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The potential for nurses to contribute to and lead improvement science in health care.

AUTHOR POST PRINT VERSION

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Abstract

Aim. A discussion of how nurses can contribute to and lead improvement science activities in healthcare.

Background. Quality failures in healthcare have led to the urgent need for healthcare quality improvement. However, too often quality improvement interventions proceed to practice implementation without rigorous methods or sufficient empirical evidence. This lack of evidence for quality improvement has led to the development of improvement science, which embodies quality improvement research and quality improvement practice. This paper discusses 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. However, we also discuss that there are insufficiencies in nursing education that require attention for nurses to truly contribute to and lead improvement science in healthcare.

Design. Discussion paper

Data Sources. This paper builds on a collection of our previous work, a 12-month scoping review (March 2013-March 2014), baseline study on a quality improvement management system (Lean), interviews with nurses on quality improvement implementation and supporting literature.

Implications for Nursing. 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.

Conclusion. 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.

Keywords: improvement science, quality improvement, nursing, nursing education

SUMMARY STATEMENT

Why is this research or review needed?

- Nurses have had limited opportunities for contributing to and leading improvement science in healthcare.
- To raise awareness in nurses of the opportunities in improvement science as a valuable option for future career development.
- To draw attention to the existing gap between nursing practice and nursing education in terms of improvement science.

What are the key findings?

- Nurses have the potential to significantly contribute to and to lead in the field of improvement science in healthcare.
- Improvement science is not comprehensively reflected in undergraduate, graduate and continuing professional development for nurses. This is despite the increasing demand for nurses to engage in improvement science.

How should the findings be used to influence policy/practice/research/education?

- There is the need for nursing education to incorporate patient safety and the principles of quality improvement.
- Nurses would benefit from the establishment of advanced nursing roles, such as clinician scientists in improvement science.

- The establishment of nurse clinician scientist roles in improvement science is an important strategy to enable nurses to lead healthcare transformation and to sustain our healthcare system.

INTRODUCTION

Healthcare is a highly complex field and faces many challenges. The demands on healthcare systems are growing and inadequacies have become widespread (Baker *et al*. 2004, Appleby *et al*. 2011, Murray *et al*. 2013, Bergman *et al*. 2015). The three critical factors responsible for these challenges are the:

a. increase in the proportion of ageing and older people in our population and with multiple chronic conditions (Bergman *et al*. 2015);
b. rapid advancements in technology, information access, medical innovations and costly treatments (Nelson *et al*. 1998);
c. a high level of reporting on the inefficiencies of healthcare systems (World Health Organisation 2006, World Health Organisation 2007, Organisation for Economic Cooperation and Development 2010).

Unfortunately, there are no 'magic bullets' to solve these problems (Shojania & Grimshaw 2004). The need to improve healthcare quality has intensified within the past decade (Chassin & Galvin 1998, Burhans & Aligood 2010, Murray *et al*. 2013). Two seminal reports from the Institute of Medicine have led to healthcare quality improvement (QI) being widely recognized as a priority area of need. In 2000, the Institute of Medicine (IOM) published *To Err Is Human: Building a Safer Healthcare System* (IOM 2000). This report signaled the urgent need for improvement in patient safety and quality of care. *Crossing the Quality Chasm: A New Health System for the 21st Century* (IOM 2001), closely followed. This report outlined a vision for safe,

high quality care that is evidence-based, patient-centered and systems-oriented. These publications have had a great impact on the drive for QI across all disciplines in healthcare.

Background

QI in healthcare is an approach to achieving and sustaining changes that lead to better care and a better healthcare system. QI refers to the application of improvement practices using tools and methods to implement, test, improve and scale-up effective QI practices (Alexander &Herald, 2009). There are challenges to QI in healthcare, with QI interventions failing to achieve or sustain their proposed outcomes (Solberg *et al*. 2000, Balasubramanian *et al*. 2010). The QI domain has attracted concern that it lacks rigorous scientific evidence (Marshall 2011, Marshall *et al*. 2013) and QI approaches often proceed on the basis of intuition and anecdotal evidence (Shojania & Grimshaw 2005). Whilst it may be understandable that there is a belief that action over evidence leads to faster improvements in healthcare, the evidence has shown that QI interventions that appear to be based on anecdotal evidence and preliminary findings often result in no significant improvements and are minimal and local in scale (Auerbach *et al*. 2007).

QI involves change, but not all changes lead to an improvement (Berwick 2008). For healthcare to fully benefit from QI, we need to be sure that the changes are made systematically and incorporate both scientific knowledge and the best available research evidence (Batalden & Davidoff 2007). A lack of rigorous evaluation studies of QI interventions results in the reasons for the success or failures of QI interventions being unknown and the knowledge is lost (Batalden & Davidoff 2007, Davidoff *et al*. 2008). Such knowledge gaps have led to the development of improvement science.

Improvement Science

Improvement science is a new field of science, which attempts to provide a scientific evidence base for healthcare QI interventions (Crisp 2015) and incorporates QI research, the implementation of QI interventions and the scientific evaluation of QI interventions (Grol *et al*. 2002). Improvement science involves a scientific process for identifying the most effective QI interventions to improve and sustain healthcare services and outcomes (The Health Foundation 2011). The overarching goal of improvement science is to ensure that QI efforts are scientifically -based akin to the scientifically-based practices we seek to implement (Shojania & Grimshaw 2005). From an improvement science stance, QI efforts should be based on sound evidence with rigorous assessment, implementation, adoption, evaluation, spread and sustainability.

The aim of improvement science is to build an evidence base on how healthcare providers and systems can improve their work by translating this evidence into practice (Pearson, 2010). Stevens (2013) discusses how the shift in healthcare towards evidence-based practice and improvement requires nurses to gain new competencies to deliver improvement that is evidence based. From our collective experiences as a [professional positions and expertise anonymized for review purposes] we argue that nurses have the potential to contribute to and lead in this movement. However, we recognize and discuss in this paper that nursing education is falling short in improvement science.

Purpose

The purpose of this paper is to discuss how nurses can contribute to improvement science in healthcare. We pay particular attention to the philosophical, theoretical, political and ethical positions that underpin the nursing discipline and profession and how these positions either

enable or hinder nurses' ability to contribute to and lead improvement science. We discuss two areas that require change for nursing to fully contribute to and lead in improvement science: a. the inclusion of improvement science education in nursing programs; and b. the increase of advanced nursing roles, such as nurse clinician scientists in healthcare improvement science.

Our paper defines nursing according to Parse (1999) that nursing is both a discipline and a profession. The purpose of the discipline of nursing is to advance the knowledge of nursing through philosophical paradigms, theoretical development and research (the science of nursing). The purpose of the profession is to provide care to patients through the application and use of the art and science of nursing science. Our discussion refers to the term 'nurses' as the personnel that make up the nursing profession and provide care to patients that is based on regulatory standards and education from the discipline of nursing (Parse 1999).

The central questions to this discussion paper are:

- Where does nursing 'fit' in improvement science?
- Considering the tenets underpinning the nursing discipline and profession, do nurses have the potential to contribute to and lead improvement science in healthcare?

Data sources

This discussion paper is:

- based on our previous work, a 12 month scoping review (March 2013-March 2014) and baseline study on Lean (Kinsman *et al*. 2014, Lawal *et al.* 2014) a quality improvement management system;
- informed by descriptive interviews with nurses and other frontline healthcare providers regarding the implementation of QI interventions in their work place (Flynn & Hartfield 2016);
- supported by a review of the literature on improvement science, quality improvement and nursing; and
- informed by the combined professional experiences of our authors as nursing researchers, an improvement science research chair, a nursing graduate student and a medical director for quality improvement.

The collection of these research and professional experiences have led us to this discussion paper that nursing has the potential to lead improvement science but that potential is currently underused in nursing education curricula and healthcare.

DISCUSSION

The positions of nursing in contributing to and leading improvement science

Nurses are the largest service provider in healthcare and is at the centre of patient care. As such, nurses are in the ideal position to contribute to and lead improvement science in healthcare. Nurses are hands on caregivers at the forefront of any healthcare system and are essential to any system of healthcare. Their work involves assessing, planning and evaluating patient care needs, advocating for patients, assuring their care is safe and that patients are satisfied with the care they receive (Burhans & Aligold 2010).

The work of nurses' requires intellectual and organizational competence. The quality of care that nurses provide shapes patient safety, satisfaction, comfort and outcomes (Needleman & Hassmiller 2009). Nurses are ideally positioned in the healthcare system to examine and understand the environment, to identify the strengths and weaknesses of healthcare systems and to identify the key elements needed for improvement science in healthcare (Page 2004, Needleman & Hassmiller 2009, Sherwood 2010).

Nursing roles have advanced, with the emergence of roles such as clinical nurse specialists, clinical nurse educators, advanced nurse practitioners and, more recently, nursing clinician scientists. All nurses are required to integrate research and clinical practice (Kirchhoff, 2004). Nursing as a profession has developed its own disciplinary way of thinking with its own body of knowledge, theory and research (Edwards 2001), equipping nurses with in-depth research skills across a broad range of research designs and methods. All of these factors mean that nurses have the potential to contribute to the advancement of improvement science in healthcare.

There is trend towards frontline led evidence-based continuous quality improvement interventions in healthcare. Releasing Time to Care (RTC) is one example of an intervention for conducting continuous quality improvement. RTC is led by nurses. The aim of RTC is to increase the autonomy of nursing staff so as to continuously improve patient care (Hamilton *et al*. 2014). A qualitative evaluation of RTC implementation in Saskatchewan, Canada demonstrated that the implementation of a nurse-led and system wide QI intervention has the potential to empower nurses to lead continuous QI (Hamilton *et al*. 2014). An important dimension to the RTC is the capacity, such as allocated resources, for nurses to be able to engage in continuous QI and the capability, such as training, for nurses to become knowledgeable and skilled in the area of continuous QI.

In RTC however, the role of the nurse is to implement the intervention, the quality improvement work. We argue that nurses have the ability to lead on-the-ground QI work and that nurses have the philosophical, theoretical, ethical and political underpinnings to potentially contribute to and lead improvement science activities.

Philosophical and theoretical positions

The philosophical positioning of nursing is such that there are multiple ways of knowing and explaining phenomena (Garrett & Cutting 2015). Carper (1978) developed the epistemological basis that there are four fundamental yet different ways of knowing in nursing, being the empirical, the ethical, the personal and the aesthetic. These patterns of knowing in nursing have the potential to:

- advance improvement science, both complimenting and expanding the paradigm of evidence-based practice;
- provide substantial empirical knowledge to improvement science; and to
- add dimensions of ethical, personal and aesthetic knowledge, where the patient is central to improvement.

Chinn & Kramer (2014) discuss emancipatory knowing, the capacity to critically assess the status quo of nursing, identify why it is that way and creates the way for change. This type of knowledge can be expressed through engagement in improvement science. Chinn and Kramer (2014) argue that there has been a lack of focus on emancipatory knowing in nursing in the past and describe that the process of emancipatory knowledge (praxis) when done collectively in nursing can lead to substantial change. We relate this to improvement science in nursing and the potential of nurses to contribute to and lead substantial improvements in healthcare. This form of knowing identifies the need for action inclusive of the ways of knowing in nursing to influence and improve praxis.

Theory development is an essential process to the development and advancement of improvement science. Theory can help to identify areas of poor quality in healthcare and enhance improvement science (Davidoff *et al*. 2015). Theory is also valuable in the evaluation of QI interventions. Theory-driven evaluations allow researchers to ask ‘how and in what contexts does the QI intervention work or can be amended to work?’ Framing the evaluation of QI interventions from this perspective is more useful for complex context sensitive QI interventions (Parry *et al*. 2013).

Nursing, as a frontline caring profession, has the potential to contribute to the theoretical advancement of improvement science; incorporating the needs of patients. Nursing practice can be viewed as both a starting point for knowledge-theory development for improvement science and as an end point, where researchers can test these theoretical developments (Im & Chang 2012). Thus, during the course of practice nurses can assist researchers in the development and testing of theories in improvement science. In turn theoretical development and knowledge development in improvement science can advance and improve nursing practice. This could lead the way for the theoretical advancement of improvement science by bridging the gaps of research and practice and combining the 'art and science' of improvement.

Ethical and political positions

Nursing, as a profession, has ethics at its core, both in practice and in research (Park *et al*. 2014). Nurses, at the centre of patient care, are ethically responsible for providing safe, compassionate and competent care (CNA 2008) and thus have the potential to be a major force for improvement science. Nurses involved in the delivery of care have the potential to play a role in improvement science and, from an ethical standpoint nurses also need to be a part of it.

Nurses who fail to engage and contribute to improvement science may jeopardize the incorporation of nursing into improvement changes. This could ultimately lead to the de-professionalization of nursing (Needleman & Hassmiller 2009, Izumi 2012). Many QI interventions and research studies focus on quantity, efficiency, waste reduction and cost and not incorporating the ethical values of nursing and, more importantly, the values of patients (Izumi 2012). Hence, to ensure that improvement science in healthcare aligns with nursing and patient values, nurses need to actively engage in improvement science.

Nurses are strategically positioned to make significant improvements to healthcare and to lead policy development for healthcare improvement. Nurses often play a key role in resolving conflicts, they deal with a multitude of personalities and challenging behaviors on a daily basis. Nurses are team players, negotiators, problem solvers and communicators (Des Jardin 2001). Each of these skills establishes the nurse as a valuable member at the political table. A political role for nursing involves being knowledgeable about current healthcare issues, epidemics, costs, laws and health policy.

The need for nursing perspectives and knowledge in the political arena has been a longstanding argument; however, the appointment of nurses to these roles, or the desire for nurses to want such roles, has been slow (Duncan *et al*. 2014). Despite the advancement of nursing leadership and management education, the enhancement of policy education in nursing has yet to keep pace (Spenceley *et al*. 2006).

Implications for nursing

As the largest providers of direct patient care by numbers, nursing is in a position to be central to improvement science efforts (Bergerman *et al.* 2015). The philosophical, theoretical, ethical and political positions underpinning nursing equip nurses with the potential to contribute to and lead improvement science in healthcare. Nurses have an important voice in the need to improve the quality of patient care and to improve current healthcare systems. In 2011 the IOM released recommendations to expand opportunities for nurses to lead collaborative improvement efforts and identified the need to prepare and enable nurses to lead change to improve healthcare (Shalala et al. 2011).

These acknowledgments of nurses are applauded, however, this paper discusses some areas of weakness for nurses to lead in improvement science. Within the current constraints and inefficiencies of many existing health systems it is a challenge for nurses to perform in the best way and to lead in the quest for high quality healthcare (Yoder-Wise 2014). For example, as a practice-based profession, nurses receive limited opportunities to engage and receive the education, research training and practical skills necessary to improve the systems where they work. There is also the limited promotion of bedside nurses into political, administrative or different clinical roles where they are in the position to lead improvement science and bridge the science and practice of QI.

We argue that there are two main areas that must change for nurses to fully contribute to and lead improvement science in healthcare, being:

a. including improvement science education in nursing programs; and

b. increasing advanced nursing roles, such as nurse clinician scientists in healthcare improvement science.

Including improvement science education in nursing programs

We argue that improvement science education for undergraduate and graduate nursing students is equally important as the actual quality improvement and patient safety practices of nurses working in healthcare systems. The major drive for better quality and safety in healthcare systems lends urgency to a transform of undergraduate and graduate nursing curricula to one that matches the values and needs of practice (Maddox *et al*. 2001, Sherwood & Drenkard 2007). Undergraduate nursing education needs to transform so that novice providers have the knowledge, skills and attitudes to be competent in improvement science and to provide high quality and safe care (IOM 2003). QI principles and skills should be a required and core

component of the educational curriculum for undergraduate nurses (Jones *et al*. 2013, Flynn *et al*. 2015). Nurses need to be prepared and competent to work in complex environments, where they have responsibility to improve healthcare process and delivery. This is one responsibility of nursing education (Needleman & Hassmiller 2009).

There are many resources available to provide guidance and support to establish quality and safety curricula for health care providers (undergraduate and postgraduate) from academic centers, quality and safety organizations, as well as health care organizations. The Institute for Healthcare (IHI) Improvement Open School is a key resource for building a QI course for an undergraduate nursing curriculum. The IHI is a nonprofit organization that is a leading innovator, convener, partner and driver of results in health and health care improvement worldwide. The IHI offers a wide range of resources and teaching tools to help health care professionals lead effective improvement efforts. The IHI offers free online educational courses for students on quality, improvement capability, patient safety, safety, leadership, person and family centered care and other healthcare topics (IHI 2016). The World Health Organization (WHO) has a Multi-Professional Patient Safety Curriculum Guide that is another rich collection of resources that is available in six languages. This includes a list of recommended foundational topics, as well as accompanying teaching resources and tools for both quality improvement and patient safety (WHO 2011). In addition, the Quality and Safety Education for Nurses (QSEN) developed six core competencies for undergraduate nursing curriculum: patient-centred care, teamwork and collaboration, evidence-based practice, quality improvement, safety and informatics (QSEN 2009). The QSEN was developed to prepare nurses with the knowledge, skills and attitudes to continuously improve the health systems where they work. These core competencies have been piloted at 15 nursing schools across the United States of America.

Murray et al. (2010) report the implementation of the QSEN competencies at one of the pilot schools. The QSEN initiative is a useful resource for future nursing schools looking to implement improvement science to their curriculum.

Graduate nursing education needs to better understand health quality improvement sciences to identify, test and scale up effective QI approaches (Health Quality Ontario, 2014, The Health Foundation 2011). The introduction of improvement science to graduate nursing education will develop expertise in improvement science research, leadership and change management skills to lead improvement across systems. We argue that these changes cannot be successfully achieved in the traditional boundaries of 'silo' education. Quality and patient safety are important issues for all the health disciplines. Improvement science should be taught using a transdisciplinary approach where the health sciences learn as a team the principles, skills and knowledge of improvement science that can be implemented in practice using a collaborative interdisciplinary team approach. Despite the argument for patient safety and QI education to be embedded in healthcare education (IOM, 2003) and nursing education (Bargagliotti & Lancaster 2007, Milligan et al. 2007, Sherwood & Drenkard 2007, QSEN 2009); QI education is not consistently offered across the spectrum of health sciences and does not appear to be valued as a major component to health professional trainee education. For example, In the USA and Canada only 25% of medical schools incorporate instruction on these topics, the majority of which only include lectures and small-group discussion (Alper *et al*. 2009). This discrepancy places the education of healthcare professionals at odds with the current emphasis on QI and patient safety in clinical practice.

From our own experiences at the University of Saskatchewan and University of Alberta at two provinces of Canada there are elements of improvement science across health sciences

curricula but there is no dedicated improvement science course offered to the health sciences including nurses. This shortcoming led to the curriculum development of a quality improvement (QI) course for health sciences (nursing, medicine, pharmacy and nutrition, dentistry, allied health and public health) for undergraduate and graduate students at the University of Saskatchewan.

The University of Saskatchewan's' QI curriculum has two levels, course level I tailored to the needs, skills and knowledge base of undergraduate students and course level II tailored to the needs, skills and knowledge base of graduate students. Course level I for undergraduate health science students will have a strong focus on applied health quality improvement activities and interventions (e.g. Plan- Do- Study- Act, PDSA cycles) designed to improve patient safety and patient-oriented care (e.g. how to reduce central line infections among newborns). Course level II will be tailored towards the needs of graduate health science students and their research activities (e.g. conduct a systematic review to identify effective intervention to prevent pressure ulcers). The curriculum will cover important improvement science topics such as: The fundamentals for improvement, the life cycle of a QI project, patient safety, human factors and safety, team work and communication, root cause analysis, healthcare associate infections, leadership and QI, patient-centered care, quality cost and value, measuring for improvement and models for improvement. The curriculum will be implemented using a two-phase implementation strategy including a paper based pilot implementation with lectures, videos, tutorials and QI activities in 2016. In phase two, courses will be offered as an online course with direction provided by a course coordinator. This QI curriculum will be funded by the University of Saskatchewan's curriculum innovation fund. The Saskatchewan Health Regions will fund the level II continuous education course which will be offered as an online course. The curriculum

development is in accordance with the relevant professional competency frameworks such as the Canadian physician competency framework (CanMEDS), the Canadian nurse practitioner framework, the professional competencies for Canadian pharmacists and the competency profile for physiotherapists in Canada. The transferability of this QI curriculum will also be tested across universities in Netherlands, Germany and Australia.

At the University of Alberta, health science students formed a quality improvement student led group the Edmonton Healthcare Improvement Network (EHIN), as an Institute for Healthcare Improvement (IHI) Open School Chapter. The aim of the IHI Open School Chapter is to bring students from different health sciences with a shared interest in learning about quality improvement (Sundaram *et al*. 2015). EHIN was formed at the University of Alberta because of the recognized need and desire by our health science students to learn about and engage in QI. Currently improvement science is not a mandatory competency in our nursing education or healthcare systems. Reasons for this are unclear, but one may postulate this may be due to lack of space for new material in already crowded curricula; lack of expertise amongst faculty to develop and teach improvement science given these are relatively new concepts in health care and the lack of opportunity for interdisciplinary learning in our current educational system, which is key to learning and applying quality and safety concepts. Since 2013 the Royal College of Physicians and Surgeons of Canada has included QI and patient safety training as a competency requirement for specialty residents (Wong *et al*. 2014). This competency framework is one that other health sciences and nursing could use for its own curriculum.

Competency in improvement science and patient safety should be a requirement of both the regulatory bodies for nursing and those of other health care providers. This will require a focus on developing quality and safety competencies, a scholarly basis for improvement science

and practice and a knowledge of the interventions that are effective for improving and transforming healthcare (Sherwood 2010). Nurses guided by improvement science have the potential to be a powerful force for evidence-based quality improvement in healthcare (Bergerman *et al*. 2015).

Increase of advanced nursing roles in healthcare improvement science

Nurses have begun to identify the knowledge, skills and attitudes necessary to work in the healthcare systems that are rooted in continuous quality improvement. These include teamwork, collaboration, patient-centered care, quality improvement, safety and informatics (Cronenwett *et al*. 2007, Cronenwett *et al*. 2009a, Cronenwett *et al*. 2009b). As healthcare shifts its focus to improvement science, the comprehensive knowledge held by nurses on how healthcare systems work and the needs of patients should be used more effectively (Tucker *et al*. 2008). One way to address this gap is the creation of nurse clinician scientist roles in improvement science.

The development of such roles would enable the integration of improvement science and quality improvement work into the day-to-day operations and real-world practice of frontline healthcare providers. This would offer front line staff, such as nurses, the time and resources to participate in improvement science and improvement decision making (Needleman & Hassmiller 2009). The development of advanced roles of nurses in improvement science provides professional extension of the scope of nursing and enables nurses to be key players in the movement to sustain our healthcare systems.

To achieve changes valued by the patients, nurses need to be centrally involved in improvement activities such as research, practice and decision making (Fox *et al*. 2011). Improvement science should be a priority focus area for nursing research (Mensik 2013).

Improvement research from the ontological and epistemological views of nursing would contribute to building a body of scientific knowledge based on understanding patient-centered outcomes, contextual factors, ethical factors, the impact of QI on nursing values and the impact of nursing on QI outcomes (Needleman & Hassmiller 2009).

As a practice-based profession, many nurses do not receive opportunities to conduct research and contribute to improvement science (Taylor *et al*. 2010). The engagement of bedside nurses in improvement science will prepare them for the use of QI tools, for seeking the best research evidence, for measuring care outcomes and in the use of empirical data to assess their current practice (Sherwood 2010). Engaging research nurses in improvement science will assist in bridging the theory-practice gap by furthering collaborations between the clinical and academic environments (Fox *et al*. 2011). Bridging these two domains enables nurses to be collaborative leaders in improvement science, as a collaborative approach is a requirement for successful improvement work. Jones &Woodhead (2015) provide a learning report by The Health Foundation on the collaborative capability building improvement approaches taken by five health and social care trusts across the UK. The report provides evidence on how to create a collaborative capability and capacity building environment, which is conducive to driving and sustaining quality improvement. The case studies in this report demonstrate how critical bridging practice and educational training is for improvement capability capacity and sustainability.

Our previous research evaluating the function of a frontline improvement team established as part of health system reform (Flynn & Hartfield 2016) found that the majority of nurses did not have time to engage in, contribute to or lead improvement efforts. Historically, this had not been a part of their job description and typically most viewed improvement work as an extra task to be done ‘off the side of one’s desk’. In addition, most health systems only have

funding to support a small number of quality improvement experts, who as individuals, are unable to reliably sustain large improvement efforts.

To overcome the challenge of sustaining continuous quality improvement in a time of fiscal constraint, some health systems [health system name, National Health Services, Intermountain Health, Children's Hospital of Philadelphia (CHOP) and others] educate practicing nurses (and other providers) in improvement methodologies to build the improvement science capability and capacity of teams. The goal of educating nurses and other frontline providers is to establish a system where the quality lens is applied to everyday practice. At CHOP, this was referred to as the 'Innovation Unit' model and applying rigorous education, with some initial support from improvement experts, resulted in successfully engaging staff in quality improvement work in a sustainable manner, with improved outcomes (Fieldston 2016). QI work and improvement science needs to be collectively valued by healthcare systems, organizations and units so that a culture can develop where improvement is viewed as something nurses and other healthcare professions do every day. All nurses have a responsibility to advance and progress the discipline and we share the viewpoint that improvement science education and the advancement of nursing roles in improvement science is a key approach to achieving this.

> Everyone in healthcare has two jobs when they come to work every day: to do their work and to improve it. (Batalden & Davidoff 2007, pg. 3.).

CONCLUSION

The key points in this paper demonstrate that the nursing profession is philosophically, theoretically, politically and ethically positioned to contribute to and lead improvement science

activities in healthcare. We note some fundamental limitations needing to be addressed for nurses to reach their full potential as leaders of improvement science.

By reforming nursing education to have a substantial focus on improvement science and research, leadership, business management and healthcare policy, these limitations can be addressed. Such areas of education are vital for the next generation of nurses, facing the ever growing complex world of healthcare. There also needs to be a greater opportunity for nurse clinician scientist roles in improvement science, where nurses can attempt to close the practice-science gap of quality improvement, bridging the research and practice of QI in healthcare.

Improvement science has the potential to reform healthcare systems around the globe. This is an opportunity for to nurses to take the lead in redesigning healthcare systems using their research skills, theoretical development and clinical expertise on patient values, needs and care. Nurses can be central to the movement of making health systems sustainable and this paper argues that education is the critical starting point for nurses to become leaders of improvement science.

Conflict of interest

The authors declare no conflicts of interest.

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