



UNIVERSITY OF TORONTO
FACULTY OF MEDICINE

Report for External 5-Year Review of the University of Toronto Centre for Quality Improvement and Patient Safety

EXECUTIVE SUMMARY

BACKGROUND

The **Centre for Quality Improvement and Patient Safety (C-QuIPS)** is a joint partnership between the University of Toronto's Faculty of Medicine and two of its major teaching hospitals, Sunnybrook Health Sciences Centre and the Hospital for Sick Children ('SickKids').

C-QuIPS began as the University of Toronto Centre for Patient Safety (in January 2009), reflecting the early focus in many countries on patient safety as a particularly galvanizing aspect of healthcare quality. From the outset, we engaged in quality improvement more broadly and made this explicit by changing the Centre's name to C-QuIPS in 2013.

MISSION AND STRATEGIC PLAN

The Centre's mission is: To create, disseminate, and implement new knowledge in the fields of patient safety and healthcare quality more generally at the University of Toronto and its affiliated hospitals in order to provide the highest quality and safest possible care.

Based on input from numerous internal and external stakeholders, we developed a strategic plan comprising 5 domains of activity: research, education, supporting local improvement at UofT hospitals and clinic, fostering connectivity among individuals working on safety or quality within different institutional or professional silos, and dissemination.

ACHIEVEMENTS

The full report outlines achievements in each of the five domains of our strategic plan. We highlight some of the notable achievements in research and education below. An important general achievement, however, consists of the leadership we have played in creating academic recognition for work in quality improvement (e.g., the new *Clinicians in Quality and Innovation* job description for faculty in the Department of Medicine), and for developing novel educational curricula, especially for clinical trainees and professionals in practice.

Research

The 8 faculty who hold leadership positions within C-QuIPS published 179 peer review articles related to patient safety or quality improvement (2009-2013). Including all members of the Centre increases the total number of publications to 405. Both of these numbers compare favourably with similar centers in Canada (Ottawa and Calgary—85 and 96 publications,

respectively), the US (Northwestern University and Johns Hopkins—205 and 444, respectively), and the UK (Imperial College—405 publications in same time period). These centres have all existed for at least as long as C-QuIPS.

As outlined in the full report, we have also obtained some notable grants. Dr. Chris Parshuram received a \$3.3 million award to conduct a multi-centre cluster randomized trial of “The Bedside Paediatric Warning System”. Dr. Shojania is on the core project team (as the Scientific Chair) for *Building Bridges to Integrate Care*, a \$5M program by the UofT Departments of Medicine and Family and Community Medicine at the University of Toronto and funded by the Ontario Ministry of Health and Long-term Care. Professor Ross Baker helped lead a \$1.3M CIHR grant to for a national adverse events study in the home care setting—the first study of its kind. Dr. Anne Matlow and other members of the Centre conducted the first national paediatric adverse event study (published in the *CMAJ*). And, Dr. Shojania became the Editor-in-Chief of *BMJ Quality and Safety* in January 2011. Two C-QuIPS members are Associate Editors.

Education

- Our Certificate Course in Quality Improvement in Patient Safety attracted 125 staff from a range of clinical settings—academic and community-based over 3 years. It won an award from the Office of Continuing Education and Professional Development.
- In partnership with the Institute for Health Policy, Management, and Evaluation (IHPME), we launched a new Master’s stream in Quality Improvement and Patient Safety. We received 80 applications and selected 25 participants in 2012. Demand persisted and we selected 26 of 79 applicants (including 4 out of province) in 2013.
- Dr. Brian Wong led the development of an innovative Faculty-Resident Co-Learning Curriculum in Quality Improvement in the Department of Medicine that has involved over 25 faculty members and nearly 80 residents from 12 subspecialties.
- We have also contributed to scholarship in education related to quality improvement, including primary research articles and ‘state of the science’ reviews. Core members are also members of national and international committees related to residency education in QI and advanced training for improvement science.

FINANCES

The two partner hospitals and the UofT Faculty of Medicine each contributed \$100,000 per year over five years. We also generated net revenue of approximately \$600,000.

FUTURE DIRECTIONS

Concrete plans for the future include:

- Mentoring the growing number of junior faculty we have trained in order to address our ‘bandwidth’ problem, namely having too few faculty to sustain the teaching load and project mentorship generated by the successes of our educational programs

- Greater engagement with Faculties outside of Medicine (e.g., Nursing, Pharmacy, Management, Engineering) and Departments outside of Medicine and Paediatrics (e.g., Surgery, Obstetrics, Psychiatry)
- Using some of the revenue we have generated to partner with clinical departments and provide matching funds to protect the time of more faculty members.
- Using some of the revenue we have generated to hire additional research support staff to assist members of C-QuIPS with projects (e.g., with project management, construction of statistical process control charts, qualitative data collection). In our experience, this support is often more valuable to clinicians than modest increases in protected time.

Questions moving forward

We focused primarily on capacity building through education and training in the first 5 years of the Centre (for reasons explained in the full report). We remained very productive in terms of publications and grants, but a major decision we face for the future is the extent to which we should focus on creating a research program more intrinsic to C-QuIPS.

Another important question we face is how to harmonize the research activities related to healthcare quality and safety in the UofT community. Fragmentation across the UofT remains a problem, with major activities similar to those of the Centre in the Knowledge Translation program in the Li Ka Shing Institute at St. Michael's Hospital, the Human Factors group and the Centre for Innovations in Complex Care at UHN, and a new Institute for Health System Solutions and Virtual Care at Women's College Hospital. It may be that we need to think of formalizing a network structure among these different groups, similar to SIM-ONE and the various hospital-based simulation groups.

CONCLUSION

In five years, we have developed innovative new education programs that have contributed to a palpable change in the sense of opportunity for and interest by clinicians to engage productively in quality improvement work. We have also produced a large number of research papers (179 by the directors alone), and led or participated in major externally funded research projects. We have also generated enough revenue to support more faculty engaged in QI work. And, we have the opportunity in the Centre's next five years to stake out an international reputation in training clinicians to engage effectively in improvement work in a range of clinical settings.



UNIVERSITY OF TORONTO
FACULTY OF MEDICINE

**Report for External 5-Year Review of the University of Toronto
 Centre for Quality Improvement and Patient Safety**

INTRODUCTION AND CONTEXT

The **Centre for Quality Improvement and Patient Safety (C-QuIPS)** is a joint partnership between the University of Toronto's Faculty of Medicine and two of its major teaching hospitals, Sunnybrook Health Sciences Centre and the Hospital for Sick Children ('SickKids').

C-QuIPS began as the University of Toronto Centre for Patient Safety (in January 2009), reflecting the early focus in many countries on patient safety as a particularly galvanizing aspect of healthcare quality. The choice of patient safety as the Centre's initial focus also reflected the strengths of the founding faculty members, including Dr. Ross Baker (co-lead of the Canadian Adverse Event Study), Dr. Edward Etchells (also an investigator in the Canadian Adverse Event Study and widely cited for his early studies establishing medication reconciliation as an important patient safety strategy), Dr. Anne Matlow (lead developer of the Paediatric Trigger Tool), and Dr. Shojania, whose work at the time had included various major patient safety research and educational initiatives funded by the US Agency for Healthcare Research and Quality.

C-QuIPS Faculty with Leadership Roles*

Kaveh G. Shojania, MD	Director, C-QuIPS
Trey Coffey, MD, FAAP, FRCPC	C-QuIPS Associate Director and Site Lead, Hospital for Sick Children
Brian M. Wong, MD FRCPC	C-QuIPS Associate Director and Site Lead, Sunnybrook Health Sciences Centre
G. Ross Baker, PhD	Director of Graduate Studies
Christopher Parshuram, MD PhD PRCP	Director of Paediatrics Research
Chaim Bell, MD, PhD, FRCPC	Site Lead for VA Quality Scholars
Anne Matlow, MD, FRCPC	Associate Director, SickKids (2009-13)

Edward Etchells, MD, MSc	Associate Director, Sunnybrook (2009-13)
<u><i>C-QuIPS Support Staff</i></u>	
Leahora Rotteau, MA (doctoral student)	Program Manager
Lisha Lo, MPH	Administrative and Research Coordinator
*Appendix A lists all core and affiliate members	

Mission and Strategic Plan

C-QuIPS's mission is: *To create, disseminate, and implement new knowledge in the field of patient safety and healthcare quality more generally at the University of Toronto and its affiliated hospitals in order to provide the highest quality and safest possible care for our patients.*

Throughout our first year, we met with numerous stakeholders—senior leaders from within the UofT clinical and academic communities, the Ontario Ministry of Health and Long-Term Care, and the Ontario Hospitals Association. We used the input from these stakeholders to develop a strategic plan for achieving the goals laid out in the above mission statement. (These meetings also helped create awareness of the Centre in a variety of circles.) We then presented the tentative strategic plan at our first annual symposium (November 2009) and refined the plan on the basis of feedback from focus group style discussions among attendees during a workshop session at the symposium.

The final strategic plan identified five domains of activity: research, education, supporting local improvement, and fostering connectivity and dissemination. The rest of this report describes our activities in each of these five areas in detail, but highlight appear below.

1. Research – publication in peer review journals and obtaining external funding, especially through peer review grants
2. Education – including undergraduate and graduate education for health professionals, as well as continuing professional development for practitioners
3. Supporting local improvement – including providing academic expertise help to support specific improvement projects at UofT hospitals (e.g., helping with evaluation of a planned improvement initiative or the development of the initiative itself)
4. Fostering connectivity – bringing together people working on patient safety within different institutional and/or professionals silos
5. Dissemination – promoting the Centre and its activities outside of the UofT community, including provincially, nationally, and internationally

Why these domains of activity?

The first two domains—research and education—require no explanation. One would expect any academic unit to focus on both of these activities, though many might prioritize one over the other (usually research). As part of our deliberations in the first year of the Centre, we chose to prioritize educational efforts. The strategic basis for this decision will be explained shortly.

The last of the five domains listed above also requires little explanation. Dissemination of research results and successful educational initiatives promises advancement for the field in general and offers the hope of creating additional opportunities for funding—through contract work (which we have obtained), donations (also obtained), and the greater chance of success in peer review grant competitions that recognition brings.

The other domains two domains—supporting local improvement and fostering connectivity—warrant greater explanation.

Supporting local improvement

The Centre’s mission is primarily academic and the two hospitals that fund C-QuIPS (Sunnybrook and SickKids) support that academic focus. Nonetheless, we recognized that having a Centre for Quality Improvement and Patient Safety had to translate into some concrete local gains for the supporting hospitals to perceive a return on their investment.

We envisioned the Centre as helping hospitals and clinics in the UofT community in one of three ways:

1. Providing academic expertise in designing/implementing interventions to address improvement targets identified by the clinical units or management
2. Assisting with the evaluation of local improvement projects
3. Capacity building by training clinicians and managers so that they would have sufficient skills to develop solutions to local quality/safety problems on their own or with some expert input from C-QuIPS.

We have participated in examples of the first two strategies – e.g., designing an evaluation of the patient Safety WalkRounds program at two UofT hospitals at the request of senior hospital leaders in order to assess the value of the programs and identify potential improvements to them. Similarly with the critical incident review systems at two hospitals. (We tend to try to conduct the same project at pairs of hospitals in order to have compare and contrast information and also to increase anonymity).

Increasingly, however, over these first five years, we have focused on *capacity building* through various educational offerings at C-QuIPS. The rationale for this decision is explained shortly below under Prioritizing Training and Education over Research.

Fostering connectivity

In many areas of biomedical research, the University of Toronto faces a challenge with fragmentation and even competition between hospital-based research institutes where most clinical and even much basic science research occurs. Each major teaching hospital has its own research institute with its own funding base from grants, industry support, and philanthropy. Consequently, these hospital-based institutes have a vested interest in branding their efforts in terms of St. Michael's Hospital, Sunnybrook, Mount Sinai, University Health network, the Hospital for Sick Children, and so on, rather than the University of Toronto Faculty of Medicine.

Recent efforts on the parts of leaders within the Faculty of Medicine and major clinical departments have resulted in greater collaboration across sites—providing seed money for research projects that involve more than one hospital in order to increase the chance of successful external grant applications for multi-site teams, overseeing and orchestrating new faculty hires so that institutions do not compete for the same individuals. Still, the problem remains and we did not want research in quality improvement and patient safety at the UofT to suffer from fragmentation and competition.

Because patient safety and quality improvement are relatively young/small fields, we did not face quite the same pre-existing scale of competition that existed for clinical and basic biomedical research. Nonetheless, a number of established groups with activities directly or indirectly related to patient safety and healthcare quality already existed:

- the *Centre for Global eHealth Innovation* based at University Health Network and which includes the Healthcare Human Factors Group
- the *Centre for Innovations in Complex Care (CICC)*, also at the University Health Network
- the *Network of Excellence in Simulation for Clinical Teaching & Learning (NESCTL)*, which changed its name to *SIM-One*, as well as individual simulation centers, such as Surgical Skills Centre at Mount Sinai Hospital
- the Institute for Health Policy, Management and Evaluation (IHPME)
- the *Knowledge Translation Program* at St. Michael's Hospital's *Li Ka Shing Knowledge Institute*, as well as the *Evaluation Program for Complex Interventions* also at *Li Ka Shing*
- the *Centre for Inter-Professional Education* led by the Toronto Western Hospital and the Toronto Rehabilitation Institute
- the *Centre for Healthcare Engineering Research*
- the *Wilson Centre* at University Health Network, an internationally recognized research institute in medical education research, some of which has included work directly related to patient safety
- the Institute for Clinical and Evaluative Sciences (ICES) which conducts health services research that often identifies healthcare quality problems

We did not want to compete with any of these groups. In fact, we saw a role not just for collaborating with them ourselves, but bringing some of them together and even just referring potential projects their way.

Because core members of C-QuIPS are clinicians and also have broad connections in the fields of patient safety and quality improvement, we often are approached about projects that span a wide range of topics. Some of these topics benefit more from the expertise of individuals from the above groups (e.g., human factors engineering, simulation, educational research and development). We saw the Centre as having a role of putting people in touch with these existing experts, rather than attempting to replicate their expertise and activities. But, more generally, we sought through our goal of fostering connectivity to make faculty members affiliated with different centers, groups and institutes become more familiar with the range of activities and expertise related to patient safety and quality improvement in the UofT community. In short, we regarded our mission as furthering work in quality improvement and patient safety at the UofT in general, not necessarily just at C-QuIPS.

Prioritizing Education and Training over Research in the First 5 Years

Yes, this sounds dicey. What academically-oriented unit admits to prioritizing education over research? Education brings less prestige than research. It also tends to generate less money, in so far as the typical awards for external research grants dwarf the size of educational grants (though successful educational courses can bring in revenue). And, education is a notoriously weak improvement strategy.

First, let us make clear. We did not abandon our research efforts. As detailed in a subsequent section of this report, the 8 members of C-QuIPS who hold leadership positions (Director, Associate Directors, leaders of research and educational programs) have by themselves published 179 articles related to patient safety or healthcare quality, indexed in Medline since January 2009. Including all core and affiliate members of the Centre increases this number to 405 Medline-indexed articles related to patient safety or healthcare quality from 2009-mid 2013. As shown later in this report, this number compares very favourably to the research productivity of other Centers in Canada, the US and UK. In the same time periods, members of comparable centers in Ottawa and Calgary published 85 and 96 articles, respectively. Faculty at Northwestern University's program in patient safety and healthcare quality published 205 articles, the Armstrong Institute for Patient Safety at Johns Hopkins University published 444 articles, and the Centre for Patient Safety and Service Quality at Imperial College in London published 405.

So, we did not stop doing research. A better way of putting it is that, for research, we did not attempt to make the whole greater than the sum of its parts. For instance, we did not attempt to develop a major grant application involving multiple C-QuIPS faculty. As individuals (sometimes partnered with one or two other C-QuIPS faculty), we published a lot and successfully obtained external funding including several very large grants (e.g., a CIHR grant for \$3.3M to Chris Parshuram at SickKids to conduct a multi-site trial of a paediatric early warning score, a \$5M program project to evaluate innovative models of care delivery funded by the Ontario Ministry of Health, a \$1.3M CIHR grant to study adverse events in the home care). But, we did not try to develop a grant that would be housed in and led by key faculty in C-QuIPS. For education and training, however, we did seek to make the whole greater than the sum of our individual activities. Here is why.

The Cons of Research as a Focus for C-QuIPS

1. Major grants take time to develop and the chance of success is low to moderate, especially given the limited sources of external funding for work in patient safety and quality improvement
2. Grants in Canada pay for research assistants and equipment, but not investigators' salaries, so the revenue generation would be modest even with a large grant. The money would allow us to hire staff, but these staff would be working on the grant and not on other activities, so we would be committed to making the work of the grant the major work of the Centre.
3. To develop a major project, successfully obtain external support, and then execute the project would require a minimum of 3 years, but quite possibly 4 or 5. In the meantime, we would have little to show for the investment by the University and partner hospitals.
4. Moreover, the research would not necessarily generate a success story. Most rigorous evaluations of improvement interventions show small to modest gains.
5. Even if everything worked out, any intervention developed and evaluated over 3-5 years would likely address a fairly specific or narrow patient safety or healthcare quality problem.

The above points outline our concerns over the cons of focusing on a major research project for C-QuIPS in its initial years. We also saw some pros in focusing on education and training to increase the number of clinicians with practical skills related to developing and evaluating interventions to improve quality.

The Pros of Education and Training

1. Increasing the numbers of clinicians able to study and address quality problems in their clinical settings offers the opportunity to further the goals of a wide range of clinical services and settings of care (e.g., hospitals, ambulatory clinics, long-term care).
2. Even when researchers want to work on “local problems”, they often need a clinician to help lead the project – championing it to other clinicians, attending to the day to day work of implementing the intervention (responding to barriers and applying their detailed knowledge of their clinical environment to overcome these barriers, and so on). A researcher will not have the time to go to weekly meetings to determine why clinicians are not using the new checklist or order set, complying with the new protocol or whatever the case may be. And, unlike in much other research, these day to day tasks associated with leading a project cannot be delegated to a (non-clinical) graduate student. Successfully dealing with these problems requires clinical expertise and, ideally, respect from other staff.

For many projects, therefore, the natural partners for researcher may consist of clinicians who have some training in the methods of quality improvement, rather than graduate students. In other words, unlike in other areas of biomedical research, attracting (non-

clinical) graduate students will not necessarily increase the research productivity of researchers in QI.

Thus, we envisioned achieving two goals by training a cadre of clinicians in the methods of QI: i) equipping clinical units with staff able to develop, implement and evaluate improvement projects; and, ii) creating potential partners for researchers interested in carrying out interventions in numerous possible clinical settings.

3. Education and training played to our strengths as practicing clinicians and experienced educators of other clinicians. The leaders at C-QuIPS have substantial experience teaching clinicians on a variety of topics and applying content expertise in patient safety and healthcare quality to a wide variety of clinical contexts. We anticipated that training clinicians in quality improvement would become increasingly in demand and that clinicians would respond favourably to courses led by clinicians, as opposed to managers, improvement specialists, PhD researchers, and others who may have relevant content expertise but not be as familiar with the perspectives of frontline clinicians.

Our decision to focus on developing educational offerings designed to engage clinicians in quality improvement with the skills to participate meaningfully in the development and evaluation of interventions has increasingly seemed like the right one. Notable accomplishments are listed below and are further described in the section that follows.

- The University of Toronto Certificate Course in Quality Improvement in Patient Safety, has provided 125 individuals over 3 years with basic skills to develop, implement, and evaluate improvement projects.
- The new Master's stream in Quality Improvement and Patient Safety in partnership with IHPME has attracted a large pool of applicants for two years in a row, from a broad range of settings, including outside Toronto and even outside Ontario.
- Creation of a new job description for faculty engaged in QI activities in the UofT Department of Medicine. Four graduates of the Master's program have already been recruited into this job description and a fifth will come on faculty later this year.
- The Faculty-Resident Co-Learning Curriculum in Quality Improvement in the Department of Medicine, which has included 25 faculty members and nearly 80 residents from 12 subspecialties
- Becoming a site (the only one outside the US) in The VA Quality Scholars Program
- Building on the framework described in a commentary in *Annals of Internal Medicine* by Dr. Shojania (co-authored by the Chair of the Department of Medicine and the former Director of the University of Toronto's Office of Continuing Education and Professional Development) to develop innovative Continuing Education offerings that advance knowledge of and interest in QI (Shojania KG, Silver I, Levinson W. Continuing medical education and quality improvement: a match made in heaven? *Ann Intern Med*. 2012;156(4):305-8).

EDUCATION

Our priority lay in increasing the capacity to do research and local improvement work in the UofT community. Consequently, we focused our efforts in developing curricula for clinicians, managers, and senior trainees soon to go into practice or join faculty. We describe these efforts first, followed by educational programs for other learner groups. The emphasis has been on medical education. We have worked with hospital-based groups of nurses, pharmacists, and healthcare engineers. But, we have delivered only guest lectures for undergraduate and graduate audiences in these faculties. We did not attempt to develop new curricula in Nursing, Pharmacy, and Engineering, because these Faculties already had some internally developed programs with which we did not want to interfere and because we did not have the bandwidth to take these one as well as medical education.

We know from an environmental scan that we conducted (funded by the UK health Foundation) that centres like ours across North America and in Europe provide a number of different training opportunities in QI and patient safety that vary by intensity, scope and target audience. The activities we have run at C-QuIPS range from brief but intensive two-day workshops to longitudinal certificate-level programs to the establishment of a new graduate MSc program with a concentration in QI and patient safety in collaboration with IHPME. These offerings on their own constitute major commitments to QI and patient safety education, but C-QuIPS has further established itself as a major contributor to advancing scholarship in education and training around quality improvement and patient safety. C-QuIPS members were the lead authors of two separate reports for the Future of Medical Education in Canada (FMEC) Project for the Association of Faculties of Medicine of Canada (AFMC), as well as a Royal College of Physicians and Surgeons of Canada white paper on the future of patient safety education in Canada.

We have also published systematic reviews, state of the science reviews, and scoping reviews in leading medical education journals such as *Academic Medicine* and *Medical Education*, providing comprehensive summaries of how best to teach quality improvement, patient safety and discrete topics such as medical error disclosure. Many of the scholarly activities in QI and patient safety education receive peer-reviewed funding support from local as well as national granting agencies such as the Royal College of Physicians and Surgeons of Canada. This support has allowed for educational innovations and novel ways of building capacity, such as the use of co-learning as a strategy to teach QI to trainees and faculty members concurrently. As a result, national-level organizations in Canada and the United States increasingly seek the expertise of C-QuIPS members and engage them as core contributors to the design and implementation of their large-scale QI and patient safety educational programs. These include the Patient Safety Education Program (PSEP) organized through the Canadian Patient Safety Institute, the Advancing Safety for Patients in Residency Education (ASPIRE) train-the-trainer program organized through the Royal College of Physicians and Surgeons of Canada, and the Teaching for Quality (Te4Q) faculty development program organized through the Association of American Medical Colleges in the United States.

Publications related to these scholarly activities in education appear in the Research section and Appendix B. The section below describes the specific education programs we have developed at C-QuIPS.

Certificate Course in Quality Improvement and Patient Safety

The University of Toronto Certificate Course in Quality Improvement in Patient Safety, which ran for three years, has been a tremendous success, attracting 125 from a range of professions and clinical settings. The Centre received the 2010-2011 Colin Woolf Award for Excellence in Course Coordination from the University of Toronto's Office of Continuing Education and Professional Development for the Certificate Course. (Drs. Etchells and Shojania also received an award in Continuing Medical education from the Sunnybrook department of medicine.)

The course consists of approximately 50 hours over eight months, covering core concepts in patient safety and methods of quality improvement, using a mixture of didactic lectures, interactive workshop-type sessions, and project presentations by class participants to receive feedback on projects they are developing. Attendance has been consistently high despite the busy schedules of the participants. For 2008-09, the course filled to capacity within two weeks of its announcement (39 participants). For 2009-10, we expanded the total number of hours and received a grant from the Ministry of Health AFP Innovation Fund to support the further development and evaluation of this course; 48 participants enrolled. For 2010-11, we had planned to limit enrollment to 25, but received so many requests that we decided to limit the number of participants to 40.

Participants have come from a broad range of professional roles and represent all the fully affiliated teaching hospitals, as well as a number of community settings (see table below). Over 70% of participants have been physicians, including not just senior trainees and junior faculty, but several full professors and heads of departments or major clinical divisions. We consider the high rate of participation from physicians as a major success, as lack of physician engagement has been widely identified as a stumbling block in efforts to improve patient safety and healthcare quality. However, the predominance of physicians partly reflects the greater flexibility in their schedules. It tends to be easier for physicians, especially academic ones, to block off two afternoons a month, than for frontline nurses or pharmacists. (To address this concern, we developed a shorter version of the course offered over two days and have already delivered this version to two groups of approximately 20 frontline nurses, as well as other groups.)

At the end of the 2009-2010 program, we conducted a qualitative evaluation, interviewing participants. The results of this and other educational evaluations are presented later in the report "Summary of C-QuIPS Education Program Evaluations," p. 17).



Certificate Course participants working in groups to map the process of exiting an isolation room



Certificate Course participants analyzing the mapped process of removing personal protective equipment



Certificate course participants engaging in redesigning a defibrillator as part of a human factors engineering exercise



Certificate Course participants applying human factors design principles to improve workflow in a paediatric hospital room



Certificate Course participants applying human factors design principles to improve workflow in a paediatric hospital room



Certificate Course participants applying human factors design principles to improve epi-pen use

Improvement Fellowship Program

Building on the success of the Certificate Course, the Centre collaborated with St. Michael's Hospital to establish the Improvement Fellowship. The inaugural year (2011-2012) saw 22 successful applicants spanning a broad spectrum of professional roles, ranging from physicians, nurses and allied health professionals to a project manager in environmental services and a decision support associate. The Fellowship differed from the Certificate Course in having a smaller cohort (approximately 20 students per year instead of 40), allowing for a greater focus on mentoring participants in developing a specific improvement project and providing them with direct exposure to improvement projects at St. Michael's Hospital. St. Michael's hospital primarily delivered the second year of the Fellowship in January 2013. However, the Centre still played a role, as the St. Michael's lead, Dr. Chris Hayes, is a core member of the Centre, and other Centre faculty delivered guest lectures for the fellowship.

Certificate Course and Fellowship Participants

Institutional Breakdown	2008-09	2009-10	2010-11	2011-12*
Sunnybrook	10	9	-	3
SickKids	8	8	10	3
University Health Network	7	6	2	2
St Michael's Hospital	4	8	2	13
Mount Sinai Hospital	1	3	3	-
Centre for Addictions and Mental Health	3	1	-	-
Women's College Hospital	1	-	-	-
Baycrest	2	-	-	-
Toronto East General Hospital	-	3	7	-
Lakeridge Health	-	2	-	-
Trainees – Multiple Sites	3	4	7	-
North York General Hospital	-	-	5	-
HIROC	-	-	2	-
Toronto Rehab	-	-	1	-
St. John's Rehab	-	-	1	-
Other	-	2	-	1
Total	39	46	40	22

Master of Science Concentration in Quality Improvement and Patient Safety

The Centre had planned to develop a graduate program in patient safety and quality improvement roughly since its inception in 2009. In 2012, in the context of an opportunity suggested by the Dean of the Faculty of Medicine, the Centre collaborated with the Institute of Health Policy, Management and Evaluation (IHPME) to develop a one-year Master of Science concentration in

Quality Improvement and Patient safety (MScQIPS). This Master of Science degree provides a research-informed education in patient safety and healthcare quality improvement.

The program comprises 7 core courses that prepare graduates to lead, research or teach healthcare quality improvement and patient safety. Learning outcomes include knowledge of improvement science, skills for uncovering the root causes of quality and safety problems, knowledge and skills in methods to improve, test changes, learn and measure outcomes. Students also gain an understanding of system-wide healthcare quality issues and the leadership and implementation approaches necessary for the integration of these methods and tools into and across Canadian healthcare organizations. Students in this program are expected to contribute to the work of researchers and healthcare teams who are creating a growing body of empirical evidence that informs quality improvement and patient safety. (Appendix C presents details of the Master's courses and curriculum.)

Throughout the program, guest lecturers were invited to share and discuss practical experiences in core areas of improvement methods, risk management, health systems, measurement and evaluation, leadership and change management and knowledge translation. Guest lecturers presented issues related to the sustainability and spread of improvement concepts in healthcare locally and in other places such as in the United States, and in other Canadian provinces. The required Applied Project in the Project Practicum enabled students to test and learn about quality methods in a practice setting and experience how research informs the practical and scientific foundations of improvement science.

The instructors for the program are known for their expertise in the content and delivery of quality improvement and patient safety education. Throughout the first year, instructors adjusted their course material as much as possible in response to students' feedback, which was gathered at the end of each session.

We received 80 applications and accepted 25 students into the inaugural class (September 2012). The 25 successful applicants include: 11 physicians, with a mix of senior trainees, junior faculty members, including one from another university, and one full professor, 10 nurses, pharmacists, and other healthcare professionals, including one mid-wife, and four managers with non-clinical backgrounds. Seventeen of the 25 students worked in academic settings, while the other eight in non-academic ones. Most participants already have full-time jobs, but some were senior clinical trainees. The Department of Medicine appointed four of these trainees to the faculty after graduation and a fifth will likely come on faculty in the next 12 months. Some of the first year's graduates have also been engaged recruited to participate in teaching activities—in the Master's and other of our educational programs.

Approximately 80 individuals again applied for entrance into the second class (Sept 2013) and 25 were again accepted, with a similar makeup to the first cohort, except that four participants come from outside Ontario.

US Veterans Affairs Quality Scholars (VAQS) Program

Under the leadership of Dr. Chaim Bell, we became the only non-American site participating in the Quality Scholars Program in the US Veterans Affairs system. The VA Healthcare system has become recognized nationally and internationally as a leader in quality improvement over the past 10-15 years. The VAQS is a prestigious 2-year fellowship program (originally just for academically oriented physicians, but more recently for other healthcare professionals interested in research training related to quality improvement). The program includes faculty and students at 6 sites, including Dartmouth (the lead center), University of Alabama at Birmingham, Vanderbilt University, the University of California San Francisco, Case Western Reserve University in Cleveland, and the University of Iowa. Fellows and faculty meet for weekly videoconferences that include didactic material and discussions of projects. They also meet in person 3 times a year.

Dr. Chaim Bell leads the program at the UofT. We had 5 fellows in the first year (2011-12) and 6 in the second (2012-13)—more than some of the US sites. Enrollment has increased further, with 13 participants in 2013-14 (more than any other site). What the VAQS program offers that is distinct from the Master's and Certificate Course is a chance for academically oriented senior trainees and junior faculty to receive ongoing teaching and mentorship in the context of a network of trainees and faculty engaged in similar activities at major academic centres in the US. Some of individuals have enrolled in the masters as well as VAQS. For other individuals, VAQS has served as a complement to advanced training in clinical epidemiology. For instance, we have senior trainees and junior faculty who already have a master's in clinical research but whose interest like in quality improvement. Rather than enroll in another Master's program, they work on their improvement projects while attending the weekly lectures and discussions through VAQS.



VA Quality Scholars for 2011-2013(some absent) and Dr. Chaim Bell (far right)

Summary of C-QuIPS Education Program Evaluations

Educational Activity	Date	Overall Evaluation Score	Sample Comments
Certificate in Patient Safety and Quality Improvement	2009-2010	9.15/10	-Presenters are very knowledgeable in their fields -Excellent group discussions
	2010 - 2011	9.09/10	-Good balance of introducing concepts with discussion and interaction -Learning exercise was very interesting, should be basic med school material
Improvement Fellowship	2011-2012	9.29/10	- Very helpful overview of quality theory, many new aspects and topics for me - Loved the exercises and frequent small breaks
Quality Improvement Workshops	October 2011	9.58/10	-Excellent use of humour and truly engaged participation -Very informative and well presented workshop
	February 2012	9.40/10	-Passion of presenters for the topic -Good combination of didactic and interactive
	April 2012 (Quinte)	9.55/10	-Common sense approach utilizing real case studies -Honesty and straight forward presentation of research/supported finding
Most Responsible Physician (MRP) Workshops	April 2011	9.21/10	-The speaker was able to engage the audience and present abstract theory practically -Strong reinforcement of simple concepts, allowing for high % of take home messages
	May 2011	9.43/10	-Excellent introduction to looking at QI issues and becoming aware of pitfalls -Straight forward and simple presentation of complex issues around implementation
	October 2011	9.09/10	-Well presented and led sessions -Humbled by the complexity of the process -An amazing activity to a realistic problem
Co-Learning Quality Improvement Curriculum	September 2012	9.42/10	-Very interactive, have clear instructions, facilitated discussion -Very clear breakdown of concepts; nice to be able to apply to our projects in a step by step manner
	January and February 2013	9.29	-Excellent use of analogies/examples & interactive exercises. -Clearly knowledgeable & enthusiastic.
IHPME Master of Science (Quality Improvement and Patient Safety concentration)	2012-2013	2.73*	* IHPME uses a rating scale such that lower scores are better: 1(excellent), 2 (very good), 3 (good), 4 (fair), 5 (poor)

Qualitative Feedback from Participants in Certificate Course

At the end of the 2009-2010 course (our second year), we conducted a qualitative evaluation, interviewing participants to better understand how the course has impacted professional activities and how to improve the course. Participants appreciated the opportunity to obtain current knowledge, network with peers, and develop projects. Some of their comments are shown below.

“I didn’t know how to go where I wanted to go. Now I know how.”

“I took on more of a leadership role ... so I wanted to take the course just to develop my skills.”

“I thought this would be a great thing to sort of have all the tools and the info to be able to execute quality projects more efficiently.”

“I liked how they...organized it. I think pulling together a community of people was very interesting.”

“It’s wetted my appetite for more information and more things to do in this area.”

Participants recommended broadening topics beyond acute care and developing ongoing mentoring programs, (*“I think we probably with time are going to need more one-to-one mentoring around our projects”*). We partially incorporated this feedback the following year and more substantially into the re-launched certificate course for 2013-14.

Educational Activities for Undergraduate, Graduate and Postgraduate Students

Undergraduate students

Patient Safety Curriculum, Transition to Clerkship & Transition to Residency Courses, University of Toronto Medical School

The undergraduate curriculum has undergone a number of changes over the past few years. These changes have encouraged greater exposure of students to core patient safety and quality improvement concepts. C-QuIPS members designed and delivered a full-day patient safety session as part of the “transition to clerkship”. The day begins with a didactic lecture that introduces key concepts in the context of engaging clinical cases. The lecture also highlights the importance of keeping the possibility of error in mind when taking care of patients in real time, rather than presenting patient safety solely as a health policy problem or research target. The rest of the day includes detailed case-based discussions that were developed (by Dr. Shojania and colleagues at the University of California San Francisco) as part of a series of articles in the *Annals of Internal Medicine*.

We chose this case-based approach to engage students because the course occurs just prior to the students’ first clinical rotations. The case-based tutorials cover clinical aspects of the case as well as highlighting patient safety issues related to teamwork and communication, human factors (one of the cases involves a series of equipment related areas including a nasogastric pump attached to the wrong wall nozzle for suction), cognitive biases (one of the cases involves a diagnostic error), and supervision. The course was initially taught by Drs. Kaveh Shojania, Anne Matlow, Chris Hayes and Ed Etchells. Dr. Trey Coffey now leads the course, with some of the previous core faculty helping to lead tutorials sessions, but we are

broadening the involvement to include young clinical educators with an interest in quality improvement (e.g., one of the recent physician graduates from our Master's program). In the upcoming year, members from the Centre will collaborate with the organizers of the transition to clerkship course to develop novel curricula related to the stewardship of finite healthcare resources.

Institute for Healthcare Improvement (IHI) Open School, Toronto Chapter

Established in 2009, the University of Toronto Chapter of the IHI Open School is an interdisciplinary educational community that provides students with the quality improvement and leadership skills to become change agents in healthcare improvement. Students from a variety of healthcare (e.g., medicine, nursing, pharmacy) and healthcare related (e.g., engineering, public health) disciplines come together to engage in educational experiences applied to team-based quality improvement initiatives. Several Centre members serve as faculty advisors and have directly overseen quality improvement projects and provided mentorship to IHI open school members. C-QuIPS has also funded students to attend the IHI Annual Meeting to present posters of their work.

Postgraduate Clinical Trainees

PGCorEd™ Patient Safety module, Postgraduate Medical Education

In collaboration with the Postgraduate Medical Education Office, we developed the PGCorEd™ Patient Safety module, a 30-minute multimedia, web-based educational module that is mandatory to complete for residents in all postgraduate training programs at the University of Toronto.

Patient Safety Curriculum, Department of Medicine Academic Half Day Program

Since 2011, Dr. Brian Wong has led the design and delivery of a longitudinal patient safety curriculum for core internal medicine residents at the University of Toronto. The curriculum centers on the theme of handoffs and transitions, and uses these contexts to introduce fundamental patient safety competencies as outlined by the Canadian Patient Safety Institute (CPSI) Safety Competency Framework such as teamwork, structured communication, systems thinking and safety culture.

I-PASS Handoff and Team Communication Training, Hospital for Sick Children

Dr. Trey Coffey is the site lead for the I-PASS study, a multisite research study evaluating the impact of a comprehensive handoff improvement bundle on medical errors, handoff quality and efficiency, and resident satisfaction with handoff. One of the key components of the bundle is the delivery of a teamwork and handoff curriculum to residents in the paediatrics residency training program.

Patient Safety and Quality Improvement Expert Working Group, CanMEDS 2015, Royal College of Physicians and Surgeons of Canada

The Royal College of Physicians and Surgeons of Canada is currently revising the CanMEDS competency framework. One of the key activities is the integration of safety and quality competencies into the existing framework. Dr. Brian Wong is acting as the Chair of the Patient Safety and Quality Improvement Expert Working Group. In this capacity, he will have the opportunity to lead the establishment of core physician competencies as they relate to patient safety and quality improvement. Once implemented, the Royal College of Physicians

and Surgeons of Canada will require all residency programs to incorporate patient safety and quality improvement training into their curricula.

Faculty-Resident Co-Learning Curriculum in Quality, Department of Medicine

Two of the Centre's members led the design, delivery and evaluation of an innovative faculty-resident co-learning curriculum in quality improvement. This year-long program brought together senior subspecialty trainees, faculty leads and residency program directors to learn about quality improvement and work together in faculty-resident teams on quality improvement projects. Due in large part to positive participant reviews, the program has expand from 3 subspecialty training programs in 2011-12, to 9 programs in 2012-13, and to 12 programs in 2013-14. Over 25 faculty members and nearly 80 residents have taken part in this program in the first 2 years. Six of the faculty member participants, through participating in this program in prior years, have developed skills in teaching quality improvement and will teach as part of this program in the 2013-14 academic year.

Health care professionals

The Certificate Course, Improvement Fellowship, and Master's program have already been described. All of these programs primarily targeted healthcare practitioners. Additional educational offerings targeted at healthcare professionals are listed below.

Ontario Ministry of Health's Most Responsible Physician Quality Improvement Program

Based on the success of the Certificate Course, we were awarded a contract (\$248,000 over two years) from the Ontario Ministry of Health and Long-Term Care to provide education and support to physicians enrolled in the MOH's Most Responsible Physician Quality Improvement (MRP QI) Program, an initiative designed to provide modest remuneration to hospital-based, fee-for-service physicians to take time away from seeing patients in order to carry out quality improvement work. The MOH engaged us to develop educational workshops and provide project support for participants in this program. Three workshops were delivered (two basic and one advanced) to 120 physicians from 73 hospitals across Ontario. Participants provided uniformly enthusiastic evaluations after the sessions:

- *“It was inspiring.”*
- *“I learned more in 1 hour than my entire Master's degree.”*
- *“It was the best learning experience I've ever had.”*
- *“Excellent content!”*

The contract with the MOH also included the provision of coaching to attendees of the workshops around their specific projects. The coaching also generated very positive feedback from participating physicians:

- *“Thanks again for all your help. It was really inspiring to be able to get assistance from someone so knowledgeable like you! In fact, it made me think that as a working doc in the trenches, unlike as a resident, one gets so little chance to ask for intellectual mentorship, unless one is part of one of the big tertiary academic centres with lots of academics surrounding you, so I really appreciate... your time to help me think further on my project.”*
- *“Thanks - you guys are such a great help/support.”*

Quality Improvement Workshops and Ontario Hospitals Association “Quality Improvement Bootcamp”

The Centre developed an 8-hour workshop for participants who have little to no background in this field and would like to learn more, but do not have the time to devote to a course running over the 8-9 months of the Certificate Course. We received \$20,000 from the Ontario Hospitals Association (OHA) to deliver this course for 60 participants who attended the OHA’s Quality Improvement Bootcamp in May 2011. We have run similar workshops for groups of 20 attendees at a time at the Centre’s SickKids offices. Attending groups have included the Temmy Latner Centre for Palliative Care, and two groups of roughly 20 nurses engaged in improvement projects at St. Michael’s Hospital. These workshops have provided profits of \$15,000-\$18,000 per workshop. We also delivered a series of workshops to staff and senior leaders at Quinte Healthcare in Belleville, ON.

Faculty Educators

Faculty-Resident Co-Learning Curriculum in Quality, Department of Medicine

This program was already described above under postgraduate trainees. In addition to 80 residents who have participated in this program, over 25 faculty members took part in this program in the first two years. Six of the faculty member participants, through participating in this program in prior years, have developed skills in teaching quality improvement and will teach as part of this program in the 2013-14 academic year.

Patient Safety Education Program (PSEP), Canadian Patient Safety Institute

The Canadian Patient Safety Institute, in partnership with Northwestern University, developed the Patient Safety Education Program, an interprofessional train-the-trainer educational program that certifies participants as patient safety trainers. Several Centre members are certified Master Facilitators and have made significant contributions to revamping the content of the program for a Canadian audience. Over the past 3 years, Centre members have served as core faculty for this program, which has enrolled over 200 interprofessional participants from across the country.

Advancing Patient Safety in Residency Education (ASPIRE), Royal College of Physicians and Surgeons of Canada & Canadian Patient Safety Institute

The Royal College of Physicians and Surgeons of Canada (RCPSC), in partnership with the Canadian Patient Safety Institute (CPSI), developed a national patient safety train-the-trainer program for postgraduate medical educators interested in incorporating patient safety content into their training programs. In April 2013, 56 participants from across the country participated in the inaugural 4-day program. Two Centre members contributed significantly to the design and delivery of the programs as members of both the ASPIRE steering and the curriculum design committees.

Teaching for Quality (Te4Q), Association of American Medical Colleges

The Association of American Medical Colleges (AAMC) established Teaching for Quality (Te4Q) to support the AAMC / University HealthSystem Consortium (UHC) Best Practices for Better Care campaign. Te4Q seeks to facilitate the integration of quality improvement and patient safety into medical education across the curriculum. One of the key activities is the development of a training program to develop a cadre of quality improvement teachers and educators across the United States. The first phase involved the publication of a report (Te4Q:

Integrating Quality Improvement and Patient Safety across the Continuum of Medical Education) – one of the Centre’s members was a co-author for this report. The second phase involves the development of the actual faculty development program – again, one of the Centre’s members is actively involved as a curriculum development committee, and is co-leading the program evaluation part of the initiative.

RESEARCH

Core and affiliated members engage in a broad range of research, mostly in the acute care setting, but also focused on improved care coordination and transitions across settings of care. Specific research topics include clinical informatics, medication safety, usability and human factors engineering, fatigue, handoffs between providers, innovative models for teaching the concepts and methods of quality improvement, and improving methods for identifying patient safety problems. Some research highlights appear below followed by a more detailed analysis of research productivity.

- Dr. Chris Parshuram (paediatric research lead for C-QuIPS) received a \$3.3 million award from the Canadian Institutes for Health Research (CIHR) to conduct a multi-centre cluster randomized trial of the “The Bedside Paediatric Warning System” which he has developed over the past several years. The trial includes 22 hospitals in Canada, the US, and New Zealand.
- Prof. Ross Baker was part of a \$1.3M CIHR-funded project to conduct a national study of adverse events in the home care setting—the first national study to apply the methods of previous adverse event research to characterize the types of preventable harms experienced by patients receiving home-based care. The first main results from this study were recently published with an accompanying editorial and a press release from the Canadian Patient Safety Institute.
- Drs. Brian Wong and Kaveh Shojania, along with several other core members of the Centre, including Dr. Ed Etchells and Prof. Ross Baker, received the highest ranking in the Canadian Patient Safety Institute’s annual grant program, for a study entitled Promoting Real-Time Improvements in Safety for the Elderly (PRISE).
- Dr. Anne Matlow led a multi-centre team, including Prof. Ross Baker, Dr. Trey Coffey, and Virginia Flintoft from the Centre, to conduct the first national paediatric adverse event study. The main paper presenting the study’s appeared in the CMAJ (*Canadian Medical Association Journal*).
- Dr. Ed Etchells led a team, including several members of the Centre (Drs. Shojania and Anne Matlow) that successfully obtained the award associated with a Request for Proposals from the Canadian Patient Safety Institute to evaluate the economic burden of patient safety problems and cost-effectiveness assessments of patient safety interventions.
- Dr. Shojania is on the core project team (as the Scientific Chair) for *Building Bridges to Integrate Care*, a \$5M program by the UofT Departments of Medicine and Family

and Community Medicine at the University of Toronto and funded by the Ontario Ministry of Health and Long-term Care. BRIDGES supports the evaluation of 9 innovative models of care delivery with an emphasis on reducing avoidable hospitalizations through better care coordination for patients with chronic illnesses.

- Dr. Shojania was part of the core project team on a \$1M contract from the US Agency for Healthcare Research and Quality (AHRQ) to produce a comprehensive set of systematic reviews evaluating the effectiveness of patient safety interventions. The project involved investigators at 5 AHRQ Evidence-based Practice Centers funded by (RAND-UCLA, Stanford, University of California San Francisco, Johns Hopkins University, and the non-profit research institute ECRI (Emergency Care Research Institute). *Annals of Internal Medicine* published multiple papers from this work as a supplement in Feb 2013.
- Dr. Trey Coffey leads the sole Canadian site in \$2M, 10-site study funded by the US Department of Health and Human Services to implement and evaluate a structured patient handoff program for clinical trainees.
- Dr. Shojania became the Editor-in-Chief of *BMJ Quality and Safety* in January 2011. Published by the *British Medical Journal*, *BMJQS* accepts only 18% of the roughly 1000 manuscripts received each year and has the highest impact factor of any of the journals in the fields of patient safety and quality improvement. Two C-QuIPS faculty members, Dr. Chaim Bell and Prof. Ann Tourangeau, are Associate Editors at the journal.

Research productivity

Core faculty who hold leadership positions within the Centre published 179 peer review articles related to patient safety or quality improvement (2009-2013). For all members of the Centre (i.e., all core and affiliate members listed in Appendix A), the total number of publications is 405.

Thirty selected publications (2009-2013) in high impact general medical journals (the *Lancet*, *JAMA*, *Annals of Internal Medicine*, *BMJ*) and leading journals in safety/quality, informatics, and medical education journals (e.g., *Academic Medicine*) appear below. The full list of publications appears in Appendix B.

Selected Research Articles

1. **Wong BM**, Kuper A, Hollenberg E, **Etchells EE**, Levinson W, **Shojania KG**. Sustaining Quality Improvement and Patient Safety Training in Graduate Medical Education: Lessons From Social Theory. *Acad Med*. 2013;88(8):1149-1156.
2. Blais R, Sears NA, Doran D, **Baker GR**, et al. Assessing adverse events among home care clients in three Canadian provinces using chart review. *BMJ Qual Saf*. 2013 [Epub ahead of print].
3. Fallis BA, Dhalla IA, Klemensberg J, **Bell CM**. Primary medication non-adherence after discharge from a general internal medicine service. *PLoS One*. 2013;8(5):e61735.
4. Stroud L, **Wong BM**, Hollenberg E, Levinson W. Teaching medical error disclosure to physicians-in-training: a scoping review. *Acad Med*. 2013;88(6):884-92.

5. Emery DJ, **Shojania KG**, Forster AJ, Mojaverian N, Feasby TE. Overuse of magnetic resonance imaging. *JAMA Intern Med.* 2013;173(9):823-5.
6. Kwan JL, Lo L, Sampson M, **Shojania KG**. Medication reconciliation during transitions of care as a patient safety strategy: a systematic review. *Ann Intern Med.* 2013;158(5 Pt 2):397-403.
7. Wu RC, Lo V, Morra D, **Wong BM**, et al. The intended and unintended consequences of communication systems on general internal medicine inpatient care delivery: a prospective observational case study of five teaching hospitals. *J Am Med Inform Assoc.* 2013;20:766-77.
8. **Wong BM**, Cheung CM, Dharamshi H, Dyal S, Kiss A, Morra D, Quan S, Sivjee K, **Etchells EE**. Getting the message: a quality improvement initiative to reduce pages sent to the wrong physician. *BMJ Qual Saf.* 2012;21(10):855-862.
9. **Matlow AG**, **Baker GR**, Flintoft V, Cochrane D, **Coffey M**, et al. Adverse events among children in Canadian hospitals: the Canadian Paediatric Adverse Events Study. *CMAJ.* 2012;184(13):E709-18.
10. **Etchells E**, Koo M, Daneman N, McDonald A, Baker M, **Matlow A**, Krahn M, Mittmann N. Comparative economic analyses of patient safety improvement strategies in acute care: a systematic review. *BMJ Qual Saf.* 2012;21(6):448-56.
11. Tricco AC, Ivers NM, Grimshaw JM, Moher D, Turner L, Galipeau J, Halperin I, Vachon B, Ramsay T, Manns B, Tonelli M, **Shojania K**. Effectiveness of quality improvement strategies on the management of diabetes: a systematic review and meta-analysis. *Lancet.* 2012;379(9833):2252-61.
12. **Bell CM**, Brener SS, Gunraj N, et al. Association of ICU or hospital admission with unintentional discontinuation of medications for chronic diseases. *JAMA.* 2011;306(8):840-847.
13. Shekelle PG, Pronovost PJ, Wachter RM, Taylor SL, Dy SM, Foy R, Hempel S, McDonald KM, Ovretveit J, Rubenstein LV, Adams AS, Angood PB, Bates DW, Bickman L, Carayon P, Donaldson L, Duan N, Farley DO, Greenhalgh T, Haughom J, Lake ET, Lilford R, Lohr KN, Meyer GS, Miller MR, Neuhauser DV, Ryan G, Saint S, **Shojania KG**, Shortell SM, Stevens DP, Walshe K. Advancing the science of patient safety. *Ann Intern Med.* 2011;154(10):693-6. *This publication summarized work funded by the US Agency for Healthcare Research and Quality. The long list of authors includes many of the most prominent researchers in the field.*
14. Kotsakis A, Lobos AT, **Parshuram C**, et al; Ontario Paediatric Critical Care Response Team Collaborative. Implementation of a multicenter rapid response system in paediatric academic hospitals is effective. *Paediatrics.* 2011;128(1):72-8.
15. Chan J, **Shojania KG**, Easty AC, **Etchells EE**. Usability evaluation of order sets in a computerised provider order entry system. *BMJ Qual Saf.* 2011;20(11):932-40.
16. **Etchells E**, Adhikari NK, Wu R, Cheung M, Quan S, Mraz R, **Wong B**, et al. Real-time automated paging and decision support for critical laboratory abnormalities. *BMJ Qual Saf.* 2011;20(11):924-30.
17. Forster AJ, Worthington JR, Hawken S, Bourke M, Rubens F, **Shojania K**, van Walraven C. Using prospective clinical surveillance to identify adverse events in hospital. *BMJ Qual Saf.* 2011;20(9):756-63.
18. **Matlow AG**, Cronin CM, Flintoft V, Nijssen-Jordan C, Fleming M, Brady-Fryer B, Hiltz MA, Orrbine E, **Baker GR**. Description of the development and validation of the Canadian Paediatric Trigger Tool. *BMJ Qual Saf.* 2011;20(5):416-23.
19. **Etchells E**, Adhikari NK, Cheung C, Fowler R, Kiss A, Quan S, Sibbald W, **Wong B**. Real-time clinical alerting: effect of an automated paging system on response time to critical laboratory values--a randomised controlled trial. *Qual Saf Health Care.* 2010;19(2):99-102.
20. Kennedy TJ, Regehr G, **Baker GR**, Lingard L. Preserving professional credibility: grounded theory study of medical trainees' requests for clinical support. *BMJ.* 2009;338:b128.

Selected Editorials, Commentaries, and Reviews

1. Kwan JL, **Bell CM**. Should we rethink the scheduling of elective surgery at the weekend? *BMJ*. 2013;346:f3353.
2. Shekelle PG, Pronovost PJ, Wachter RM, McDonald KM, Schoelles K, Dy SM, **Shojania K**, et al. The top patient safety strategies that can be encouraged for adoption now. *Ann Intern Med*. 2013;158(5 Pt 2):365-8.
3. **Shojania KG**, Dixon-Woods M. 'Bad apples': time to redefine as a type of systems problem? *BMJ Qual Saf*. 2013;22(7):528-31.
4. **Shojania KG**, Thomas EJ. Trends in adverse events over time: why are we not improving? *BMJ Qual Saf*. 2013;22(4):273-7.
5. Chopra V, **Shojania KG**. Recipes for checklists and bundles: one part active ingredient, two parts measurement. *BMJ Qual Saf*. 2013;22(2):93-6.
6. **Shojania KG**, Silver I, Levinson W. Continuing medical education and quality improvement: a match made in heaven? *Ann Intern Med*. 2012;156(4):305-8.
7. **Shojania KG**, Levinson W. Clinicians in quality improvement: a new career pathway in academic medicine. *JAMA*. 2009;301(7):766-8.
8. **Shojania KG**. Deaths due to medical error: jumbo jets or just small propeller planes? *BMJ Qual Saf*. 2012;21(9):709-12.
9. **Wong BM**, **Etchells EE**. Improving communication of critical laboratory results: know your process. *BMJ Qual Saf*. 2012;21(8):624-6.
10. Wright J, **Shojania KG**. Measuring the quality of hospital care. *BMJ*. 2009;338:b569.

Research Output for C-QuIPS Compared with Centers in Canada, US, and the UK

We sought to compare our research output (in terms of publications) with comparable centres in Canada, the US, and the UK. We chose Imperial College in the UK as it has had an internationally recognized Centre for Patient Safety and Service Quality for many years. For the US, we chose one of the most widely recognized centres for patient safety (at Johns Hopkins) as well as the program at Northwestern University, because it has had a formal Master's program for several years. For Canada, we chose the two most prominent other Centres—the Ward of the 21st Century (W21C) at the University of Calgary and The Ottawa Hospital Centre for Patient Safety.

For each of the Centres, some members have published papers on a wide variety of topics, not just related to quality or safety. To avoid having to sort through the citation lists for each centre and apply subjective judgments about what counts as related to patient safety or healthcare quality, we applied a PubMed search string with key terms related to patient safety and healthcare quality to the list of authors/members for each of the above Centers. (See Appendix B for details).

Centre	Members	Medline Publications (Jan 2009-July 2013)	Publications per member
C-QuIPS (Toronto)	8 (48)*	179 (405)*	22 (7)
Ottawa Hospital	3	85	28
University of Calgary	22	96	4
Northwestern University	26	205	8
Johns Hopkins University	43	444	10
Imperial College London	54	405	7.5

* For C-QuIPS, we performed one search restricted to the 8 members who have held titles positions within C-QuIPS— Kaveh Shojania (Director), Brian Wong (Associate Director, Sunnybrook), Edward Etchells (former Associate Director, Sunnybrook and still a core member), Trey Coffey (Associate Director, SickKids) or Anne Matlow (former Associate Director, SickKids), or Chris Parshuram (Research Director, SickKids), or Ross Baker (Director of Graduate Studies, and Chaim Bell (lead for VA Quality Scholars Program). This restricted search yield 179 publications from 2009-July 2013. A separate search including the additional 48 core and affiliate members yielded 226 additional papers, for a total of 405 publications from 2009-213.

As can be seen from the Table, C-QuIPS compares favorably in terms of the total number of publications and the number of publications per member. That said, the total number of publications and publications per member do not convey the collaborative productivity at each Centre work together. In this regard, Imperial is particularly noteworthy. While Imperial has a modest total number of publications (and low number per member), scanning the publication list (Appendix B) reveals that the average number of members per publication is probably higher than for any of the Centres. Imperial seems to have more publications with 3 or more members as authors. It also seems to have the fewest publications with just one member as an author. It was too labour intensive to calculate these statistics formally (e.g., generating the median centre members per publication), but we wanted to acknowledge this positive characteristic—that the publication record at Imperial suggests the greatest degree of collaboration between its members.

SUPPORTING LOCAL IMPROVEMENTS IN PATIENT SAFETY

Each of the University of Toronto hospitals has a department of patient safety or quality improvement focused on operational initiatives ranging from preparing for accreditation to implementing specific improvement activities. The vision for the Centre thus lay in more academic, externally facing activities, such as generating new knowledge in patient safety and developing innovative educational programs. However, generating new knowledge and educating trainees serve little purpose if we cannot foster the local uptake of new knowledge and innovations.

Our efforts to foster local improvements have taken two main forms. First, we have focused much of our educational activities on faculty development. Through the Centre's Certificate Course in Quality Improvement and Patient Safety, we have provided numerous staff (approximately 125, plus an additional 50 through the Improvement fellowship) at Toronto hospitals (and some outside Toronto) with the knowledge and tools to characterize patient safety problems and effectively develop improvement initiatives to address them.

Within the UofT Department of Medicine, we have developed a distinct job description for academic physicians engaged in quality improvement. The need for and ideas behind this job description were initially articulated in a commentary by the C-QuIPS Director published in the *Journal of the American Medical Association* [Shojania KG, Levinson W. Clinicians in quality improvement: a new career pathway in academic medicine. *JAMA*. 2009;301:766-768]. We currently have 15 faculty members in this job description.

Second, we have looked for opportunities to leverage academic expertise and resources at the Centre to help hospitals evaluate or improve some of their specific activities around patient

safety. For instance, we assisted two hospitals in evaluating patient safety walkrounds (a widely recommended practice in which executives meet with frontline staff and ask them about their concerns related to patient safety) and two hospitals in evaluating their critical incident review processes. We presented the results for these evaluations to the hospitals involved and will work with them to make changes that will address some of the problems identified in our evaluation. One of these evaluations has been written up for publication and is in the final stages of revision (i.e., it has been tentatively accepted pending final revisions).

Synergy between C-QuIPS and internal roles at Sunnybrook and SickKids

At the SickKids hub of the Centre, the Associate Director role has also held the role of Safety Officer for the Hospital, which has enhanced our integration with frontline health professionals engaged in improvement work. In these dual roles, Dr. Coffey continually looks for ways to achieve synergy between the operational work of the hospital with the Centre's mandate to create, disseminate, and implement new knowledge to improve patient safety.

The Medication Reconciliation experience illustrates this. Originally done operationally on a voluntary basis with the *SaferHealthcareNow!* Campaign, Centre faculty have since produced several academic publications on medication reconciliation and continue to lead the spread of and refinements to this program.

The I-PASS project is another example of integration between Centre Faculty's research, dissemination, and education efforts from the local to international level. As site PI for the multi-site study, Dr. Coffey is well positioned to integrate handoff and teamwork training into the U of T undergraduate education program and has successfully spread handoff improvements across hospital units and disciplines.

At Sunnybrook, Dr. Etchells has led similar efforts—first in his capacity as director of the Patient Safety Service at Sunnybrook (which was folded into the Centre after it was formed) and later as Medical Director of Informatics. For example, published work he has led on medication reconciliation and the optimal design of computerized order sets grew out of efforts in these internal roles related to patient safety.

FOSTERING CONNECTIVITY

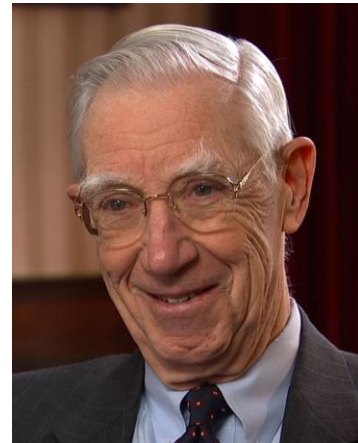
We recognized when the Centre was established that a number of groups with expertise and interests related to patient safety already existed within the University of Toronto community. Unfortunately, these groups often work in isolation, within the silos created by the organization of University faculties and departments, as well as hospital-based research institutes. We have sought therefore to foster connections between these diverse groups in order to enhance collaboration around initiatives to study and address patient safety problems.

- We launched the Centre's website in 2010 (www.cquips.ca) as a central repository of information and activities related to the Centre, such as announcements of rounds and other events, but also including a searchable listing of the approximately 50 faculty

affiliated with the Centre along with their areas of expertise. This publicly available database permits users to search by various topic areas, methodologies, and settings of care in order to identify individuals with specific types of expertise.

- Our annual symposium has attracted each year approximately 200 researchers, educators, clinicians, patient safety officers, and hospital executives from the Greater Toronto Area and around the province. Speakers have included prominent international researchers, including:

- Dr. Lucian Leape, widely regarded as one of the ‘fathers’ of the patient safety field
- Dr. Tejal Gandhi from Brigham and Women’s Hospital and Harvard University (and now President of the National Patient Safety Foundation), known for her research and leadership in a range of patient safety topics (ambulatory medication errors, diagnostic errors, clinical informatics applications)
- Dr. Alan Forster, Director of The Ottawa Hospital centre for Patient Safety and developer of the Ottawa Hospital’s Data Warehouse, which has supported numerous research studies and internal improvement efforts
- Dr. Thomas H. Lee, a senior executive at Partners Health Care in Boston, Professor at Harvard University, and Associate Editor at the *New England Journal of Medicine*
- Dr. Eric Thomas, Director of a highly productive research group and one of the lead investigators of the Utah-Colorado study (one of the two seminal studies highlighted in the US Institute of Medicine Report *To Err is Human*)
- Drs. Uma Kotagal and Stephen Muething from Cincinnati Children’s, an internationally renowned Paediatric Hospital in general, but also known for its leading work in patient safety and quality improvement (Dr. Atul Gawande highlighted the extraordinary quality improvement work there for cystic fibrosis care in one of his *New Yorker* articles)
- Dr. Alan Forster, Director of The Ottawa Hospital centre for Patient Safety and developer of the Ottawa Hospital’s Data Warehouse, which has supported numerous research studies and internal improvement efforts



Dr. Lucian Leape



Dr. Lucian Leape presenting his work on the “hidden curriculum” at the Pre-Symposium Dinner at the 2nd annual symposium



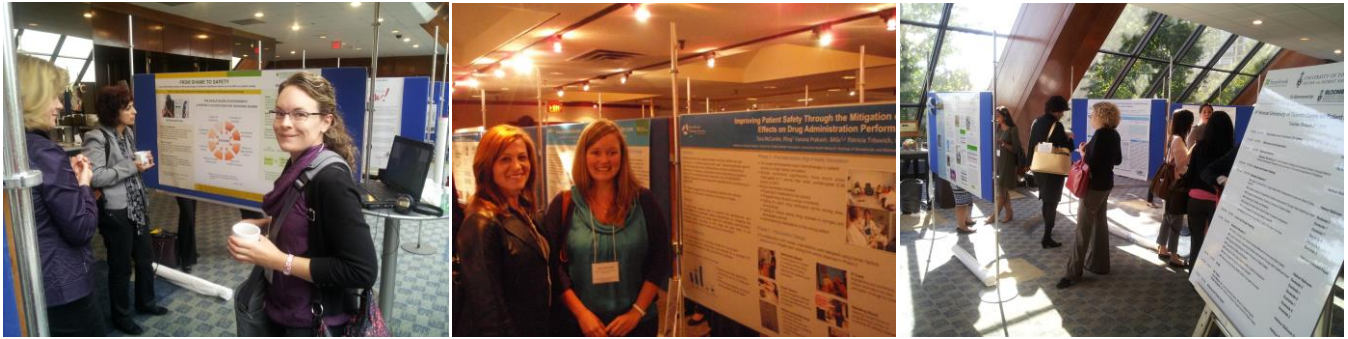
Plenary Panel on the Excellent Care For All Act at the 2nd Symposium (L to R: Ross Baker, Tom Closson, Mary Jo Haddad, Barry McLellan, Adelsteinn Brown)



Dr. Kaveh Shojania presents the Poster Award to Dr. John Abrahamson, Julian Wiegelmann and Dr. Ian Fraser, who are part of the team behind “Community Hospital Critical Care Response Team (CCRT) responses identify more preventable adverse events than incident reporting”



Keynote speaker, Dr. Thomas Lee, and Prof Ross Baker in discussion with an attendee at the 2nd Annual Symposium



Poster sessions at the various Symposia over the years



Dr. Sara Singer, from Harvard School of Public Health, speaks to an attendee after her session on Safety Culture at the 4th Symposium



Dr. Ann Tourangeau moderating a panel on engaging interdisciplinary frontline staff at the 4th Symposium



Dr. Stephen Muething, the Keynote from Cincinnati's Children presents his work on the Ohio Collaborative to improve patient safety network



Drs. Kaveh Shojania and Ed Etchells present the Best Overall Poster Award to Dr. Christine Soong for her poster: "A novel approach to improving emergency department consultant response times" and Best Trainee Poster Award to Adina Weinerman for her poster: "Lost in Translation: Inconsistent Code Status Documentation amongst Internal Medicine Inpatients" at the 4th Annual Symposium

- We initiated city-wide QI and Patient Safety rounds, which have included a number of prominent visiting researchers, and Research in Progress Rounds, which give members of the Centre (especially junior faculty) the chance to present work at an early stage and receive feedback.



Dr. Jerome Leis presented his project at the inaugural Work in Progress Rounds on: “Modified urine culture reporting as a strategy to decrease antimicrobial therapy for asymptomatic bacteriuria: a controlled time series analysis” along with Dr. Tania Principi (not pictured), who presented on: “The Effective Care Project – developing a novel system to communicate with patients post discharge”



Dr. Doug Cochrane , Director of the British Columbia Patient Safety & Quality Council presenting on: “Team Behaviours and Non-Technical Skills in a Paediatric Surgical Facility”



Dr. Martin Marshall from the UK discussed research and evidence in guiding innovation and health policy in the NHS on May 2, 2013



Amitai Ziv from the Israel Center for Medical Simulation delivered a talk in simulation and patient safety to a full audience at the Centre.

- The Centre has collaborated with specific groups working in patient safety, including the Healthcare Human Factors group at University Health Network, members of the Patient Safety and Quality Departments at Sick Kids, Sunnybrook, Mount Sinai, and St. Michael's Hospital, as well as the Centre for Innovations in Complex Care at University Health Network.
- C-QuIPS houses the SickKids Chapter of the Paediatric International Patient Safety and Quality Community (PIPSQC), with members meeting monthly at C-QuIPS to discuss local safety topics and hold discussions with invited experts. Participants in the Centre's educational programmes present Works In Progress, and graduates of Centre programs and other junior faculty come for advice and peer-to-peer mentorship about navigating QI projects through the complex academic health science centre setting. The networking and building of collegial relationships fosters a sense of energy and momentum in the field of QI, and extends far beyond the boundaries of the Centre as we interact and collaborate regularly with other faculty, trainees, and hospital administrators and executives.

DISSEMINATION

In addition to the 179 publications from faculty with leadership positions in C-QuIPS, we have delivered over 100 presentations outside of Ontario (i.e., national or international presentations), and many more local and regional ones. We also have numerous connections with national and international organizations.

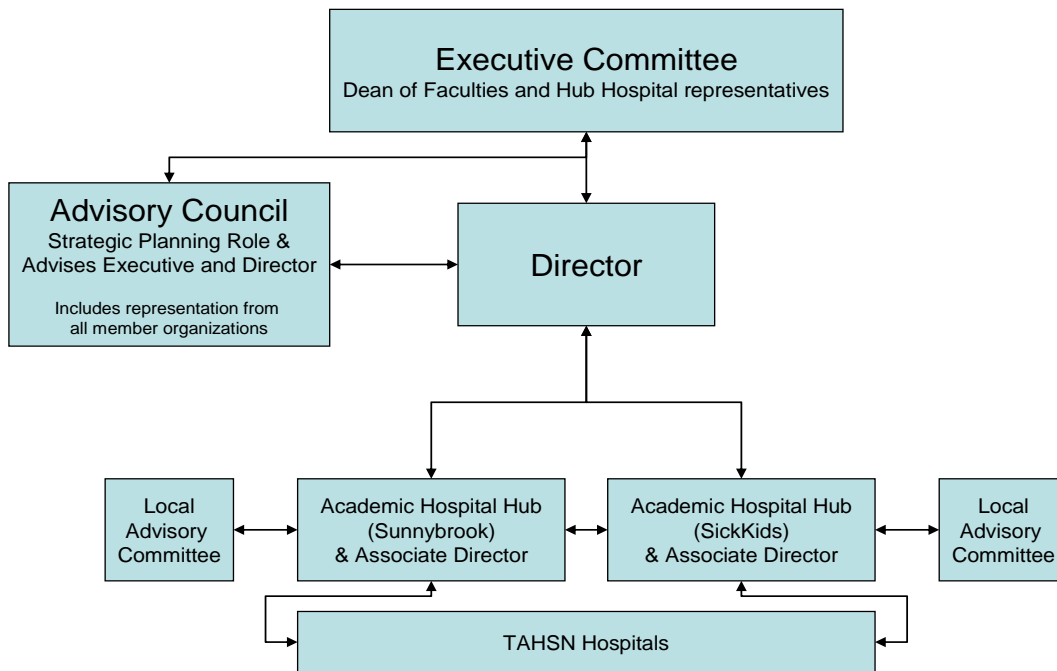
- **Patient Safety Education Program (PSEP), Canadian Patient Safety Institute**
 - Several Centre members are certified Master Facilitators and have made significant contributions to revamping the content of the program, which has enrolled over 200 interprofessional participants from across the country.
- **Advancing Patient Safety in Residency Education (ASPIRE), Royal College of Physicians and Surgeons of Canada & Canadian Patient Safety Institute**
 - In April 2013, 56 participants from across the country took part in the inaugural 4-day program. Two Centre members contributed significantly to the design and delivery of the programs as members of both the ASPIRE steering and the curriculum design committees.
- **Teaching for Quality (Te4Q), Association of American Medical Colleges**
 - Through Te4Q, the Association of American Medical Colleges (AAMC) and University HealthSystem Consortium (UHC) Best Practices for Better Care campaign seeks to develop a cadre of quality improvement teachers and educators across the United States. Dr. Brian Wong co-authored a report (Te4Q: Integrating Quality Improvement and Patient Safety across the Continuum of Medical Education) that outlined the first phase of this initiative. The second phase involves the development of the actual faculty development program – again, Dr. Wong is actively involved as a member of the curriculum development committee and is co-leading the program's evaluation.

- Dr. Chris Parshuram’s trial of the paediatric early warning system involves 22 sites in Canada, the US, and New Zealand.
- Dr. Shojania’s role as Editor-in-Chief at *BMJ Quality & Safety* has led to multiple international connections, such as work with the UK Health Foundations’ Improvement Science Network and involvement in the planning of the Scientific Symposium of the International Forum for healthcare Quality.
- A video highlighting the Centre for Patient Safety was shown at the Annual Conference of the Institute for Healthcare Improvement in Orlando, Florida (December, 2010) . This video was part of a series profiling organizations doing innovative work in patient safety and quality improvement. The Centre was the only non-US organization spotlighted in the video series, and was chosen on the basis of our work in building capacity and engaging faculty in patient safety efforts (e.g., through the Certificate Course). The Institute for Healthcare Improvement (IHI) has an international reputation and is widely seen as the single most influential organization in the field of quality improvement. Their annual conference attracts over 5,000 attendees from around the world and from a wide variety of backgrounds—healthcare managers and executives, researchers, clinicians, and those involved with changing policy to foster improvements in healthcare. The video was shown in a special session at the meeting and was also run on monitors in various areas throughout the conference. The full video can be seen on the Centre’s website (www.cquips.ca).
- The Centre supports the Paediatric International Patient Safety and Quality Community (www.pipsqc.org), which advocates for paediatric patient safety internationally. This group was founded by Dr. Anne Matlow (former Associate Director and SickKids Lead for C-QuIPS) and a small group of international paediatric patient safety leaders in 2007. Since then, the group has grown to more than 250 members from many countries. PIPSQC has advocated for paediatric patient safety by leading paediatric symposia linked to international safety conferences such as the recent Patient Safety Congress in Birmingham, UK. Between in-person meetings, a web-based community is maintained where members share their latest work in quality and safety through blog posts and interest groups.

ORGANIZATION AND GOVERNANCE

C-QuIPS is an Extra-Departmental Unit (EDU) within the University of Toronto. Specifically, it is an EDU: C, as we do not appoint faculty, nor do we have student admitted directly to us or grant degrees (http://www.vpacademic.utoronto.ca/Extra-Departmental_Units.htm). Consistent with the model for other multi-departmental academic units at the University of Toronto, the Governance of the Centre for Patient Safety consists of an Executive Committee and an Advisory Council.

The UofT Centre for Patient Safety Governance and Advisory Oversight



Current Executive Board Members

- Dr. Catharine Whiteside (Chair), the Dean of Medicine and Vice-Provost, Relations with Healthcare Institutions
- Mary Jo Haddad, President and CEO, Hospital for Sick Children
- Dr. Barry McLellan, President and CEO, Sunnybrook Health Sciences Centre
- Dr. Robert Howard, President and CEO, St. Michael's Hospital
- Dr. Cheryl Regehr, Vice-Provost, Academic Programs, University of Toronto (originally on Board in capacity as Dean of Social Work)
- Dr. Sioban Nelson, Vice-Provost University of Toronto (formerly Dean of Nursing)

Past Executive Board Members

- Dr. Mark Rochon, President and CEO, Toronto Rehabilitation Institute
- Dr. David Mock, Dean of Dentistry (2009-12)
- Dr. Henry Mann, Dean of Pharmacy (2012)

The Hospital for Sick Children Advisory Committee Member

- Dr. Jim Wright, Surgeon-in-Chief and Vice President Medical Affairs
- Jeff Mainland, Executive Vice President, Strategy, Quality, Performance and Communications
- Marilyn Monk, Executive Vice President, Clinical Programs & Services

- Peter Laussen, Co-chair M&M Committee
- Karim Jessa - Chief Medical Informatics Officer
- Patricia Macgregor, Executive Director, Clinical Services
- Rick Wray, Director, Quality Management and Infection Prevention and Control
- Pam Hubley, Chief, Professional Practice and Nursing
- Dr. Denis Daneman, Paediatrician-in-Chief
- Dr. Ron Laxer, Staff Rheumatologist (formerly VP Medical Affairs)
- Rita Damignani, Quality Analyst / Patient Safety Coordinator

Past Members

- Dr. Lawrence Roy, VP, Medical and Academic Affairs (2009)
- Polly Stevens, Director, Quality and Risk Management (2009-2010)
- Dr. Teresa To, Director, Child Health Evaluative Sciences Program, SickKids Research Institute (2009-2010)

Sunnybrook Health Sciences Centre Advisory Committee

- Michael Young, Executive Vice-President, Corporate
- Ru Taggar, Vice-President, Patient Safety and Quality Improvement, Executive Vice-President, Programs/Chief, Health Professions and Nursing Executive
- Dr. Brian Cuthbertson, Chief, Department of Critical Care Medicine
- Dr. Joshua Tepper, Vice- President Education
- Marcia Visser, Sunnybrook Health Sciences Executive Board Member

Past Members

- Dr. Merrick Zwarenstein, Director, Centre for Health Services Sciences (2009-2010)
- Thomas Paton, Director of Pharmacy (2009-2010)
- Susan VanDeVelde-Coke, Executive Vice-President, Programs/Chief, Health Professions and Nursing Executive (2009-2011)

FINANCES

The Centre receives \$300,000 per year in support—\$100,000 from each of the three partner institutions. Sunnybrook and SicKids also donated space for offices at each site. The Table below breaks down our revenues and expenses. As shown below, revenue generation—primarily from education but also some donations—has resulted in a net surplus of \$605,000.

	Fiscal Year 09/10	Fiscal Year 10/11	Fiscal Year 11/12	Fiscal Year 12/13	Projected Fiscal Year 13/14
REVENUE					
Partners	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
Education/Symposium	\$0	\$32,177	\$178,532	\$111,484	\$126,750
Grants/Consulting	\$2,750	\$51,772	\$0	\$7,184	\$8,750
Donations*	\$7,589	\$69,185	\$6,427	\$53,846	\$0
Total Revenue	\$310,339	\$455,484	\$484,959	\$472,514	\$435,500
EXPENSES					
Staff Salaries/Benefits**	\$48,731	\$41,999	\$157,198	\$145,441	\$140,000
Salaries for Directors†	\$111,250	\$110,000	\$110,000	\$110,000	\$110,000
Education/Symposium	\$12,505	\$58,121	\$49,111	\$81,092	\$94,476
Promotions‡	\$11,437	\$20,267	\$4,778	\$500	\$5,000
Supplies General	\$19,979	\$12,587	\$7,838	\$4,721	\$5,000
Total Expenses	\$203,902	\$242,974	\$328,925	\$341,754	\$354,476
SURPLUS	\$106,437	\$212,510	\$156,033	\$130,760	\$81,024
RETAINED EARNINGS	\$106,437	\$318,947	\$474,980	\$605,740	\$686,764

* We have received two modest-sized donations—one for approximately \$60,000 and one for \$50,000. Both related to malpractice cases in which the settlements directed the defendant to contribute to advancing patient safety in lieu of or in addition to paying damages to the plaintiff.

** Staff salaries refer to the Program Manager (Ms. Leahora Rotteau) and Coordinator (Ms. Lisha Lo). The low salary expenses in 2009 and 2010 reflect defraying some salary support from an external grant that ended in July 2011. Also, we had only one full-time staff for most of 2009 and 2010.

† The Director and two Associate Directors each receive partial salary support. The Director of Research at SickKids also received a small amount of salary support in 2009.

‡ Promotions include our website and a video produced for the Institute for Healthcare Improvement’s annual meeting in Orlando, Florida.

The Table at the right displays our revenue generating activities in greater detail. These activities and their revenue are captured in the overall budget above.

Not captured in the budget is an additional \$68,000 in net revenue generated from the Certificate Course. Due to restrictions on how we can spend this revenue given University rules about uses for revenue from CME courses, we hold this revenue in an account through the University’s Department of Medicine. We use the money in this account to support students and trainees (e.g., for travel to meetings to present their work).

Projected budget for next 5 years

Moving forward, we have assumed that we will continue to receive \$300,000 from our partners—the Faculty of Medicine, Sunnybrook Health Sciences Centre, and SickKids. We have also projected that we will continue to generate revenue by delivering the Certificate Course and one QI workshop a year. We did not assume more frequent workshops due to our current workload with the Master’s Program and Certificate Course.

Revenue Generating Activities	
Initiative	Net Revenue
MOH MRP QI Initiative	\$ 75,375
Quality Improvement Workshops (3)	\$ 47,125
Certificate Course	\$45,000
OHA QI Boot Camp	\$ 20,000
Quinte Health Care QI Workshop	\$ 10,800
Improvement Fellowship	\$ 7,742
Consulting Activities	\$ 33,725
Donations	\$ 137,065

We will also continue to deliver our annual symposium, for which we have budgeted a \$15,000 loss despite the attendance of over 200 people each year. The loss occurs for a variety of reasons, including the choice not to obtain corporate sponsorship to date, our willingness to subsidize registration for students, trainees, and non-physicians, among others. We could probably avert the \$15K loss by asking for small amounts of support from institutions and organizations. (E.g., the Faculty of Nursing provided \$5K/year for two of the symposia). Overall, though, we believe the annual symposium provides value to our members and the UofT community and we generate enough revenue from other sources to justify this modest investment in our goals of fostering connectivity and dissemination.

The average revenue from the first five years for Grants/Consulting and Donations were used to project the ongoing revenue. Similarly, the averages for general expenses and for promotions and supplies were used to project for the five year expenses. The salaries for the director and associate site directors will remain the same, while a 2% annual increase will be applied to the two existing staff salaries and benefits.

Finally, we have added two new budget items: \$80,000 in salary support for junior faculty (e.g., \$20,000 per year to protect the time for four junior faculty members of C-QuIPS) and \$70,000 to hire an additional research assistant to support the work of Centre members, especially junior faculty.

The Table below shows budget projections for the next 5 years of C-QuIPS. *We have deliberately estimated spending in excess of revenue each year in order to invest the retained earnings generated in the first 5 years into growth for the Centre.*

Projected five-year budget (2014-2019)

	Fiscal Year 14/15	Fiscal Year 15/16	Fiscal Year 16/17	Fiscal Year 17/18	Fiscal Year 18/19
REVENUE					
Partners	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
Education/Symposium	\$117,000	\$117,000	\$117,000	\$117,000	\$117,000
Grants/Consulting	\$14,091	\$14,091	\$14,091	\$14,091	\$14,091
Donations	\$27,409	\$27,409	\$27,409	\$27,409	\$27,409
Total Revenue	\$458,500	\$458,500	\$458,500	\$458,500	\$458,500
EXPENSES					
Staff Salaries/Benefits [§]	\$219,592	\$223,984	\$228,463	\$233,033	\$237,694
Salaries for Directors	\$110,000	\$110,000	\$110,000	\$110,000	\$110,000
Faculty Support †	\$80,000	\$80,000	\$80,000	\$80,000	\$80,000
Education/Symposium	\$97,464	\$97,464	\$97,464	\$97,464	\$97,464
Promotions	\$3,426	\$3,426	\$3,426	\$3,426	\$3,426
Supplies General	\$7,536	\$7,536	\$7,536	\$7,536	\$7,536
Total Expenses	\$518,018	\$522,410	\$526,890	\$531,459	\$536,120
SURPLUS	-\$59,518	-\$63,910	-\$68,389	-\$72,959	-\$77,619
RETAINED EARNINGS	\$627,245	\$563,335	\$494,946	\$421,987	\$344,367

[§] Projections include an annual 2% increase in salaries, as well as a new staff member to increase capacity to provide project support to C-QuIPS members

† New line item to protect time for junior faculty to work on Centre related activities (4 faculty x \$20,000/yr)

RESOURCES AND INFRASTRUCTURE

The C-QuIPS has dedicated office space at both sites—Sunnybrook and SickKids. The space at Sunnybrook accommodates the offices of the Centre Director, the Sunnybrook Associate Director and the Program Manager. We are also able to provide office space to two physicians who support quality and safety at Sunnybrook and work closely with the Centre. The space also contains an office space for students and research assistants and a meeting room. The meeting room is also used for some weekly meetings of the hospital-based department of Quality and Patient Safety.

The SickKids site holds three offices and a large multipurpose meeting space. The Sickkids site has office space for the SickKids Associate Director and the Administrative Coordinator as well as space for students, researchers and members. Because the SickKids site is located downtown, near the other UofT hospitals, we designed the main open space to allow us to accommodate many of the Centre's programs such as rounds, research and education meetings, workshops and the Certificate Course. The multipurpose space is equipped with videoconferencing equipment which allows for greater flexibility in meetings and interactions with national and international collaborators. E.g., the VA Quality Scholars group meets there for its weekly videoconference meetings with the six US sites.

INTERNAL AND EXTERNAL RELATIONSHIPS

In order to support local improvement, C-QuIPS has focused much of its activities on capacity building and fostering connectivity. Through these and other activities over the past 4 years, we have developed partnerships with individual healthcare providers, affiliated hospitals, research institutions and faculties, within and external to UofT, as well as external government and professional organizations.

We work closely with the Quality Improvement and Patient Safety Departments at both of the partner hospitals, Sunnybrook Health Sciences Centre and the Hospital for Sick Children. Collaborations have included evaluations of patient safety initiatives and support in the development of QI interventions as well as mentorship of clinical faculty becoming involved in QI. We also provide meeting spaces for the QI and PS departments in the dedicated C-QuIPS space at both hospitals. Relationships with other affiliated hospitals have been developed through education opportunities and evaluation support for specific projects undertaken by the hospitals.

Internal Relationships: example collaborations with hospitals and cognate academic units within University of Toronto community

- Evaluations of several specific patient safety interventions at 3 UofT hospitals (the two partner hospitals and Mount Sinai)
- Developing the Master's program with the Institute for Healthcare Policy, Management and Evaluation (IHPME)
- Working with the Centre for Faculty Development and the UofT Office for Continuing Education and Professional development to develop and deliver our Certificate Course
- Delivering the Improvement Fellowship with St. Michael's Hospital
- Collaborating with the human factors group at University Health Network on various projects and engaging them to deliver educational content at our annual symposia, the Certificate Course, and the Master's program, as well as co-supervising master's theses for clinical engineering students working in patient safety
- Collaborating on research projects with faculty at the Li Ka Shing Knowledge Institute at St Michael's Hospital

- Delivering invited one-day workshops to clinical groups at St. Michael's Hospital (Nursing) and Mount Sinai (Palliative Care)
- Delivering multiple invited lectures to many groups at UofT hospitals, including not just major teaching hospitals, but community hospitals as well
- The Bloomberg Faculty of Nursing has provided financial support for our annual symposium (for 3 of the 4 years) and faculty members from nursing have organized one of the breakout sessions each year
- Collaborations with the Institute for Clinical Evaluative Sciences (ICES). One province-wide evaluation project, supported by the Ontario MOH, focused on the implementation of Process Improvement Programs in Emergency Departments across Ontario. C-QuIPS provided important research support in the analysis of the extensive qualitative data for this study (from semi-structured interviews with program participants at multiple sites). We have continued to collaborate with ICES in the development of a proposed evaluation methodology the MOH's IDEAS initiative.

External Relationships

- C-QuIPS works closely with the MOH and specifically the Health Quality Branch of the government. As outlined previously, the Centre was awarded a contract (\$248,000) to develop two QI Workshops to support the Most Responsible Physician Quality Improvement program and provide ongoing coaching for participants as they developed and executed QI projects in their clinical settings. Dr. Shojania is the Chair of the Scientific Advisory Committee for BRIDGES, a MOH initiative to support the development of local QI projects across Ontario. Dr. Chaim Bell, a core C-QuIPS member works directly with the Health Quality Branch of the MOH as a medical advisor on quality improvement initiatives.
- For the Ontario Hospital Association, we helped develop a series of meetings for hospital-based patient safety officers in Ontario. We also delivered a one-day workshop on the methods of quality improvement ("Quality Improvement Bootcamp")
- Dr. Anne Matlow was on the Board of the Canadian Patient Safety Institute for many years. Drs. Baker and Shojania have also served on advisory committees for CPSI, and Dr. Brian Wong has been a part of the CPSI's Patient Safety Education Program (PSEP).
- Dr. Wong chairs a committee for the Royal College of Canada on advancing patient safety education for residents and also works with the Association of American medical Colleges on this same topic.
- Dr. Coffey works with various patient safety groups in other countries through C-QuIPS' role facilitating the membership of SickKids in the Paediatric International Patient Safety and Quality Community (PIPSQC)
- Dr. Shojania has worked with the UK-based Health Foundation in several capacities through his role as Editor-in-Chief at BMJ Quality & Safety. C-QuIPS was awarded a contract by the Health Foundation to conduct an environmental scan of advanced training programs in Improvement Science.

MAJOR CHALLENGES

Bandwidth for sustaining educational activities

The major challenge we face is one of bandwidth for the faculty who lead C-QuIPS educational programs, as they are time intensive in terms of preparing and delivering the material, as well as providing project mentorship for participants. Sustaining this educational load presents a particular challenge both because of the amount of work and the small number of C-QuIPS core members involved, especially given that teaching is not the only activity they want to do.

This problem has been described in the literature. In fact, in a qualitative study we conducted (led by Brian Wong) in which we interviewed authors who had published educational curricula related to QI or PS, we found that many reported that burn out among faculty resulted in their struggling to sustain the educational programs they had developed. A typical academic medical centre has a handful of experts in QI or PS (sometimes just one) and it proves difficult to continue teaching a program with so few faculty to support it. This problem is compounded when the curricula include project work and a single or small number of faculty members have to supervise the development and execution of multiple improvement projects.

It may seem straightforward to train some former participants in our educational problems. The problem, however, is that even if someone is a good teacher and learns the content, if they do not have experience with QI projects, it limits their effectiveness. For, say, teaching evidence-based medicine, if tutors simply know the material and can teach around worked examples, they can achieve educational objectives even if they are not clinical researchers. It is a bonus if they are, but not essential. But, for the programs we offer, the whole point is for the faculty leads to combine content expertise with practical experience executing and evaluating improvement interventions (and having an appreciation of the many workflow issues and other barriers that impact frontline staff given their clinical backgrounds).

To address this problem, we have focused on identifying individuals from the Master's program and recruiting them to become involved as tutors and eventually as teachers of material from the different courses. This process has been facilitated by our efforts in the UofT Department of Medicine to create a new career track for faculty interested in QI. We now have 15 faculty in this track, many of whom are recent graduates of the new Master's program. As such, they have content expertise in QI, are actively engaged in ongoing QI work of their own, and they have an interest in teaching as part of their faculty roles.

Bandwidth for maintaining mentorship relationships

Another problem has been maintaining ongoing relationships with the participants in our education programs, such as the Certificate Course, QI workshops and the Master's program. We know from feedback that past participants in our educational programs hope to maintain these relationships through ongoing mentorship and collaborations. Unfortunately, in the first few years, we did not have the bandwidth to continue substantive mentoring relationships with past participants. They would contact us sometimes for advice or possibly to request coming to give a presentation, and we would keep them informed about Centre Rounds (e.g., Research in

Progress Rounds, and visiting lecturers) and our annual symposium. But we did not have enough faculty to mentor past participants in educational programs and also continue delivering ongoing educational programs and helping with projects for current participants. In the past year, however, we have focused more on mentoring a group of senior trainees and junior faculty. This has been worthwhile in its own right, but will also help increase our bandwidth for mentoring as these junior faculty become more involved in delivering portions of our educational programs. As they deliver more teaching, it frees up more senior C-QuIPS faculty to mentor participants (past and current) with their projects.

Revenue

Grant support allows us to hire research staff, but these staff have to engage in the funded projects and these projects are not necessarily ones that will deliver any direct (or even indirect) benefits to our supporting institutions within a useful timeline (2-3 years). Obtaining philanthropic support in this field poses challenges. While the supporting institutions have offered to assist with fund raising, no institutional foundation will actively campaign for donations outside of capital campaigns for major projects (e.g., new buildings). The best we can do is be on a list at the foundations such that, if a donor expresses potential interest in the topics of healthcare quality or patient safety, the foundation will steer the donor our way. Unfortunately, this rarely happens anywhere (and never here in Toronto). Donors tend to have in mind supporting cures for cancer and heart disease, research into Alzheimer's disease, and so on. A few examples of large donations elsewhere have occurred, but they have involved the coincidence of a medial error involving a wealthy patient, a forgiving family, and the presence of a prominent (charismatic) researcher working in patient safety at the same institution.

For the above reasons, we focused our efforts on generating modest revenue from our educational programs. The challenge that has emerged recently has been that our educational programs other than the Master's program generate revenue for C-QuIPS, whereas the Master's does not. Yet, the Master's program takes up so much time that we have had to decrease our workshops and other activities that bring in revenue with much less effort. The Master's program achieves other important goals, but it does mean that we will bring in less revenue in the next few years—until we have further increased our cadre of teachers so that we can have more senior faculty focus on the Master's while more junior C-QuIPS faculty run the Certificate Course and workshops.

Member Engagement Specifically in C-QuIPS

Clinical departments at UofT sometimes (often) have the problem that researchers publish papers and deliver talks as representatives of their hospitals, not the University of Toronto. Many researchers and most clinicians receive the bulk of their financial support from hospitals, not the university. Therefore, unless they have an important role at the University (typically in education), they list their hospital clinical department and hospital-research institute as their affiliations on papers and in presentations.

We have this problem to an even greater extent. All of our core members have multiple affiliations already—clinical and academic departments, various research institutes, cross appointments to additional academic departments, and so on. Many of these affiliations reflect

not just academic appointments, but salary support as well. By contrast, we can provide salary support to only a handful of our members (essentially, the ones who are directors of something). Consequently, even branding for us is an issue—few C-QuIPS members consistently list C-QuIPS on their publications or in their presentations.

More importantly, the fact that we can provide financial support to so few members means that our members do not hold advancing C-QuIPS as a priority (understandably so). For instance, if Doctor or Professor so-and-so derives the bulk of his salary from a UofT hospital to direct a Knowledge Translation Program or Centre for Innovation, he will understandably focus on developing research projects and other activities that will benefit and bring recognition to that hospital-based group. We cannot expect such individuals to do more than collaborate occasionally with C-QuIPS, deliver guest lectures, and so on.

So far, we have dealt with this problem simply by finding and working with faculty member who have wanted C-QuIPS to succeed—either for altruistic reasons or because they see a benefit in generating a reputation for the University of Toronto in this field, since the UofT is more likely to attain brand recognition in quality improvement and patient safety than is a specific hospital. We have found a few such individuals. For instance, Dr. Chaim Bell directs our participation in the VA Quality Scholars Program and helped with both the Certificate Course and our workshops for the Ministry of Health, even though he receives neither salary support from C-QuIPS nor office space. Similarly, Dr. Chris Hayes (St. Michael’s Hospital) and Dr. Lianne Jeffs (St Michael’s Hospital and the UofT Faculty of Nursing) have collaborated with us frequently even though they receive no salary support from C-QuIPS. In the future, we hope that the growing cadre of junior faculty whom we have directly mentored will continue to work with us and support C-QuIPS activities—partly out of allegiance on the basis of mentorship and partly because for some of them we have helped arrange financial support and, in the future, might have directly provided their salaries.

REPORT OF MEMBERS

We approached four of our Core Members and asked them to provide their views and vision of the Centre via an anonymous web link. We asked them to reflect on the successes and weakness of the Centre over the first 5 years and important priorities for the next five years. Their views were compiled by the C-QuIPS Program Manager.

The Core members all agreed that the strength of the Centre over the last 5 years has been the development and delivery of strong education programs. Continuing education and capacity building through the Certificate Course, Improvement Fellowship and the QI workshops were important contributions. The Centre has also demonstrated leadership in undergraduate and graduate education, specifically through the development of the MSc. (QIPS) with IHPME and the education partnership with the UofT Department of Medicine in undergraduate medical education. The annual symposia and Dr. Shojania’s editorship of the BMJ Quality and Safety journal were also identified as Centre successes.

The limited engagement with Faculty of Medicine departments outside of the Department of Medicine, and with other Faculties, such as nursing and engineering and other healthcare disciplines is seen as a weakness of the Centre by the core members. There was also a noted lack of presence of the Centre in both the affiliated and community hospitals. The limited focus on research is also described a weakness, especially with regards to supporting the research of junior faculty and researchers. It was noted that the governance structure of the Centre may be a factor in limiting the widespread engagement with the Centre beyond the Department of Medicine.

Moving into the next five years, Core members suggest maintaining a focus on continuing education, which is a major strength of the Centre. The creation of research fellowships or grants for senior residents and young investigators is seen as an important way the Centre can expand its research capacity. Focused research into knowledge translation activities and economics of patient safety and quality improvement were also recommended, as well as increased attention in the area of patient engagement. It was also recommended that the Centre continue to enhance its focus on quality improvement, which could be accomplished through the creation of more formalized educational content and coaching strategies to aid in the implementation and evaluation of local quality improvement.

C-QuIPS Core Members views and suggestions

C-QuIPS Successes	<ul style="list-style-type: none"> -Continuing education (certificate course and QI workshops) -Leadership is undergraduate and graduate education. -Annual symposium -Dr. Shojania’s editorship of BMJ Quality & Safety
C-QuIPS Weaknesses	<ul style="list-style-type: none"> -Limited engagement with Faculty of Medicine departments other than the Department of Medicine -Limited engagement with other U of T faculty, such as Nursing and Engineering. -Limited focus on research, especially junior clinicians and researchers
Suggested future plans	<ul style="list-style-type: none"> -Continue to focus on continuing, graduate and undergraduate education -Creation of research grants and fellowships -Continued, and enhanced focus on quality improvement, through formalized education content and coaching -Research on knowledge translation and economics -Increased attention on patient engagement

REPORT OF LEARNERS

To elicit the views of our learners, we distributed a short open-ended survey (as an anonymous web link) to individuals who have participated in our education programs or received mentorship from one of the Centre core members. We asked learners to reflect on their overall

experience with the Centre, how the Centre has impacted their career and how the Centre could support them better as learners.

Structured educational programs, such as the Certificate in Quality Improvement and Patient Safety and the Improvement Fellowship, and the opportunities for mentorship and networking were seen as the key ways C-QuIPS supports learners. The Certificate Course and the Fellowship were characterized as excellent and outstanding, with a good range of speakers and topics that provide the participants with a solid foundation to build upon. Mentorship and networking allowed the learners to build on the skills they acquired in the education programs and use them in practice. The C-QuIPS annual symposiums, invited speaker rounds and research in progress rounds also allowed for learners to stay involved with the Centre. These events gave learners the opportunity to continue learning and network with others working in the field of patient safety and quality improvement.

I was a participant in the certificate program in patient safety and quality improvement. I enrolled in the program to explore the field, as I was interested but had no previous experience in the area. It provided a solid foundation to build upon, and also introduced me to many colleagues within U of T who were active in patient safety and quality improvement.

My experience with C-QuIPS has been mainly with their educational programs, which are excellent and a unique educational opportunity in Ontario. I have also attended other educational/outreach events such as the Annual Symposium which always has high-caliber speakers and provide an opportunity to network with others in the Toronto area interested in QI.

Participation with C-QuIPS through education programs and mentorship had a direct impact on the roles and careers of many of the learners. Some of the learners described being inspired to pursue a career in QI and safety or take on leadership roles in QI at their institutions, whereas others described making fundamental changes to their clinical or administrative work based on their participation with C-QuIPS. Being introduced to quality improvement and patient safety concepts and skills and the opportunities to use those skills in patient care helped learners become further interested in pursuing further involvement in the field.

Help me realize areas where improvement in quality and patient safety can occur.

Also, help establish a foundation to start work into the area of patient safety.

Helped create a fundamental reorientation of my clinical & administrative work.

Three of the learners who are still establishing their careers described the role C-QuIPS played in helping them to obtain academic positions related to Quality Improvement. They identified not just the direct help delivered by C-QuIPS through training in the methods of QI, but also indirect help through C-QuIPS' work to enhance the profile of quality improvement and developing specific clinician quality improvement roles within the U of T healthcare community, as well as mentoring trainees through the career development process. Another learner described how participation with C-QuIPS supported them in developing their leadership skills in quality improvement, by giving a forum for supervising a QI project, participating in high profile QI projects through U of T and becoming involved in research associated with quality improvement and patient safety.

C-QuIPS was instrumental in firstly creating the role of a clinician in quality improvement and in allowing me achieve my goal of appointment as a clinician in quality and innovation and provided a framework on how to progress in this career. I have had the fortune of being mentored by one of the C-QuIPS faculty members who inspired me to pursue a career in QI and safety. I feel extremely supported by the resources that are available for trainees interested in such a career path.

More access to structured mentorship and networking and collaboration opportunities were seen as important ways C-QuIPS could better support learners. Some learners who were mid-career or based out of community hospitals found it challenging to take advantage of mentorship or coaching opportunities and called for more support in hospital-based QI projects. There was also a call for more specialized quality improvement workshops and research support for quality improvement and patient safety research.

*Perhaps offering a more structured or formalized approach to mentorship, to make it more likely that mentorship occurs on a regular basis, and so that learners can receive mentorship without worrying that they might be imposing upon their mentors
Establish QI/Patient Safety innovation hubs/clinical laboratories in affiliated community teaching hospitals to enhance system-wide capacity building & learning environments for trainees outside of quaternary centres in order to sustain QI across province.*

Views of C-QuIPS Learners

How C-QuIPS supports learners	<ul style="list-style-type: none"> • Certificate Course in Quality Improvement and Patient Safety • Improvement Fellowship • Individual mentoring • Networking opportunities
How C-QuIPS impacts learners careers	<ul style="list-style-type: none"> • Inspired to pursue a career in quality and safety • Made fundamental changes to clinical or administrative work • Enhancing the profile of Quality Improvement within the U of T and developing clinician improver roles • Supported learners in finding positions in hospitals related to quality and safety
How C-QuIPS could better support learners	<ul style="list-style-type: none"> • More access to structured mentorship • Supporting local and community based quality improvement work • Offer more specialized workshops • Support research of young researchers and clinicians

FUTURE DIRECTIONS

We focused primarily on capacity building through education and training in the first 5 years of the Centre (for reasons explained previously). We remained very productive in terms of publications and grants. But, a major decision we face is whether to continue making the delivery of our educational programs our main collective activity or focus on creating a research program more intrinsic to C-QuIPS? We have already established a research track record related to our educational activities and have received national and international recognition for our work in this area (e.g., our work with the Royal College of Physicians of Canada and the American Association of Medical Colleges in developing guidance for training programs regarding curricula in patient safety and quality improvement). Thus, the question we face is the extent to which we build on this sort of scholarship and our existing educational programs to garner a more substantial international reputation in training clinicians to engage productively in quality improvement. Or, do we try to develop a more traditional research program focused on some domain of patient safety or healthcare quality?

We lean towards continuing our focus on capacity building through education and training, especially as we have begun to achieve our goal of having a cadre of clinical faculty trained and mentored by C-QuIPS by engaged in quality improvement work benefiting their clinical settings. For instance, in the Department of Medicine have 15 faculty members in in the new job description for Clinicians in Quality and Innovation. Five of these faculty are graduates of our Master's program. We also have a reputation for scholarship in this area of education and training in QI, and our Master's program has begun to attract applicants on a national scale.

Building on these successes seems like the right strategy: continuing to train and mentor individuals with the expertise to develop and carry out successful improvement initiatives in their clinical settings seems more likely to benefit affiliated institutions than attempting to develop one or two large research projects. And, these activities generate scholarship as well, both in terms of the projects themselves and studies describing our educational programs and their impacts. Thus, rather than attempting to build an international research reputation for C-QuIPS, we believe we should focus on solidifying our niche in training clinicians (especially academic physicians) in quality improvement.

Building an international reputation in QI training

Currently, if a senior trainee wants to pursue a traditional researcher career in patient safety or quality improvement (i.e., become a clinician scientist devoting approximately 70% of their time to research), we would often advise the trainee to consider going to Harvard to do a traditional Master's (in Clinical Epidemiology or Public Health) and work with one of the many prominent researchers in patient safety (e.g., at Brigham and Women's Hospital in Boston). For a Clinician Scientist, the best training in Improvement Science is probably a traditional advanced degree supplemented by mentorship by a supervisor expert in some aspect of healthcare quality.

Staying in Toronto can still work out very well—we have solid advanced research degree programs and a number of faculty working in various aspects of patient safety and healthcare quality. But, for preparing students to become principal investigators in patient safety or

healthcare quality, Toronto has only a national reputation, not an international one. For instance, we do not currently enjoy a reputation equivalent to that of the Wilson Centre for Education, which does have an international reputation in research training in education related to the health sciences. We do not have the critical mass of major principal investigators working in patient safety or quality improvement that Harvard does. We still have far more than any other Canadian institution and more than most American ones. But, it would be hard to attract top graduate students from outside Canada to come to the UofT for advanced research training in patient safety or quality improvement.

That said, our educational programs have targeted a different group than graduate students seeking to become Clinician Scientists or principal investigators. Rather, we have focused more on training clinicians who want to pursue local quality improvement in a scholarly manner. This is a growing pool of trainees and junior faculty, and we probably could develop a reputation that attracts clinicians from outside of Canada to come here for our Master's or other educational offerings that we might tailor to candidates from outside of Ontario (e.g., a version of the Master's delivered over several intensive 1-week periods in order to minimize travel).

Dr. Shojania wrote about this emerging career path in a commentary in the *Journal of the American Medical Association* (Shojania KG, Levinson W. Clinicians in quality improvement: a new career pathway in academic medicine. *JAMA*. 2009;301(7):766-8). The new job description for Clinicians in Quality and Innovation in the Department of Medicine has built on the ideas outlined in this commentary. The job description, which already includes 15 faculty members, is not designed for physicians who, for instance, have a Master's degree or PhD in clinical epidemiology and spend most of their time conducting externally funded research. Even if their research relates directly to quality improvement, their activities fall squarely within the scope of the job description for Clinician Scientists. But, there are a growing number of junior faculty who spend some 30% to 50% of their time engaged in scholarly work related to quality improvement—evaluating local improvement projects, teaching concepts and methods of quality improvement and so on. Our Master's program and the Certificate Course focus on training and mentoring these sorts of (future) faculty members. They are not going to conduct multi-site randomized controlled trials of candidate patient safety interventions. But, they will develop and implement effective improvements in their clinical settings and often conduct a robust enough evaluation to have their work published and influence practice elsewhere.

We do have faculty at C-QuIPS who do conduct externally funded, multi-site randomized controlled trials and other major national and even international studies. But, the niche we are developing at C-QuIPS is not so much to produce more such researchers, but to produce clinicians capable of developing effective improvement projects in their local settings (and having their work published). Internationally, there are only two prominent programs that have this more pragmatic focus—one from the Boston-based Institute for Healthcare Improvement (IHI) and the other at Intermountain Healthcare in Salt Lake City.

The IHI program is not very substantive and has generally been disappointing to academics who have taken the course, except with respect to the networking opportunities. The

Intermountain program is more substantive, but seems to have developed its reputation because there was no competition for so long. Academics and senior leaders from Ontario who have taken the course have found it very disappointing—too didactic in format and outdated examples. Even putting those anecdotal remarks aside, it is designed for people further along in their careers who want to learn about data driven efforts to tackle quality problems (e.g., as part of a new administrative position in a healthcare system) in a 9-day intensive course, not to shape the career of a junior faculty member who wants to make quality improvement the focus of her academic activity.

Beyond the innovative content and engaging format of our educational offerings, our programs are led by faculty who are active clinically and in quality improvement. Other programs are often taught by people active in neither domain—they have not worked clinically in many years (or never were clinicians) and they have often not carried out improvement projects for many years. Years ago, they became fulltime teachers of change management strategies, the use of run charts, process redesign and so on. They have not conducted local improvement projects in many years. And, they often do not have academic track records – they are more operationally focused.

Formal and informal feedback has shown that participants in our programs clearly respond to the familiarity of our faculty with the realities of clinical practice settings and current barriers improvement projects face as well as their content expertise in a wide range of topics in patient safety and quality improvement. We think we could build on our successes to date and either attract an increasing number of participants to our existing programs or develop new ones tailored to the needs of clinicians from outside Canada. We already enjoy a national reputation for research training in patient safety and quality improvement. But, for training the rapidly growing cadre of clinicians engaged in scholarly improvement work, we think we could develop an international reputation in coming years.

Future Directions at the Local Level

Feedback from members of the Centre and others identified the following suggestions for improvement.

- Greater engagement with Faculties outside of Medicine (e.g., Nursing, Pharmacy, Management, Engineering)
- Greater engagement with Departments outside of Medicine and Paediatrics (e.g., Surgery, Obstetrics, Psychiatry)
- Greater engagement of more C-QuIPS members in Centre initiatives and education programs (i.e., instead of just a handful of core members)
- Develop more specialized Quality Improvement educational offerings (e.g., workshops focused on specific topics such as implementation, evaluation, using performance data) rather than general ones that cover all of these topics but only in a little detail
- Small amounts of financial support or research assistance for QI/PS projects
- Financial support/resources for junior researchers
- Offer grants and fellowships

Reflecting on the above specific suggestions and the various challenges that have emerged in the first five years, we are considering the following plans, but plan to await the completion of the external review before pursuing them further.

- **Use some of our retained earnings to provide direct support to more faculty members.** The successes of our capacity building activities (Certificate Course, new Master's) mean that a growing cadre of clinicians with interest and training in quality improvement and patient safety exists. Some can be engaged to help with workshops and our other teaching (providing mentorship to people doing quality improvement projects). In return, we can provide them ongoing academic mentorship and also, for a few that seem likely to be highly successful, we can provide financial support. This was what occurred with Dr. Brian Wong. He started as a fellow working with Drs. Shojania and Etchells just a few years ago. Since then, he has gone on to leading the University's Department of Medicine (DOM) activities in quality improvement and continuing education with substantial financial support from the DOM and more recently took over from Dr. Etchells as the Sunnybrook lead for the Centre in April 2013.

We do not have the financial resources to provide direct support to more than one or two faculty, especially by ourselves. But, we can work with clinical Department Heads to garner support for greater protected time for some faculty. We have already done so for five recent recruits to the Department of Medicine. For faculty in other Departments, we could provide matching funds to help generate support.

- **Use some of our retained earnings to grow the research support infrastructure within C-QuIPS.** We will never have enough funds to help support more than a few faculty members. Using some of our funds to hire more research assistants who can assist faculty with their projects may be a more efficient strategy. Many clinicians engaged in QI need assistance collecting data and with other aspects of project management more than they need their own time protected.
- **Build a formal mentorship structure for junior faculty engaged in QI/PS work.** With the large number of applicants and resulting ability to enroll high caliber students for the first two years, we will soon see a rapid growth in the number of academic physicians at the U of T with formal training in quality improvement and patient safety, as well as other healthcare professionals and managers/administrators. Having them work in relative isolation in their respective clinical areas will dissipate their impact. We need to create and sustain a network of people working in this area, providing ongoing support for this group. Drs. Wong and Shojania have initiated monthly meetings with the roughly 15 junior faculty in the new Clinicians in Quality and Innovation job description. C-QuIPS Research in Progress Rounds also provide a forum for advising junior faculty and others on their projects. But, we need to look at ways of developing more formal mentoring and ongoing support for clinicians outside the Department of Medicine engaged in QI work.

- **Play a more direct role in providing academic support for major projects at Sunnybrook, SickKids, and at least one other U of T hospital.** This has happened only haphazardly to date—the hospital has a need that we happen to find out about and have the time and resources to assist with. Dr. Coffey holds a position within SickKids related to patient safety, and Dr. Etchells is medical director of informatics at Sunnybrook. These positions lead to some opportunities, but there are issues with how they are branded. Similarly, Dr. Shojania is the scientific director of BRIDGES, a \$5M project funded by the MOH and led by the Departments of Medicine and Family and Community Medicine aimed at developing and evaluating improvement projects related to coordination of care across hospital and ambulatory settings. This has resulted in various projects in other hospitals, but the relationship to C-QuIPS has been indirect. Solidifying a formal relationship between BRIDGES and the Centre represents an important goal, though may not be feasible. In terms of adding another hospital with which we work on a regular basis, the most likely candidate is St. Michael's, given our relationships with core members such as Dr. Lianne Jeffs in Nursing and Drs. Irfan Dhalla and Chris Hayes in Medicine, as well as the interest in QI on the part of Dr. Bob Howard, the CEO of St. Michael's and a member of our Executive Board.
- **Formalizing a network structure for the various research groups in the UofT community working in patient safety and quality improvement.** Fragmentation across the UofT remains a problem, with major activities similar to those of the Centre in the Knowledge Translation Program within the Li Ka Shing Institute at St. Michael's Hospital, the Human Factors group and the Centre for Innovations in Complex Care at UHN, and a new Institute for Health System Solutions and Virtual Care at Women's College Hospital. We need to harmonize the activities of these various groups and more consistently identify opportunities for synergy and collaboration. It may be that we need to think of formalizing a network structure among these different groups, similar to SIM-ONE and the various hospital-based simulation groups.