and health systems science).	Health systems science education can be viewed by learners as peripheral to their future practice and not aligned with a professional identity that places emphasis on basic and clinical science topics. For some students, this traditional identity limits engagement in health systems science curricula.
15	Gonzalo, Dekhtyar, Starr, Borkan, Brunett, Fancher, Green, Grethlein, Lai, Lawson, Monrad, O'Sullivan, Schwartz, Skochelak	2017	United States	The authors performed a review of 30 Accelerating Change in Medical Education full grant submissions and an analysis of the **health systems science (HSS)**-related curricula at the 11 grant recipient schools to develop a potential comprehensive HSS	Medicine- undergraduate medical education	In phase 1, to identify domains, grant submissions were analyzed and coded using constant comparative analysis. In phase 2, a detailed review of all existing and planned syllabi and curriculum documents at the grantee schools was performed, and content	Triple Aim	Analysis yielded three types of domains: core, cross-cutting, and linking. Core domains included health care structures and processes; health care policy, economics, and management; clinical informatics and health information technology; population and public health; value-based care;	This broad framework aims to build on the traditional definition of systems-based practice and highlight the need for medical and other health professions schools to better align education programs with the anticipated needs of the systems in which students will practice. HSS will require a critical

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				curricular framework with domains and subcategories.		in the core curricular domains was coded into subcategories. The lead investigators reviewed and discussed drafts of the categorization scheme, collapsed and combined domains and subcategories, and resolved disagreements via group discussion		and health system improvement. Cross-cutting domains included leadership and change agency; teamwork and interprofessional education; evidence-based medicine and practice; professionalism and ethics; and scholarship. One linking domain was identified: systems thinking.	investigation into existing curricula to determine the most efficient methods for integration with the basic and clinical sciences.
16	Gonzalo, Haidet, Blatt, Wolpaw	2016	United States	In this study, we investigated students' perceptions of the barriers to, challenges involved in and benefits of the implementation of a **HSS curriculum**.	Medicine-undergraduate medical students	In 2014, we conducted 12 focus groups with 50 medical students across all years of medical school. Group interviews were audio-recorded and transcribed verbatim. We used thematic analysis to explore students 'perceptions of a planned HSS curriculum, which was to include both a classroom-based course and an experiential component. We then identified themes and challenges from the students' perspective and agreed upon results and quotations.	Not well described. "Population health, health system improvement and high-value care"	Students identified four barrier-related themes, including (i) medical-board licensing examinations foster a view of basic science as 'core', (ii) systems concepts are important but not essential, (iii) students lack sufficient knowledge and skills to perform systems roles and (iv) the culture of medical education and clinical systems does not support systems education. Students also identified several perceived benefits of a systems curriculum, including acquisition of new knowledge and skills, enhanced understanding of patients' perspectives and improved learning through experiential roles. The major unifying challenge related to students 'competing priorities; one to perform well in examinations and match into preferred residencies, and another to develop systems-based skills	Students' intrinsic desire to be the best physician possible is at odds with board examinations and desired residency placements. As a result, HSS is viewed as peripheral and non-essential, greatly limiting student engagement. New perspectives are needed to effectively address this challenge.
17	Gonzalo, Ogrinc	2019	United States	Using the curricular implementation "performance gap" concept as a guide, we explore successes and challenges of student engagement in HSS curricula and call for a reexamination of 5 key issues that may address the broader understanding of underlying challenges of **HSS** innovations.	Medicine-undergraduate medical education	With over 11 years of experience in global HSS curricular reform in 2 medical schools and informed by the curricular implementation "performance gap," the authors explore student receptivity challenges, including marginalization of HSS coursework, infancy of the HSS field, relative nascence of curricula and educators, heterogeneity of pedagogies, tensions in	Quadruple Aim	The authors call for the reexamination of 5 issues influencing HSS receptivity: student recruitment processes, faculty development, building an HSS academic "home," evaluation metrics, and transparent collaboration between medical schools.	To fulfill the social obligation of meeting patients' needs, educators must seek a shared understanding of underlying challenges of HSS innovations.

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						students' perceptions of their professional role, and culture of HSS integration.			
18	Gonzalo, Thompson, Haidet, Mann, Wolpaw	2017	United States	In this Article, the authors use a lens informed by communities of practice theory to explore these three concepts, examining the implications that the communities of practice theory has in the constructive reframing of educational practices—particularly common student roles and experiences—and charting future directions for medical education that better align with the needs of the health care system.	Medicine-undergraduate medical education	The authors apply several key features of the communities of practice theory to current experiential roles for students, then propose a new approach to students' clinical experiences—value-added clinical systems learning roles—that provides students with opportunities to make meaningful contributions to patient care while learning health systems science at the patient and population level.	Quadruple Aim	As health systems move from a physician-centric community of practice with independent physicians to a community of interdependent providers aligned to optimize patient health, so must medical education. Medical educators must provide experiences that emphasize this interdependence rather than a facsimile of the physician-centric status quo that will not adequately prepare students to be collaborative physicians in evolving health systems.	As medical education and health systems undergo significant transformation, medical schools must learn to successfully incorporate health systems science curricula, including experiential roles that fully immerse students into the evolving communities of practice in which they will be working.
19	Hamrin, Vick, Brame, Simmons, Smith, Vanderhoef	2016	United States	Quality improvement (QI) projects provide the opportunity for nurse practitioner students to learn systems knowledge and improve health care outcomes in patient populations. A gap in the literature exists around how to systematically teach, apply, and measure QI curricular objectives at the master's level.	Nursing- Master of Science in Nursing	Six faculty evaluated the QI project for the psychiatric nurse practitioner master's program by identifying the most challenging QI concepts for students to apply, revising their teaching strategies to address gaps, and retrospectively evaluating the outcomes of these curriculum changes by comparing student outcomes before and after the curricular changes.	Systems level change (grounded in IHI theory)	A significant difference was noted on QI project performance between students in the 2014 and 2015 graduating classes, measured by the scores earned on students' final papers. Theoretical principles of adult and cooperative learning were used to inform curricular changes to enhance student's acquisition of QI skills.	Nursing faculty can better prepare students to become change agents in the ever-evolving health care system by engaging students in population- and systems-level thinking.
20	Horstman, Miltner, Wallhagen, Patrician, Oliver, Roumie, Dolansky, Perez, Naik, Godwin	2021	United States	Despite the need for leaders in health care improvement across health professions, there are no standards for the knowledge and skills that should be achieved through advanced interprofessional health care improvement training. Existing health care improvement training competencies focus on foundational knowledge expected of all trainees or for specific career pathways. The authors	Physicians, pre- and postdoctoral nurses, doctorally trained clinical psychologists, pharmacists, and other clinicians as fellows and faculty	Commentary article The VAQS Program is an interprofessional, postdoctoral training program whose mission is to develop leaders and scholars to improve health care. An interprofessional committee of VAQS faculty reviewed and revised the competencies over 4 months beginning in fall 2018. The first draft was developed using 111 competencies submitted by 11 VAQS training sites and a review of published	Health care improvement: redesign of health care for quality and safety.	Once attained, the VAQS competencies will guide the skill development that interprofessional health care improvement leaders need to participate in and lead health care improvement scholarship and implementation.	These broad competencies are relevant to advanced training programs that develop health care improvement leaders and scholars and may be used by employers to understand the knowledge and skills expected of individuals who complete advanced fellowships in applied health care improvement.

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				describe the development of the revised national **Veterans Affairs Quality Scholars (VAQS)** Program competencies		competencies. The final version included 22 competencies spanning 5 domains: interprofessional collaboration and teamwork, improvement and implementation science, organization and system leadership, methodological skills and analytic techniques for improvement and research, and teaching and coaching.			
21	Hoyle, Johnson	2015	United States	This article describes a clinical curriculum that builds knowledge and skills in QI and systems change throughout a 3-year DNP-FNP program. The goal is to train graduates to be effective change leaders by equipping students with the skills needed to lead organizations in QI activities.	Nursing	Designed to develop expertise in nursing practice, the DNP curriculum must also focus on leadership for practice change to improve the quality, cost, and safety of care. Building skills in QI is an important step in leading change. The use of different teaching strategies, preexisting process improvement tools, and experiential learning opportunities are most successful in building QI knowledge and skills.	Triple Aim	Today's APRNs are challenged to lead and transform a complex healthcare system and create clinical strategies that improve practice and healthcare outcomes. An innovative clinical curriculum was designed in one DNP-FNP program to address incoming students' lack of knowledge and skills related to organizational and system change. Skill development in QI strategies and application to practice enhance the DNP APRN's ability to assess, implement, and evaluate organizational change.	The DNP-FNP curriculum is described, designed to build students' leadership competencies for systems change in healthcare settings.
22	Kim, Morris, Ford	2017	United States	Implementing an innovation, such as offering new types of patient–physician encounters through the patient-centered medical home (PCMH) model while maintaining Accreditation Council for Graduate Medical Education (ACGME) accreditation standards (e.g., patient encounter minimums for trainees), is challenging.	Medicine-graduate medical education (Primary Care)	In 2009, the Group Health Family Medicine Residency (GHFMR) received an ACGME **Program Experimentation and Innovation Project (PEIP)** exception that redefined the minimum Family Medicine Resident Review Committee requirement to 1,400 face-to-face visits and 250 electronic visits (1 electronic visit defined as 3 secure message or telephone encounters). The authors report GHFMR residents' continuity clinic encounters, specifically volume, from 2006 through 2013 via pre-	Triple Aim	Post-PCMH residents had 20% more overall patient contact. The largest change in care delivery method included a large increase in secure messages between patients and residents. PrePCMH residents had more face-to-face encounters; however, post-PCMH residents had more contact for all types of patient care encounters (face-to-face, secure messaging, and telephone) per hour of clinic time.	The ACGME PEIP exception, allowing the incorporation of the PCMH, facilitated an increase in patient access and immersed residents in primary care innovation (namely, practicing in a PCMH model during graduate medical education training). The next steps are to assess the effect of the PCMH on resident learning and clinical outcomes and to continue residents' access to training that keeps pace with today's health care delivery needs

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						and post-PCMH implementation. They discuss the implications for leaders of high-performing practices who desire to innovate while maintaining accreditation			
23	Kirch, Ast	2017	United States	This paper will examine the depth of transformation underway in U.S. health care, and the roles of all those in academic medicine, and psychologists in particular, in leading change.	Psychologists	Commentary	Triple Aim	To create this change, there are several critical success factors for academic health center leaders, including creating a culture of collaboration, becoming‘ ‘multipliers,’’ embracing innovation, adhering to core professional ethics, and working to promote resilience.	Given their extensive training and predisposition to these skills, psychologists are well-positioned to serve as leaders in today’s academic health systems.
24	Koch, Bitton, Landon, Phillips	2017	United States	Authors describe a common framework that academic learning collaboratives are using to transform primary care practice based on our analysis of 6 collaboratives nationally.	Medicine-Primary Care	Authors used a descriptive and qualitative approach. We asked leaders from each collaborative to complete a questionnaire describing the demographics of participating practices, sources and amount of funding, types of technical assistance, evaluation plans, and measured outcomes. We interviewed 20 key informants using a semi structured interview. The areas of focus included genesis of the collaborative, transformation strategy and change package, residency redesign, and experience to date.	Triple Aim	The educational mission of AHCs provides an important impetus for these practices to trans-form. Our findings suggest a path forward for AHCs committed to transforming primary care practice and education within teaching clinics. Clearly, rigorous evaluation is needed to demonstrate the value of these collaboratives over time. The shared knowledge that resides within these collaboratives could be important resources for other AHC redesign efforts.	Authors found that learning collaboratives foster transformation, even in complex academic practices, but need specific support adapted to their unique challenges.
25	Lankshear, Limoges	2021	Canada	This commentary highlights the “made-in-Canada” research regarding intraprofessional collaboration. It also presents recommendations to strengthen intraprofessional collaboration over the next decade to achieve health system transformation.	Nursing	Commentary	Health system transformation is not well defined. Described to address health disparities, pandemic recovery, and to ensure the integration of new models of care.	As nurses recover from the effects of the pandemic, there is an urgency to strengthen intra- and interprofessional collaboration. The pace of change, new evidence and greater understanding of care needs necessitate that nurses collaborate across designations, domains of practice and jurisdictions to create the systems, processes and practices that improve the health of all.	Leaders in both formal and informal roles, and within each domain of practice, can support collaboration and help strengthen nursing to participate in health system transformation.
26	Lawson, Lake, Lazorick,	2019	United States	Calls for medical education reform focus on preparing physicians	Medical Students	Brody School of Medicine redesigned its curriculum to prepare	Quadruple Aim	Two cohorts (15 LINC scholars) completed the summer immersion in 2015	A distinction track with an immersion component can be an effective method to

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	Reeder, Garris, Baxley			to meet the challenges of today's complex health care system. Despite implementing curricula focused on **health systems science (HSS),** including quality improvement (QI), patient safety, team-based care, and population health, a significant gap remains in training students to meet the system's evolving needs		leaders to effect health system change. This included development of a distinction track in health system transformation and leadership, known as the Leaders in INnovative Care (LINC) Scholars Program. Selected LINC scholars spend eight weeks in a summer immersion experience designed to provide foundational knowledge and practical application.		and 2016. Participants demonstrated significant improvement in knowledge and confidence and continue to be engaged in ongoing QI projects throughout the health system. All scholars have presented their work at local, regional, or national meetings. Students rated patient navigation experiences, health system leader interviews, QI project application, and interprofessional experiences as most valuable and recommended adoption in the curriculum for all students.	pilot innovative HSS components for the entire curriculum while preparing a cadre of learners with advanced expertise. To longitudinally measure HSS knowledge change, behavioral impact, and organization-level outcomes, next steps must focus on development of workplace-based assessments, establishment of learner portfolios, and longitudinal tracking of student outcomes, including career trajectory.
27	Lin, Osborn, Sattler, Nelligana, Svecc, Aaronsonc, Schillinger	2017	United States	As academic medical centres strive to transform from centres of learning-to-learning health systems, a pivotal question arises: How do you train the workforce of the future to achieve the triple aims of better patient experience, better health, and lower cost? At Stanford University School of Medicine, they are integrating health systems science education through a collection of workplace learning experiences that run in parallel and in synergy with the core medical school curriculum.	Medicine-undergraduate medical education	Commentary on the **Stanford Healthcare Innovations and Experiential Learning Directive (SHIELD)**	Triple Aim	Medical schools striving to integrate health systems science education may find several practical advantages to the approach of incremental transformation rather than large-scale overhaul. First, it is much less costly to create a menu of workplace learning experiences that run in parallel and in synergy with the core curriculum than it is to systematically retool the core curriculum. Second, embedding students into real healthcare teams at their earliest stages of training allows health systems science to be taught in the workplace where health systems problems occur, not in the classroom. Third, the learner-centred approach of developing programs with different clinical foci operating in different health care delivery settings allows students to choose from a diversity of workplace learning opportunities that match their interests and career goals.	If proved successful, authors hope that their approach of incremental curricular transformation will be adopted by other medical schools to leverage the power of health systems science in educating the physicians of tomorrow.
28	Lin, Schillinger, Irby	2015	United States	Change is desperately needed to translate education into better health outcomes for all Americans today. To achieve this change,	Medicine-undergraduate medical education	Commentary The authors propose 'value added medical education' where powerful experiential	Triple Aim	A vision for a new kind of medical education is taking shape. We believe that the principles of value-added medical education should and will play an important	The challenge now is to make value-added training a standard part of the curriculum in every medical school. We can do this by taking lessons learned from

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				significant reforms are needed in both practice redesign and medical education.		learning experiences can also add value and capacity to our health care delivery system. This can be achieved by training and involving medical students in targeted patient care tasks. Students are eager to engage in care and take on responsibilities as part of the health care team in ways that do not generate duplicative work or consume additional energy from the clinical faculty. The underlying principles of value added medical education are entirely compatible with the Institute of Medicine's framework for a Learning Health System		role in this revolution. These principles include: (1) early integrated workplace learning for all medical students, (2) an interprofessional team-based quality improvement culture to promote understanding and respect of non-clinician providers, (3) collaborative and data driven population health management, (4) optimization of professional roles that are learner-centered and continuously adjusted to changing stages of development, and (5) the fusion of robust experiential learning experiences with the delivery of high-performing, patient-centered primary care.	successful pilots and implementing them widely with the support of professional organizations and accrediting bodies. It is time to share the care with our future colleagues.
29	Lucey	2013	United States	If biomedical science and medical education are so outstanding, why is the US health care system not better? Medical education is part of the problem: although our educational techniques are outstanding, our collective target is wrong. The goal of medical education is not simply to produce physicians. It is to improve the health of our patients and their communities.	Medicine-undergraduate and graduate medical education	Commentary Realizing the promise of high-quality health care will require that medical educators accept that they must fulfill their contract with society to reduce the burden of suffering and disease through the education of physicians. Educational redesign must begin with the understanding that the professional identity of the physician who was successful in the acute disease era of the 20th century will not be effective in the complex chronic disease era of the 21st century.	Not clearly defined- loosely tied to Triple Aim. - Patient experience and outcomes - Population health outcomes - Quality, safety, costs within a complex system	Medical schools and residency programs must restructure their views of basic and clinical science and workplace learning to give equal emphasis to the science and skills needed to practice in and lead in complex systems. They must also rethink their relationships with clinical environments so that the education of students and residents accelerates the transformation in health care delivery needed to fulfill our contract with society.	Medical schools and residency programs must restructure their views of basic and clinical science and workplace learning to give equal emphasis to the science and skills needed to practice in and lead in complex systems.
30	Lutfiyya, Brandt, Delaney, Pechacek, Cerra	2016	United States	The aim of this paper is to provide direction and scope for a focused and purposive research agenda addressing what Interprofessional Practice education and collaborative practice (IPECP) may add in shaping the transformative redesign of the process of health care and in aligning education and clinical practice	Health professions education	This paper begins by briefly commenting on the current state of the science/art of IPECP research before fleshing out the elements essential to establish a research agenda and make recommendations about best practices to implement research in a way that fosters sustainable, meaningful, and beneficial health care redesign.	Triple Aim	A research agenda articulates a focus, meaningful and robust questions, and a theory of change within which intervention outcomes are examined. Further, a research agenda identifies the practices the area of inquiry is interested in informing, and the types of study designs and analytic approaches amenable to carrying out the proposed work.	Ultimately, the proposed research agenda represents a paradigm shift that has been long in the making and calls for the elevation of the research foci from that of program/project specific level impacts to the impact of inter-professional collaborative practice and education on outcomes related to patient health care cost, health care quality, and eventual improvement in population health.
31	MacRae, Rooney,	2016	Europe	This paper discusses the development of	Health professions education	This article describes how seven European	Not well described.	A contemporary consensus definition of Healthcare	We contend that Improvement Science

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	Taylor, Ritters, Sansoni, Crespo, Skela-Savic, O'Donell			evidence-based accredited inter-professional education in Healthcare Improvement Science for healthcare students at both undergraduate and postgraduate levels by Higher Education Institutions (HEIs) across Europe.		Higher Education Institutions (HEIs) worked together to develop four evidence informed accredited inter-professional Improvement Science modules for under and post-graduate healthcare students. It outlines the way in which a Policy Delphi, a narrative literature review, a review of the competency and capability requirements for healthcare professionals to practice Improvement Science, and a mapping of current Improvement Science education informed the content of the modules.	"Healthcare Improvement Science is the generation of knowledge to cultivate change and deliver person-centered care that is safe, effective, efficient, equitable and timely. It improves patients' out-comes, health system performance and population health."	Improvement Science was developed. The four Improvement Science modules that have been designed are systems thinking, models for improvement, measurements of improvement, communication and managing change. A framework to evaluate the impact modules have in practice has been developed and piloted.	education is relevant to professionals at all stages of their professional development in whatever part of the healthcare system they work. It is our hope that these modules will go some way to making Improvement Science education less fragmented and disparate across Europe. Through offering evidence based accredited education that goes beyond conceptual knowledge and the acquisition of working knowledge this project will contribute to building the improvement capacity and capability in the European healthcare workforce.
32	Makeen	2015	Saudi Arabia	The main objectives of this study are to: (1) measure the perceptions of Saudi Arabian academic medical leaders in medical colleges and residency programs of the Saudi health care system ; (2) measure how the existing curriculum teaches medical students/residents about the area of health care systems: (3) assess academic medical leaders' intentions to adopt future educational interventions; and (4) to determine and identify challenges related to teaching about the health care system. This study concludes by presenting suggestions and recommendations for future steps and initiatives to improve the health care system teaching in medical education.	Medicine- all academic medical learners including medical deans, associate deans and curricula leaders in Saudi medical colleges, and directors and members of scientific boards for residency programs.	Chi-square statistics were used to investigate differences in leaders' perceptions of: (1) the level of medical students/residents' knowledge of current challenges in the Saudi health care system; (2) the quality of the medical program's education on the key components of a well-functioning health care systems; and (3) leaders' satisfaction regarding level of student and resident knowledge on how key components of a functional health care system differ by demographic characteristics. Ordinal logistic regression was used to identify demographic factors related to health care system education outcomes.	Not well described. Describes WHO 'building blocks' to help the process of strengthening systems to ultimately improve population health. References Berwick's (2010) aim to provide consistently high-quality care for all.	Approximately half (51.9%) of leaders in medical colleges reported that the curriculum included a health care system course while (48.1%) of leaders reported no dedicated course. A problem-based curriculum is almost exclusively viewed as the best educational approach to address the subject of the health care system. The current study found no significant associations between variables of interest among academic leaders in residency programs and their perceived knowledge of medical residents to address the current challenges of the Saudi Arabian health care system, perceived quality of health care system education and perceived satisfaction of medical residents' knowledge about the health care system	Although leaders in medical colleges have made some effort to address health care system education, the findings of this study show serious issues related to the quality of education and the insignificant influence efforts related to the ability for medical students to gain knowledge about the Saudi health care system. It is recommended that academic medical leaders in medical colleges and residency programs reform and improve the health care system education in their training programs.
33	Martinez, Phillips, Fein	2013	United States	The Accreditation Council for Graduate Medical Education restructured its	Medicine-graduate medical education	Program Evaluation To examine potential outcomes of the	Not well described. Impetus stemming from 'To Err is Human: Building a Safer	The four main components of the curriculum are: (1) Finance of the Healthcare System; (2) Organization	The course, entitled Perspectives on the Changing Healthcare System (POCHS) and its

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				accreditation system to be based on educational outcomes in six core competencies. Systems-based practice is one of the six core competencies (patient care, medical knowledge, practice-based learning and improvement, systems-based practice (SBP), professionalism and interpersonal skills and communication). The purpose of this report is to describe Weill Cornell Medical College's Internal Medicine Residency program curriculum for systems-based practice (SBP) and its evaluation process.		**perspectives on the changing health care system** curriculum POCHS curriculum, an evaluation was conducted, examining participants': (1) knowledge gain; (2) course ratings; and (3) qualitative feedback.	Health System and Crossing the Quality Chasm: A New Health System for the 21st Century' fundamental changes are needed in the organization and delivery of health care expanding medical coverage, controlling healthcare costs, improving the healthcare delivery system and more tightly regulating private health insurance	of Medical Practice; (3) Healthcare Policy, Reform and Advocacy; and (4) Quality in Healthcare On average, there was a 19-percentage point increase in knowledge test scores for all three cohorts. The course was rated overall highly, receiving an average of 4.6 on a 1-5 scale. Lastly, the qualitative comments supported that the material is needed and valued.	evaluation process support that systems-based practice is crucial to residency education. The course is designed not only to educate residents about the current health care system but also to enable them to think critically about the risk and benefits of the changes. POCHS provides a framework for teaching and assessing this competency and can serve as a template for other residency programs looking to create or restructure their SBP curriculum.
34	Martins	2011	United States	The purpose of this article is to describe a new theoretical perspective, critical interactionism, that combines symbolic interactionism (SI) and critical social theory into a new approach that focuses attention both upstream and downstream.	Nursing	Commentary Critical social theory is the theoretical perspective that has been utilized most frequently to address upstream issues at the macro level and provide a framework for analysis and interventions at this level. A new theoretical approach is needed to provide a guide for examining health care problems from both upstream and downstream perspectives. Critical interactionism combines SI and critical social theory to provide this framework.	Not well described. "Dual approach incorporating both an individual/downstream and system level/upstream foci for improving health outcomes" "high quality care"	By using a critical interactionist approach, both micro and macro levels come into focus and downstream and upstream strategies for change across individual and societal levels can be developed and applied. Application of critical interactionism to patient care issues and nursing practice offers exciting new opportunities for transforming health care across system levels. It gives nurses added insight into patients' and families' problems at the micro level while giving them a lens to see and tools to apply to problems at the macro level in health care.	In nursing education, the AACN Essentials of Baccalaureate, Masters, and Doctor of Nursing Practice guide educators to teach nursing students to assess and intervene across system levels to transform health care. This may be best guided by a critical interactionist perspective.
35	Meyer, King, Kowlowitx, Lampiris	2019	United States	The aim of this study was to conduct a needs assessment of Medicaid and health care reform education in the current dental curriculum of one U.S. dental school.	Dental	Mixed-methods approach: focus groups and surveys. Three focus groups with dental students and one focus group with six external oral health stakeholders were conducted in 2018 to explore participants' attitudes and beliefs about Medicaid and health care reform. The focus groups used a	Triple Aim	Participating students and stakeholders agreed that Medicaid is confusing and challenging to incorporate into private practice. All participants viewed programs sponsored by organized dentistry as venues to learn about oral health policy. Nearly all participants agreed that private practice mentorship, improved	These findings suggest that curricular improvements are needed to incorporate more engaging and experiential learning using external resources.

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
						semi-structured guide, and transcripts were analyzed using thematic content analysis. Following the focus groups students were invited to participate in a survey assessing their general and dental-specific Medicaid knowledge and attitudes about Medicaid.		practice management, and more experiential opportunities in the predoctoral curriculum would be effective strategies to increase knowledge about Medicaid and health reform. According to the survey responses, Medicaid and health reform knowledge is poor and scarcely covered in the current curriculum, and only 39% of participating students planned to participate in Medicaid after graduation.	
36	Oliver, Potter, Pomerleau, Phillips, O'Donnell, Cowley, Sipe	2017	United states	This article describes the systematic efforts undertaken by a school of nursing in the Northeastern United States to foster innovation in health professions education.	Nursing	Authors present an application of modified team coaching and plan-do-study-act improvement methods in an educational context to rapidly integrate a quality and safety curriculum across programs.	Triple Aim	Over a 3-year period, we achieved curriculum innovation and integration of new content and applied learning activities in health care quality and safety in 8 nursing courses. The authors work represents a rapid, coordinated, and systematic effort by our school of nursing to develop a sequenced curriculum pathway for the development of professional nurses in health care quality and safety at the undergraduate, graduate, doctoral, and postgraduate levels.	Quality and safety education is a critical aspect of health professions education and practice.
37	Philippon, Montesanti, Stafinski	2018	Canada	This article highlights a novel approach to professional development, integrating leadership, development and patient-centre health system transformation in the new Fellowship Program in Health System Improvement offered by the School of Public Health at the University of Alberta.	Health professions education (executive leadership- cohort of 20)	Assessment of health system leadership fellowship focused on the **LEADS framework**	System transformation builds on the definition of transformational change which is "a shift in the business culture of an organization resulting from a change in the underlying strategy and processes that the organization has used in the past. A transformational change is designed to be organization wide and enacted over time. There is also a focus on the **social determinants of health** in transformative change.	They provided important insights, including some areas where the program can be enhanced: a) There was unanimous support for the structure of the program. The big system perspective and international experience was highly valued) The caliber of speakers was regarded as exceptional and the opportunities to interact with well-known leaders was seen as an exceptional experience's) The mentorship model was highly praised as it provided direction but allowed groups to work through issues. d) The participants identified their expanded understanding of the larger health system, the ability to take ideas	The ultimate test will the extent to which these people can truly exert leadership to improve the performance of the Canadian health system as a patient-centered system.

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
								back immediately to their respective work settings, and the added sense of self-confidence that the program gave them as enhancing their leadership capabilities.	
38	Roemer, Azevedo, Blumberg	2015	United States	In the era of the accountable care organization, U.S. models of physician practice are shifting from the solo, independent practitioner to the physician who is part of a multispecialty group practice or is employed by a health care institution, and from paper-based small offices to practice settings that emphasize technology enabled, team-based systems of care.	Medicine	Commentary In this light, **Kaiser Permanente's (KP's)** long experience as an integrated, population-based health care delivery system makes it an increasingly relevant model in which to consider how graduate medical education (GME) can best prepare physicians for 21stcentury health care.	Triple Aim	As the care delivery system evolves in an era of ACOs, physicians increasingly will be practicing in settings that emulate KP's emphasis on quality, population health, and health care value and affordability. Stakeholders in physician education are becoming more aligned on the importance of systems-based practice, population health, and lifelong learning.	All participants in GME have a role to play in preparing physicians for this future. Partnerships between universities and health care delivery systems serve as a highly effective model for education.
39	Singh, Gullett, Thomas	2021	United States	The term "health systems science" (**HSS**) has recently emerged as a unifying label for competencies in health care delivery and in population and community health. Despite strong evidence that HSS competencies are needed in the current and future health care workforce, heretofore the integration of HSS into medical education has been slow or fragmented—due, in part, to a lack of evidence that these curricula improve education or population outcomes.	Medicine-Undergraduate medical education	Perspective paper The recent COVID-19 pandemic and the national reckoning with racial inequities in the United States further highlight the time-sensitive imperative to integrate HSS content across the medical education continuum. While acknowledging challenges, the authors highlight the unique opportunities inherent in an HSS curriculum and present an elaborated curricular framework for incorporating health care delivery and population health into undergraduate medical education.	Loosely describes Triple Aim, includes a focus on achieving health equity, patient experience, population health outcomes, quality, safety, and costs.	This framework includes competencies previously left out of medical education, increases the scope of faculty development, and allows for evidence of effectiveness beyond traditional learner-centric metrics. The authors apply a widely adopted 6-step approach to curriculum development to address the unique challenges of incorporating HSS. Two examples—of a module on quality improvement (health care delivery) and of an introductory course on health equity (population and community health)—illustrate how the 6-step approach can be used to build HSS curricula.	Adapting these resources within local environments to build HSS curricula will allow medical educators to ensure future graduates have the expertise and commitment necessary to effect health systems change and to advocate for their communities, while also building the much-needed evidence for such curricula.
40	Sklar, Hemmer, Durning	2018	United States	The authors describe the potential of medical education to augment payment incentives to make changes in clinical practice and the importance of aligning the purpose and goals of medical education	Medicine-undergraduate medical education	Commentary The authors discuss how curricular and assessment changes and faculty development can align medical education with the transformative trends in the health care delivery system. They also explain how the	Triple Aim	They provide examples of how quality improvement, health care innovation, population care management, and payment alignment could create bridges for joining health care delivery and medical education to meet the health care reform	The authors illustrate how current payment incentives such as bundled payments, value-based purchasing, and population-based payments can work synergistically with medical education to provide high-value care.

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
				with those of the health care delivery system.		theory of situated cognition offers a shared conceptual framework that could help address the misalignment of education and clinical care.		goals of a high performing health care delivery system while controlling health care spending.	
41	Starr, Agrwal, Bryan, Buhrman, Gilbert, Huber, Leep Hunderfund, Liebow, Mergen, Natt, Patel, Patel, Poole, Rank, Sandercock, Shah, Wilson, Johnson	2017	United States	The purpose of this special article is to describe a new, 4-year **Science of Health Care Delivery curriculum at Mayo Clinic School of Medicine,** including curricular content and structure, methods for instruction, partnership with Arizona State University, and implementation challenges	Medicine-undergraduate medical education	Commentary	Triple Aim Value based care The High-Value Care domain focuses on the "value equation": quality divided by total cost of care over time, where quality can be further defined as the sum of clinical outcomes, patient safety, and service (patient experience).	This curriculum is intended to ensure that graduating medical students enter residency prepared to train and eventually practice within person-centered, community- and population-oriented, science-driven, collaborative care teams delivering high-value care.	A Science of Health Care Delivery curriculum in undergraduate medical education is necessary to successfully prepare physicians so as to ensure the best clinical outcomes and patient experience of care, at the lowest cost.
42	White, Lewis, McCoy	2018	United States	The purpose of this paper is to introduce gaming science as a lens to magnify **HSS** integration opportunities in the scope of medical education and practice.	Medicine	Commentary	Quadruple Aim	Evidence supports gaming science innovations as effective teaching and learning tools to promote learner engagement in scientific and systems thinking for decision making in complex scenarios. Valuable insights and lessons gained through the history of war games have resulted in strategic thinking to minimize risk and save lives. In health care, where decisions can affect patient and population outcomes, gaming science innovations have the potential to provide safe learning environments to practice crucial decision-making skills. Research of gaming science limitations, gaps, and strategies to maximize innovations to further advance HSS in medical education and practice is required.	Gaming science holds promise to equip health care teams with HSS knowledge and skills required for transformative practice. The ultimate goals are to empower providers to work in complex systems to improve patient and population health outcomes and experiences, and to reduce costs and improve care team well-being.
43	Wilkes, Cassel, Klau	2018	United States	To prepare for this practice tomorrow's doctors will need a different type of educational model, a different type of learning, in different environments, often taught by different faculty. This paper provides one innovative approach to redefine	Medicine	After reviewing current trends in medical education, this paper describes one approach being taken by a large nonprofit American health care system to move medical education and discovery (research) out of traditional academic universities and placing it within a	Triple Aim	-Education that broadens focus to integrate concepts such as community health, wellness, and behavioral and socioeconomic determinants of health increase the chance that graduates will be responsive to social needs. -Leadership starting early with training around leadership, design	The creation of a learning laboratory in a high functioning health care delivery system allows for leveraging the successes in quality health care delivery to transform medical education with a focus on prevention, improving health care quality, reducing disparities in health, and promoting practical

#	Author**(s)**	Year of Publication	Country of origin	Aims/Purpose	Study population (if applicable)	Methodology/study design/setting	How health system transformation is described/defined/measured	Results	Key findings related to scoping review question
				"academic medicine".		health care delivery system.		thinking, innovation, and community engagement. -Cultural competency and implicit bias throughout the curriculum a school can create a culture that is inclusive, embraces diversity, and provides flexibility in the student experience. -Medical schools need to be designed to create student centered learning environments that focuses on student and faculty wellness.	evidence-based clinical and outcomes focused research.
44	Wood, Fitzgerald, Kendall, Cameron	2021	Canada	In this commentary, we argue that the idea of social accountability clearly articulates a rationale and a broad range of aspirations, whereas the learning health system offers an approach to achieve these goals.	Medicine	Commentary	High value care- value is understood in terms of outcomes achieved (ie, health care and health outcomes) versus costs to achieve them. Quadruple Aim concepts.	With a similar aim to a learning health system, social accountability promotes partnerships between health professional education, the health system, and communities in a way that allows for co-designed and contextualized interventions. On the other hand, learning health systems prioritize data, research, and analytic capacities to facilitate quality improvement. An integrative framework could enhance learning cycles by collectively designing interventions and innovations with people and communities from health, research, and education systems.	The technical and scientific innovations from the LHS body of literature, as well as the framework's emphasis on agility, can enhance how health professional education impacts health systems and health outcomes. Socially accountable health professional education's focus on health equity can ensure that LHSs partner with communities and stakeholders to prioritize their needs and collectively work to address their health priorities.

Table S4.

Aspects of health system transformation are newly graduated health professionals currently prepared to participate in from their training.

Area of health system transformation	*N*	*n*	*%*
Health policy	76		
Not prepared at all		28	35.8
Slightly prepared		24	31.6
Somewhat prepared		17	23.4
Moderately prepared		7	9.2
Extremely prepared		0	0.0
Health economics	76		
Not prepared at all		50	65.8
Slightly prepared		14	18.4
Somewhat prepared		12	15.8
Moderately prepared		0	0.0
Extremely prepared		0	0.0
Health informatics	75		
Not prepared at all		24	32.0
Slightly prepared		30	40.0
Somewhat prepared		15	20.0
Moderately prepared		6	8.0
Extremely prepared		0	0.0
Population health	75		
Not prepared at all		9	12.0
Slightly prepared		20	26.7
Somewhat prepared		22	29.3
Moderately prepared		24	32.0
Extremely prepared		0	0.0
Value based care	75		
Not prepared at all		24	32.0
Slightly prepared		21	28.0
Somewhat prepared		20	26.7
Moderately prepared		9	12.0
Extremely prepared		1	1.3
Quality Improvement	75		
Not prepared at all		86	8.0
Slightly prepared		16	21.3
Somewhat prepared		27	36.0
Moderately prepared		25	33.3
Extremely prepared		1	1.3
Health systems stewardship	76		
Not prepared at all		21	27.6
Slightly prepared		29	38.2
Somewhat prepared		16	21.1
Moderately prepared		9	11.8
Extremely prepared		1	1.3
Interprofessional/team-based care	76		
Not prepared at all		2	2.6
Slightly prepared		13	17.1

Somewhat prepared		19	25.0
Moderately prepared		34	44.7
Extremely prepared		8	10.5
Systems thinking	76		
Not prepared at all		22	29.0
Slightly prepared		27	35.5
Somewhat prepared		20	26.3
Moderately prepared		7	9.2
Extremely prepared		0	0.0

Table S5.

Agreement with challenges to health system transformation in health professional education

Challenges	N	n	%
Students and faculty prioritize balance between clinical priorities and health system competencies in curricula	76		
Strongly disagree		17	22.7
Disagree		39	52
Neither disagree nor agree		11	14.7
Agree		7	9.3
Strongly Agree		1	1.3
Faculty/preceptors can align and incorporate real time health system needs with health professions education	76		
Strongly disagree		15	19.7
Disagree		41	54.0
Neither disagree nor agree		7	9.2
Agree		12	15.8
Strongly Agree		1	1.3
Health system transformation concepts are easily applied for the clinical environment where learning takes place	76		
Strongly disagree		17	22.4
Disagree		41	54.0
Neither disagree nor agree		10	13.2
Agree		8	10.5
Strongly Agree		0	0.0
Health system transformation concepts are easily applied for the clinical environment where learning takes place	76		
Strongly disagree		17	22.4
Disagree		41	54.0
Neither disagree nor agree		10	13.2
Agree		8	10.5
Strongly Agree		0	0.0

Table S6.

To what extent do you think these conversations in the scholarly literature are relevant to you?

	N	n	%
Graduates of most health professions education programs have limited knowledge about the systems in which they work.	76		
Completely irrelevant		0	0.0
Irrelevant		0	0.0
Neutral		15	19.7
Relevant		26	34.2
Completely Relevant		35	46.1
Concepts around health system transformation must be incorporated in licensing exams.	76		
Completely irrelevant		2	2.6
Irrelevant		9	11.8
Neutral		15	19.7
Relevant		30	39.5
Completely relevant		20	26.3

Table S7

Curricula on Health System Transformation in the education of health professionals

	N	*n*	*%*
To your knowledge, is there a curriculum that best addresses health system transformation for health professions?	76		
Yes		19	25.0
No		17	22.4
Don't know		40	52.6
If yes, what is it?	72		
Health Systems Science (US)		7	9.7
Veterans Affairs Quality Scholars (US)		2	2.8
LEADS Canada Framework (CAN)		9	12.5
Other		8	11.1
Don't know		46	63.9
Are current curricula sufficient to prepare health professionals to transform a system that achieves Quadruple Aim?	77		
Yes		0	0.0
No		51	66.2
Unsure		26	33.8
Are current curricula on health system transformation in health professions education sufficient to prepare health professionals to transform a system that promotes health equity?	77		
Yes		1	1.3
No		52	67.5
Unsure		24	31.2

Appendix B

Ethics Approval

15/03/2022

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	S-02-22-7709
Titre du projet / Project Title	Understanding the role of health professions in health systems transformation: Implications for health professions education, practice, and health policy
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	15/03/2022
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	14/03/2023

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
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15/03/2022

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
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Appendix C: Phase Two, Part 1 – Study Instrument

Understanding the role of health professions in health system transformation: Implications for health professions education, practice, and health policy

Instructions:
Thank you for your interest in this study. This survey will take approximately 15-20 minutes of your time to complete.

For this study, **health system transformation** is the process of coordinating interventions aimed at system-wide change affecting multiple organizations and health care providers. The impetus of health system transformation is to improve the overall health system performance through the principles of the Quadruple Aim framework that include the value of health system delivery, quality of patient care, health care provider satisfaction, and population health outcomes.

The survey seeks stakeholder feedback to a) identify the resources used to inform health system transformation practices in health professions education, b) identify areas of concern regarding the area of study, and c) prioritize directions for future programs of research and education so that the most pressing needs of stakeholders are addressed.

Consent Question:

I consent to participating in this study

a. Yes (logic: skip to question 1)
b. No (logic: end survey)

Section A: Examining the current state of health system transformation in health professions education.

1. Which of the following stakeholder groups do you primarily represent? (Select one)
    a. I am an author, researcher and/or educator with an interest in health system transformation in health professions education.
    b. I work in the field of health professions education (e.g., university faculty, health professional association, regulator)
    c. I am a health system stakeholder with an interest in health system transformation (e.g., government, professional association, policymaker)
    d. I do not represent any of these groups, therefore am not eligible to participate in this study [skip logic – end survey]

It is recognized that there is often a disconnect between what is reported in the scholarly literature and the needs of stakeholders and partners actively involved in the field. A recent literature review was conducted to describe the research activity involving health system transformation in health professions education. The dominant themes in the body of scholarly literature are presented below.

2. From your perspective do you agree with the significant challenges related to health system transformation within health professions education identified by the scholarly literature?

(Rank response according to level of agreement: strongly agree, agree, neither agree nor disagree, disagree, strongly disagree)

a. Education on health system transformation is supported by the current culture of health professions education.
b. Certification exams include health system transformation as a core component.
c. Students believe that health system transformation concepts are important/essential.
d. Faculty/preceptors consider health system transformation as core to health professions education.
e. Faculty/preceptors have in-depth knowledge about health system transformation.
f. Stakeholders can measure the impact that health system transformation in health professions education has on patients and populations.
g. Health system transformation concepts are well defined and described in health professions education.
h. Students and faculty prioritize balance between clinical priorities and health system competencies in curricula.
i. Faculty/preceptors can align and incorporate real time health system needs with health professions education.
j. Health system transformation concepts are easily applied for the clinical environment where learning takes place.

3. To what extent do you think these conversations in the scholarly literature are relevant to you or your organization? (For each item, please indicate on a scale of "Completely irrelevant" to "Completely relevant" or select "Neutral/No opinion")

a. Fundamental changes are needed in the organization and delivery of health care.
b. Graduates of most health professions education programs have limited functional literacy about the systems in which they work.
c. Health professions education must restructure the emphasis of basic and clinical science to give equal emphasis to the science and skills needed to practice in complex systems.
d. Health professions education must restructure the emphasis of basic and clinical science to give equal emphasis to the science and skills needed to lead complex systems.
e. Future research needs to demonstrate the value of health system transformation in health professions education.
f. Future curricula development must involve partnering with communities and stakeholders to prioritize their needs and collectively work to address their health priorities to achieve health system transformation.
g. Concepts around health system transformation must be incorporated in licencing exams of health professionals.

   h. Graduates of most health professions education programs have limited knowledge about the systems in which they work.
   i. Concepts around health system transformation must be incorporated in licensing exams.

4. From your experience what aspects of health system transformation are health professionals currently prepared to participate in from their training?
   [categorize by level of participation: none at all, don't know, some exposure, a great deal of exposure]
   a. Health policy
   b. Health economics
   c. Health informatics
   d. Population health
   e. Value based care
   f. Quality improvement
   g. Health systems stewardship
   h. Interprofessional/team-based care
   i. Systems thinking
   j. Other (leave open blank)

5. To your knowledge, is there a curriculum that best addresses health system transformation for health professions?
   a. Yes
   b. No [logic: if no skip to 14]
   c. Don't know

6. If yes, what is it?
   a. Health Systems Science Curriculum (US)
   b. Academic Innovations Collaborative (US)
   c. The Science of Health Care Delivery Program (US)
   d. Veterans Affairs Quality Scholars (US)
   e. The Curriculum Renewal for Interprofessional Education in Health Project (Aus)
   f. Other [blank space]

7. Are current curricula on health system transformation in health professions education sufficient to prepare health professionals to transform a system that achieves *Quadruple Aim*?
   a. Yes
   b. No
   c. Don't Know

8. Are current curricula on health system transformation in health professions education sufficient to prepare health professionals to transform a system that promotes *health equity*?
   a. Yes
   b. No

c. Don't Know

Section B: Directions for future curriculum development and future programs of research on health system transformation in health professions education.

9. What general areas of research would best address your needs (or your organizations needs) when it comes to health system transformation in health professions education? [logic: blank space]

Please rank (by clicking and dragging) the following areas of research from 1 to 5 where 1 = most preferred and 5 = least preferred.

a. Demonstrating the value of health system transformation in health professions education
b. Development of standardized curricula on health system transformation for health professions education
c. Barriers/facilitators for implementing health system transformation curricula in health professions education
d. Establishing best practices for teaching health system transformation in health professions education
e. Interprofessional approaches to teaching health system transformation in health professions education

10. Are there any specific questions regarding health system transformation in health professions education that you or your organization would want researchers to answer through future studies?
    a. No, none that I can think of at this time.
    b. Yes (please specify)

11. From your experience, have health system issues exposed through the COVID-19 pandemic catalyze renewed interest in enhancing health system transformation in health professions education?
    a. Yes
    b. No [logic: if no skip to question 21]
    c. Don't know [logic: if no skip to question 21]

12. If yes, what emerging health system issues?
    [0= don't know; 1= yes, 2=No]
    a. Address population and public health issues
    b. Adoption of innovations in health care (e.g., virtual care)
    c. Healthy system sustainability
    d. Access to care
    e. Health and human resources disparities
    f. Eliminate health care disparities, racism, and discrimination in health care.
    g. Other [blanks space]

13. Is there anything else that you would like to share regarding your experience and expertise with health system transformation in health professions education that you feel was not reflected in this questionnaire?

    [open text field]

For publication purposes, I would like to ask you a few questions about yourself in order to describe the population surveyed. I will only report on data in aggregate form (i.e., data that is grouped together).

14. In what country do you work?
    a. Canada
    b. United States
    c. United Kingdom
    d. Australia
    e. Other [logic: if other please specify]
    f. I prefer not to say

15. What is your employment jurisdiction?
    a. National
    b. Provincial/territorial/state
    c. Municipal/Community
    d. University
    e. Private sector
    f. Other (leave blank)

16. For how many years have you been working in a position that involves the subject matter of health system transformation in health professions education?
    a. Less than 5 years
    b. 5-9 years
    c. 10-14 years
    d. 20 years or more
    e. I prefer not to say

17. Part 2 of my study involves me conducting individual interviews. Would you be interested in participating in this part of the study?
    a. Yes, here is my email address [logic: prompt for email address]
    b. Maybe, please email additional information to me [logic: prompt for email address]
    c. No

18. Would you be interested in receiving a copy of the study results?

a. Yes [logic: prompt email address]
b. No
c. **You have completed the survey questions. <submit now>Thank you for your participation in this study!**

Appendix D

Table Specifications Survey (Phase Two, Part 1)

Table C1

Table of specifications for Phase Two survey

Research Questions	Dimension	Corresponding survey item numbers
	• Screening	• Question 1
1. What is the current state of the literature on health system transformation in health professions education?	• Validating scoping review findings	• Questions 2 to 8
2. Based on the current state of the literature/evidence, what areas are important to consider for curriculum development and future programs of research on health system transformation in the education of healthcare professionals?	• Recommendations for future programs of research	• Questions 9 to 13
	• Demographic questions for publication	• Question 14 to 18

Appendix E

Survey Invitation Email (Phase Two, Part 1)

Dear Stakeholder,

You are invited to participate in a brief survey for a study on health system transformation curricula in health professions education because of your expertise in this area. This study is being conducted by Ashley Chisholm, a PhD candidate in the field of Health Professions Education at the University of Ottawa. To access the survey, please visit: [Stakeholder Survey Link]

The survey seeks stakeholder feedback to a) identify the resources used to inform health system transformation practices in the education of health professionals, b) identify areas of concern regarding the area of study, and c) prioritize directions for future programs of research so that the most pressing needs of stakeholders are addressed.

For additional information, please see the attached study information letter.

If for any reason you are unable to complete the survey at this time, you may forward this invitation to a knowledgeable representative on this topic at your institution to complete the survey on your behalf.

If you have any questions or require further information, you may contact the Principal Investigator, Ashley Chisholm, by email at **** or the supervising professor, Dr. Katherine Moreau, at ****.

Thank you in advance for your participation.

Appendix F

Information Letter- Phase Two, Part 1 (Survey)

Title of the study: Understanding the role of health professions in health system transformation: Implications for health professions education, practice, and health policy

Research Team: Ashley Chisholm (PhD Candidate)
Faculty of Education
University of Ottawa
Ottawa, ON

Dr. Katherine Moreau
(Supervisor)
Assistant Professor
Faculty of Education
University of Ottawa
Ottawa, ON

Invitation to Participate: You are invited to participate in Phase Two of the abovementioned doctoral thesis study conducted by Ashley Chisholm, who is being supervised by Dr. Katherine Moreau.

Purpose of the Study: The purpose of the study is to understand the current state of literature on health professionals' involvement in health system transformation and how the education of health professionals prepares health professionals to engage in health system transformation. The study will consist of two Phases. Phase One will consist of a scoping review and Phase Two will include a stakeholder consultation. You are only being asked to participate in Phase Two, Part 1 of the study.

Participation: If you wish to participate in Phase Two, Part 1 of this study, please complete the online survey by clicking on the survey link in the email. The survey is accessible on the online survey platform *Survey Monkey*, which is governed by the Canadian Privacy Act. Your decision to complete and return this survey will be interpreted as an indication of your consent to participate in Phase Two, Part 1. The survey should take approximately 15-20 minutes to complete. You do not have to answer any questions that you do not want to answer. The research team would like to have your complete survey by (DATE). You will also receive two reminder emails sent by Ashley Chisholm regarding the survey in 14 days and 28 days.

Benefits: You will not immediately benefit from this study. However, the results from this study will contribute to the body of literature on health system transformation in the education of health professionals.

Confidentiality and Anonymity: The information that you will share will remain strictly confidential and will be used solely for the purposes of this research. The only people who will have access to the research data are Ashley Chisholm and Dr. Katherine Moreau. Your answers to open-ended questions may be used verbatim in presentations and publications but neither you (nor your institution) will be identified. In order to minimize the risk of security breaches and to help ensure your confidentiality, we recommend that you use standard safety measures such as signing out of your computer account, closing your browser, and locking your screen or device when you are no longer using them and/or when you have completed the survey. Results will be published in pooled aggregate format.

Conservation of Data: Research data will be stored in password protected electronic files, on a password protected computer, on a password protected computer at the University of Ottawa research office of Dr. Katherine Moreau. It will be stored for a period of 5 years after the publication of study findings at which time the data will be securely deleted.

Compensation: There is no compensation for participating in this part of the study. If you are interested in receiving a summary of the study results, you will be given the option to indicate this interest at the end of the survey.

Voluntary Participation: You are under no obligation to participate and if you choose to participate, you may refuse to answer questions that you do not want to answer. Completion and submission of the survey by you implies your consent to participate in Phase Two, Part 1. You can withdraw from Phase Two, Part 1 any time. However, since your survey data is not associated with your name or email address if you withdraw after submitting your responses, the research team will not be able to identify your data in order to remove it from the study analysis and securely destroy it.

Information about the Study Results: If you are interested in receiving a summary of the study results, you will be given the option to indicate this interest at the end of the survey. If you have any questions or require more information about the study itself, you may contact the

research team at the contact information herein.

If you have any questions with regards to the ethical conduct of this study, you may contact the Protocol Officer for Ethics in Research, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa, ON K1N 6N5, tel.: (613) 562-5387 or ethics@uottawa.ca.

Please keep this form for your records. Thank you for your time and consideration.
Ashley Chisholm:

May 10, 2022

Dr. Katherine A. Moreau:

May 10, 2022

Université d'Ottawa
Faculté d'éducation

University of Ottawa
Faculty of Education

Tel/Tél : 613-562-5804
Fax/Téléc :613-562-5144

145, Jean-Jacques Lussier
Ottawa ON K1N 6N5
Canada
www.education.uOttawa.ca

Appendix G: Interview Guide

Understanding the role of health professions in health system transformation: Implications for health professions education, practice, and health policy

With health professions experiencing increasingly formal expectations to be accountable to health system transformation, we need to better understand how health professionals are learning about health system transformation in health professions education (across their career trajectory). This study aims to explore the current state of the literature on health system transformation in the context of health professions education and outline areas to consider for curriculum development and future programs of research. Through my study I aim to understand the current state of the literature on health system transformation within the context of health professions education through a scoping review and stakeholder consultation.

START RECORDDING

To begin I will ask the following questions:

Research Question: What is the current state of the literature on health system transformation in health professions education?

1. For the purpose of describing the sample of the study, I am wondering you can tell me a bit about yourself and your connection to the topic of health system transformation in health professions education?
2. How would you describe the current role of health professionals participating in health system transformation?
    - Prompt a: What has happened overtime?
3. Based on your experience, how would you describe the current state of health system transformation within health professions education?
    - Prompt a: What are current challenges?
    - Prompt b: What are current facilitators?
4. What are general perceptions of curricula on health system transformation in health professions education by health professionals?

5. How are current curricula on health system transformation in health professions education sufficient to prepare health professionals to transform a system that achieves Quadruple Aim and health equity (newly termed ‘quintuple aim’)?

Research Question: Based on the current state of the literature/evidence, what areas are important to consider for curriculum development and future programs of research on health system transformation in the education of healthcare professionals?

6. What areas of research would best address your needs when it comes to health system transformation in health professions education?
7. How, if at all, has health systems issues exposed through COVID-19 pandemic catalyzing interest in enhancing health system transformation in health professions education?

    - Prompt a: how has the pandemic shifted perceptions of health systems issues?
    - Prompt b: how has the pandemic shifted perceptions of the role of health professionals participating in health system transformation?
    - Prompt c: How has the pandemic shifted the need for health system transformation curricula within health professions education?
8. How, if at all, can we better demonstrate the value of health system transformation in health professions education?

End

9. Is there anything that you would like to add to the interview about this topic?

uOttawa

Université d'Ottawa
Faculté d'éducation

University of Ottawa
Faculty of Education

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Fax/Téléc :613-562-5144

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Canada

www.education.uOttawa.ca

Appendix H

Consent Form- Phase Two, Part 2 (Interview)

Title of the study: Understanding the role of health professions in health system transformation: Implications for health professions education, practice, and health policy

Research Team: Ashley Chisholm (PhD Candidate)
Faculty of Education
University of Ottawa
Ottawa, ON

Dr. Katherine Moreau (Supervisor)
Assistant Professor
Faculty of Education
University of Ottawa
Ottawa, ON

Invitation to Participate: I am invited to participate in Phase Two, Part 2 of the abovementioned doctoral thesis study conducted by Ashley Chisholm, who is being supervised by Dr. Katherine Moreau. The study aims to understand the current state of literature on health professionals' involvement in health system transformation and how the education of health professionals prepares health professionals to engage in health system transformation. The study will consist of two parts. Phase One will consist of a scoping review and Phase Two will include a stakeholder consultation. You are only being asked to participate in Phase Two of the study.

Purpose of the Study: The purpose of the study is to understand the current state of literature on health professionals' involvement in health system transformation and how the education of health professionals prepares health professionals to engage in health system transformation

Participation: My participation will consist of one one-on-one interview at a time that is convenient for me. The interview will be conducted by video conference. The interview will last approximately one hour in length. I will be asked questions about the health system transformation in the context of the education of health professionals. I

am aware that the interview will be audio recorded and that I do not have to answer any questions that I do not wish to answer. I am aware that the interview will be audio-recorded and transcribed verbatim by Ashley Chisholm. If my interview occurs by telephone or videoconference, I can verbally consent to participate prior to starting the formal interview. However, if I would prefer, I can sign, scan, and return the consent form to Ashley Chisholm at the contact information herein. There will be an opportunity for participants to review their interview transcripts.

Benefits: My participation in this study will contribute to the body of literature on health system transformation in the education of health professionals curricula.

Confidentiality and Anonymity: I have received assurance from the researcher that the information I will share will remain strictly confidential. I understand that the contents will be used only for the purposes of this research and that my confidentiality will be protected. I am aware that the only people who will have access to the research data are Ashley Chisholm and Dr. Katherine A. Moreau. I am aware that the interview will be audio-recorded. I will not be asked to share identifying information such as my name during the interview. If any potentially identifying information is shared during the interview, I am aware that it will not be included in the transcript. The digital audio-recording of the interview will be downloaded and erased from the audio-recorder immediately after the interview. Results will be published in a pooled (aggregate) format.

Conservation of Data: I am aware that the research data will be stored in a password protected file, on a password protected computer at the University of Ottawa research office of Dr. Katherine Moreau. Research will also be stored in a password protected file, on a password protected computer at Ashley Chisholm's personal office. I am aware that it will be stored for a period of 5 years following the publication of findings, at which time the data will be securely deleted.

Compensation: I am aware that I will receive a $20 Starbucks gift card for participating in this part of the study. I will receive this gift card regardless of whether I decide to withdraw from Phase Two, Part 2 of this study. I will also be able to receive a copy of the study results by contacting Ashley Chisholm at the contact information provided.

Voluntary Participation I am aware that I am not required to participate in Phase Two, Part 2, of this project and if I choose to participate, I may refuse to answer questions or withdraw from the study at any time. I understand that I may withdraw from the study by contacting Ashley Chisholm at the contact information provided. If I choose to withdraw, all data gathered during Phase Two, Part 2 of this study will be removed from the study findings.

Acceptance: I, *(Name of participant)*, agree to participate in the above research study conducted by Ashley Chisholm of the Faculty of Education, whose research is under the supervision of Dr. Katherine Moreau.

If I have any questions about the study, I may contact Ashley Chisholm.

If I have any questions regarding the ethical conduct of this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa, ON K1N 6N5
Tel.: (613) 562-5387
Email: ethics@uottawa.ca

There are two copies of the consent form, one of which is mine to keep.

Participant's signature: *(Signature)* Date: *(Date)*

Researcher's signature