Clinicians in Quality and Innovation Review

Department of Medicine, University of Toronto

December 2022

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EXECUTIVE SUMMARY

In 2012, the Department of Medicine at the Temerty Faculty of Medicine created a new academic job description, the Clinician in Quality and Innovation (CQI). This change reflected the desire to provide an academic home for faculty whose scholarly work primarily relates to assessing and improving healthcare quality, developing new models of care, or pursuing other forms of scholarship and innovation outside of traditional 'discovery research'. The number of Department members in the CQI job description has grown from one full-time faculty in 2012 to 78 in 2022. As the position description enters its tenth year, the Department of Medicine funded an independent review to examine the development of the position over time, its impacts, and challenges.

Methods

Using a case study approach, the external reviewer conducted semi-structured interviews, analyzed
internal documents and administrative data related to the CQIs, and reviewed online publications and reports of their work. The interview study sample consisted of 23 CQI faculty and 7 Department Leaders, including 3 Physicians-in-Chief (PICs) and 4 Departmental Division Directors (DDDs). In selecting CQIs to approach for interviews, variability in training, specialty, institution, and year of CQI appointment was sought. The study sample consisted of CQI faculty with representation from 13 of the 16 Divisions including at least one CQI faculty member.

Findings

Growth of the CQI Job Description

- The CQI role has seen tremendous growth in 10 years—from one to 78 full-time faculty and an additional 11 part-time. These faculty work at all of the major teaching hospitals (Mount Sinai Health, Sunnybrook Health Sciences Centre, University Health Network, Unity Health, and Women's College Hospital), as well as Trillium Health Partners, Michael Garron Hospital, and William Osler Health System. Of the Department's 20 subspecialty Divisions, 16 include at least one CQI faculty member.

- The full-time CQIs include 9 Lecturers, 53 Assistant Professors, 13 Associate Professors, and 3 Full Professors. Promotion has been successful in so far as all 29 applications for promotion of CQIs have succeeded on the first attempt. The CQIs have also had a 100% success rate for Continuing Faculty Appointment Review (CFAR).

- Despite the success with promotion and CFAR, some CQIs reported challenges getting to the stage of being considered ready to apply for promotion. There were also concerns that successful promotion still seems to occur most easily using traditional metrics of research (e.g., publications and grants) rather than taking into account the full range of impacts included in the University's Creative Professional Activity (CPA) framework.

- With time, the CQIs have increasingly taken on leadership roles. The Medical Directors of Quality and Safety at all of the major teaching hospitals are CQIs. CQIs also play key roles in major hospital operations like informatics and infection control. And, the PIC at UHN is a CQI as was the past PIC at Trillium.

Scope of the CQI Position and Perceived 'Fit'

- Numerous quotes from the interviews indicated that the 'Clinician in Quality and Innovation' position has largely met its principal goal of providing an 'academic home' for faculty focused on quality improvement and other forms of innovation (hereafter abbreviated as Q&I). The existence and growth of the CQI position has also fostered greater awareness amongst Department Leaders and would-be faculty members about the value and academic legitimacy of Q&I work.

- Areas of focus for the CQIs have included: improving health care processes, reducing unnecessary tests and treatments, antimicrobial stewardship, infection prevention and control, developing new models of care, responding to COVID, clinical informatics, further developing QI capacity through education and training, research identifying or characterizing quality problems, and policy work.

- The widespread perception that the abbreviation CQI stands for Clinicians in Quality Improvement (not Clinician in Quality and Innovation) and the emphasis in local education programs on quality improvement, has sometimes left CQIs who do not carry out traditional QI projects wondering how they 'fit' in this role. For instance, some CQIs might evaluate a new model of care or pursue other innovations that do not fit the mold of the classic Plan-Do-Study-Act (PDSA) quality improvement project.

- A small number of participants discussed the need for the CQI position description to be responsive to developments in the field and to changes in the nature of CQI work that an individual might engage with throughout a career. Some participants also referred to problems amplified by the pandemic, such as equity issues and the social determinants of health, fundamental problems with how the health system is organized, as well as the impacts of impending threats such as the climate crisis.

Collaborations and Enablers

- Collaborations are at the core of CQI work. As one Department leader commented "The [C]QIs have a broader scope. They're very good at collaborating within their [sub]specialties and across specialties..." Other comments from interviews and reviewing CQI publications identified frequent collaborations across subspecialties of medicine, across medical specialties and Departments (e.g., Surgery and Pediatrics), across health care professional groups (e.g., Nursing, Pharmacy), as well as across hospitals in TAHSN and the Greater Toronto Area. CQIs also frequently worked with provincial and federal agencies and national professional organizations. CQIs have also collaborated with each other to a substantial extent. In the most recent 5 years alone, CQIs published 135 papers with at least 2 CQIs as authors and some had multiple CQIs as authors.

- The past ten years have seen progress in the development of enabling processes and structures within the Department of Medicine, the hospitals and Faculty of Medicine and external organizations to support the work of CQIs. For instance, DDDs have facilitated Division-wide Q&I strategic priorities and work; CQIs have been appointed to hospital leadership positions and committees related to healthcare quality; and hospital infrastructure has been created to support Q&I work. The UofT Centre for Quality Improvement and Patient Safety has also provided learning, teaching and mentorship opportunities. And,

national organizations with a strategic focus on Q&I work (e.g., Choosing Wisely Canada) have afforded opportunities and support for CQIs.

- There is variability in enabling processes and structures depending on the individual CQI and the Division and hospital in which CQIs are located, pointing to the need for continued attention to developing supporting infrastructures for CQIs. CQIs also reported continued challenges with funding for CQI work. Participants reported variable access to mentorship depending on whether their Division or hospital included more senior colleagues with expertise in Q&I work. The increasing numbers of mid- and senior-career CQIs presents an opportunity to improve the consistency of mentorship for the CQIs.

Tensions between hospital priorities and academic success

- Department Leaders (PICs and DDDs) reported that CQIs are highly valued in hospitals for their work in healthcare improvement. There was recognition of the need to support CQIs and align them with hospital priorities and senior CQIs at their hospitals. However, there was also recognition that some instances of CQI work on hospital priorities did not necessarily align with university academic expectations. These include leadership activities such as creating hospital infrastructure to support quality and safety as well as addressing local quality problems that have little academic value because the solutions are not innovative enough to generate peer review publications or garner invitations to present at national/international conferences.

Summary and Recommendations

The work of CQIs has had clear impacts at local, regional, provincial, and national levels. The number of publications and reports highlighted in this report demonstrate impact by the accessible metric of publications. Further demonstration of impacts were clearly evident through CQIs' descriptions of changes in clinical practices, organizational processes and patient care outcomes in their healthcare contexts. This work has been accomplished through individual knowledge and skills, new understandings of academic work and impacts, changing relationships within hospital organizations, evolution of the Q&I field, forging of collaborative approaches, and revisions to strategic areas of focus of academic units and healthcare organizations.

Looking forward, opportunities to optimize continued progress for clinicians in the CQI academic position and the impacts of their work include the following:

1. **Recruitment to the CQI academic pathway**:
    a. Ongoing efforts are needed to expose trainees to Q&I during training years, particularly in Divisions with a smaller number of CQIs.
    b. Department Leaders play a key role in supporting potential new faculty who may not see the fit of their work with the Q&I academic position, and therefore ongoing communication is needed about the role and its opportunities.

2. **Recognition of impacts other than the traditional metrics of publications and grants**: While progress has occurred on this front, additional efforts are needed to support CQIs when it comes to academic promotion:

a. Continued advocacy for assessment criteria that align with CQI work to ensure that assessments of impact reflect the nature of CQI work and outcomes beyond traditional metrics of grants and publications.
b. The processes and structures (e.g., forms, committee membership) require ongoing attention to ensure they are structured to collect information that is relevant to the CQI pathway and provide relevant feedback and assessments.
c. Attention to the above will prevent clinicians from choosing another academic position that is perceived to be an 'easier' pathway to promotion despite their main focus being Q&I.
d. Resolve tensions between work valued by hospitals and activities likely to garner academic credit and recognition. An analogue to 'sustained excellence in teaching' for CQIs might be helpful in this regard. Sustained excellence in teaching is demonstrated using scores on evaluations from trainees as well as winning teaching awards. Sustained excellence in Q&I would probably involve compiling a dossier with enough details about the projects undertaken and their impacts that a referee could judge the body of work as meritorious or not. Supporting letters from hospital leaders might also play a role.
e. Provide training and resources (e.g., exemplars letters of support) for Department Leaders who provide guidance and feedback to CQI faculty.

3. CQI position

a. Increase support and recognition for broader Q&I work, with particular attention to legitimizing the 'innovation' of Q&I (e.g., through courses, language used, profiling examples, mentorship) so that CQIs not engaged in PDSA-type improvement projects feel included and relevant training, job expectations, and mentorship are available.
b. Support opportunities for CQIs to engage in work in response to 'bigger picture priorities' (e.g., social determinants of health, climate crisis, the need for fundamental changes to the organization of the healthcare system) while not undermining ongoing attention to microsystem problems in clinics and on hospital wards.
c. Continued attention is needed to ensuring transparency about work expectations of the CQI position and its alignments with other academic positions (e.g., protected time for academic work, billing targets, number of clinics, funding allocation processes).

4. Mentorship

a. The growing number of more mid-career CQIs should now be seized as an opportunity to formalize mentorship opportunities and provide CQIs with formal recognition for the mentorship work that they are doing.
b. New models of mentorship for early career CQIs should be developed as relevant to contexts given the recognition that successful Q&I work is contingent on alignments with experienced mentors, hospital priorities and resources.

5. Training and continuing professional development

a. Continued attention is needed to ensure potential CQI faculty demonstrate a combination of relevant graduate training for their particular interests that could be complemented by QI training offered at places such as CQuIPS as well as workplace experiential training.
b. Further continuing professional development programs can be developed that reflect the range of knowledge and skills CQIs require given the diversity in their work and work trajectories over time.

6. **Continued CQI community development**
    a. CQIs in hospital leadership roles are playing key roles in fostering CQI activity as well as their relationships and collaborations with other healthcare providers. Their work should be recognized and learnings from across hospitals can foster infrastructures that are supportive to CQIs across all of the hospitals in which CQIs are located.
    b. The above includes efforts to support recognition for Q&I work, with particular attention to legitimizing the 'innovation' of Q&I so that all CQIs feel connected to the community of CQIs and that their work is supported.

INTRODUCTION

In 2012, the Department of Medicine at the Temerty Faculty of Medicine created the Clinician in Quality and Innovation (CQI) academic position description, an addition to the existing positions of Clinician-Teacher, Clinician Educator, Clinician Scientist, Clinician Investigator and Clinical Administrator. At that time, a small number of faculty focused on patient safety or other forms of quality improvement (QI). These faculty tended to be mid-career or more senior and so could choose to apply for promotion based on the existing mechanism of creative professional activity (CPA)[i] or their accomplishments as teachers or researchers. However, earlier career faculty primarily interested in healthcare quality and innovation, hereafter referred to as Q&I, faced the challenge of needing to demonstrate success according to the metrics for teachers or researchers (depending on their job description) in order to pass their Continuing Faculty Appointment Review, while also trying to pursue their interests in Q&I.

The development of the CQI position description aimed to address this disconnect, allowing faculty to be recognized, supported and assessed at the outset according to their Q&I goals. As described in a JAMA commentary, the CQI position aims to support and acknowledge faculty whose scholarly work primarily relates to assessing and improving healthcare quality, developing innovative models of care, or other forms of scholarship and innovation outside of traditional 'discovery research'. The number of Department members in the CQI job description has grown from one full-time faculty in 2012 to 78 in 2022, located across nearly all of the Department's subspecialty Divisions and clinical sites. And, other Departments have started to have CQI faculty members, including Psychiatry (9), Anesthesia and Pain Medicine (7), Obstetrics and Gynecology (5), Family and Community Medicine (5), Laboratory Medicine and Pathology (3), and Medical Imaging (1).

As the position description enters its tenth year, the Department of Medicine funded an independent review to examine the development of the position over time, its impacts, and challenges. These findings would provide insight into whether the creation of the position has contributed to the goal of fostering clinicians committed to healthcare quality improvement and innovations, and to identify limitations requiring further attention to enable the full potential of the CQI position.

[i] The promotions criterion Creative Professional Activity (CPA) was created at the University of Toronto Faculty of Medicine to recognize and reward a variety of types of academic endeavours that have a demonstrable impact on medical practice and care. CPA comprises three activities: professional innovation, exemplary practice, and contributions to the development of the discipline.

METHODS

This study used a case study methodological approach with the CQI academic pathway being the 'case' studied. A case study typically involves the use of a variety of data collection methods to enable a deeper understanding of the phenomenon being studied. The data collection methods used included semi-structured interviews, Department documents reporting on the CQI role and administrative CQI data, and online publications and reports of the work of CQIs.

Data Collection and Analysis

Interviews
All CQI faculty and Department Leaders (Departmental Division Directors and Physician-in-Chiefs) received an email inviting them to participate in a one-on-one semi-structured interview. A maximum variation purposive sampling approach was used to recruit CQI faculty with variability in training, specialty, institution, year of CQI appointment and number of CQIs in their Division. DDDs with a relatively larger number of CQIs were purposively recruited with the aim of understanding factors that contribute to the presence of CQIs in a Division and the experiences of Divisions with this larger number of CQIs.

Interview guides, one for CQIs and a different one for DDDs and Physician-in-Chiefs (PICs) were used for the semi-structured interviews. The questions for CQIs aimed at understanding their decision making in choosing a CQI track and pathways to becoming a CQI; the nature of their work conducted as a CQI; their experiences with mentorship, assessment and promotion; contextual factors influencing their work and opportunities as CQI faculty; and their perceptions of the development of the CQI stream over time. The questions for Department Leaders addressed topics such as the nature of CQI work in their Division/hospital, their roles in supporting CQIs and their perceptions of the challenges experienced by CQIs, training required for CQIs, and changes in the CQI role over time (See Appendix A Interview Guides). Interviews were conducted virtually April through August 2022. They ranged from 22 to 57 minutes in length (average of 37 minutes). After a verbal informed consent was obtained, interviews were audio recorded and transcribed verbatim.

Department documents and database
Relevant documents (e.g., sections on Quality in external Departmental reviews, minutes from meetings of Q&I Committee, guidance documents for judging merit/impact) that provide information about the description, evolution and outputs of the CQI academic pathway were collected and reviewed. Descriptive information about CQIs (Division, year of appointment, hospital affiliation, and professor rank) was collected from the Department database.

Publications and reports of CQIs
PubMed and online resources were examined for details about the work and impacts of CQIs.

The interviews and documents were analyzed using a thematic analysis approach informed by the purpose of the study and interview guides.

Ethics

The Research Ethics Board at the University of Toronto provided approval for this study. Study recruitment and interviews were conducted by a non-clinical researcher contracted to undertake

this study. Only this researcher had access to participant names and only anonymized and synthesized data were shared with Quality Department leadership.

FINDINGS

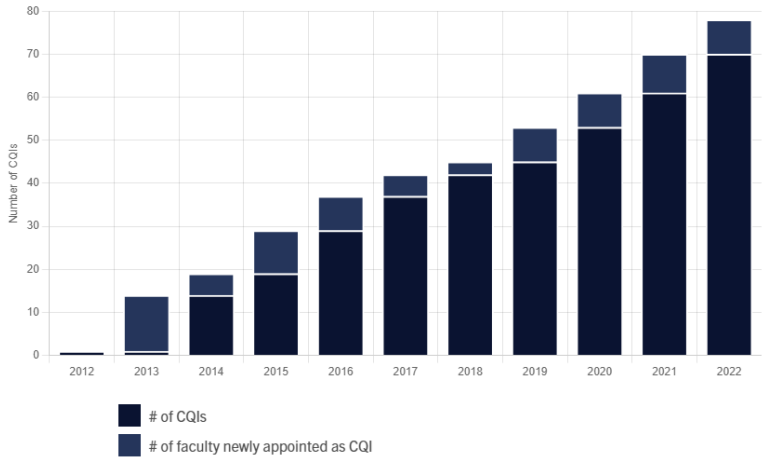
CQIs in the Department of Medicine

The CQI job description has seen tremendous growth in 10 years—from one to 78 full-time faculty and an additional 11 part-time faculty (Figure 1). Of the Department's 20 Divisions, 16 include at least one CQI. These full-time CQIs work at all 5 of the major teaching hospitals, and the part-time CQIs work at an additional 3 affiliated hospitals (Trillium Health Partners, Michael Garron Hospital, William Osler Health System). The full-time CQIs include 9 Lecturers, 53 Assistant Professors, 13 Associate professors, and 3 Full Professors, with a median time on faculty of 6.2 years (interquartile range: 2.5-8.9).

The current total of 78 full-time CQIs includes 23 faculty who switched from another academic position into the CQI position. This group mostly includes faculty who had an appointment prior to the existence of the CQI position and then decided to change following its creation. A small number had their initial appointments after its creation in 2012 and chose to change from another job description—typically clinical teacher or clinician investigator. No faculty chose to transition out of the CQI job description. (Five CQIs did leave the Department for another institution).

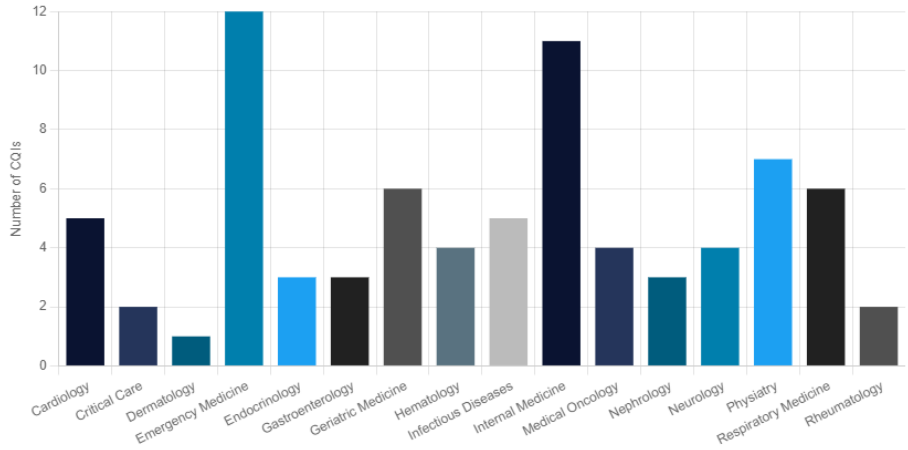
Tables 1a, 1b, and 1c show the distribution of the 78 full-time CQIs according to Division, hospital affiliation, and academic appointment. With the passage of time, CQIs have come to have leadership positions, including the role of PIC at UHN and previously the PIC at Trillium was a CQI. The medical directors of quality and safety at all of the major teaching hospitals are CQIs. And CQIs hold other key roles such as directors of clinical informatics and infection control (CQIs also hold leadership positions in the UofT's Centre for Quality Improvement and Patient Safety, the extra departmental unit supported by the Temerty Faculty of Medicine and several of the major teaching hospitals).

Figure 1: Clinicians in Quality and Innovation 2012-2022[ii]



[ii] When the job description was created in 2012, there were four faculty members considered likely to take up an appointment as CQI. For three of them, paperwork delayed their official appointment to 2013, hence the single CQI in 2012.

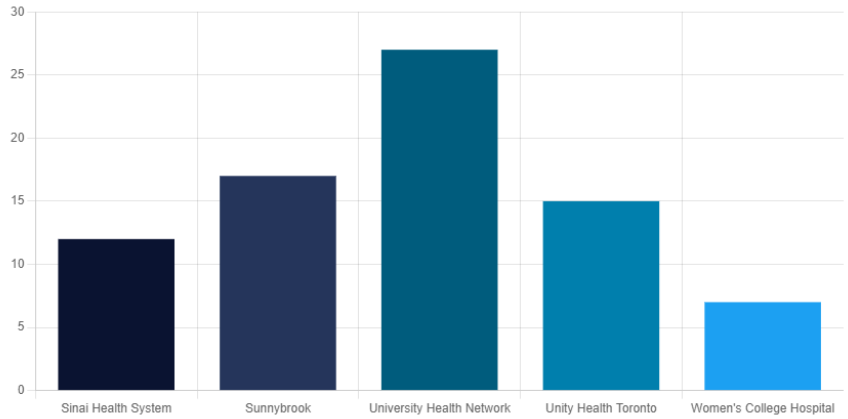
Table 1a: Distribution of Full-time CQI Faculty across Subspecialty Divisions[iii]



Subspecialty Division	CQI (n = 78)	Total Faculty in Division (n=915)
Cardiology	5	120
Critical Care	2	29
Dermatology	1	16
Emergency Medicine	12	100
Endocrinology and Metabolism	3	52
Gastroenterology and Hepatology	3	49
Geriatric Medicine	6	30
Hematology	4	64
Infectious Diseases	5	36
Internal Medicine	11	90
Medical Oncology	4	60
Nephrology	3	44
Neurology	4	81
Physician Medicine and Rehabilitation	7	38
Respirology	6	50
Rheumatology	2	41

[iii] Four Divisions have no CQIs and therefore do not appear in Table 1a: Clinical Pharmacology & Toxicology, Clinical Immunology and Allergy, Occupational Medicine, Palliative Medicine

Table 1b: Distribution of Full-time CQI Faculty across Hospitals[iv]



Hospital	CQI (n = 78)	Total Faculty in Hospital Department (n=915)
Sinai Health System	11	96
Sunnybrook	18	177
University Health Network	28	380
Unity Health Toronto	15	200
Women's College Hospital	6	52

Table 1c: Distribution of Full-time CQI Faculty across Academic Ranks

Academic rank	CQI (n = 78)	Total Faculty in Rank (n=915)
Lecturer	9	47
Assistant Professor	53	390
Associate Professor	13	248
Professor	3	230

Interview sample

The interview study sample consisted of 23 CQI faculty, and 7 Department Leaders (3 PICs and 4 DDDs). Faculty appointment dates for the interviewed CQIs ranged from prior to 2013 (existing faculty who had switched into the CQI track when it was created) to 2021. The sample included representation from: Cardiology, Emergency Medicine, Endocrinology, General Internal Medicine, Geriatrics, Hematology, Infectious Diseases, Medical Oncology, Nephrology, Neurology, Respirology, Rheumatology, and Physical Medicine and Rehabilitation. The participants worked at all of the major teaching hospitals - Mount Sinai Hospital, Sunnybrook Health Sciences Centre, Unity Health, University Health Network, and Women's College Hospital

[iv] Part-time CQIs are based at additional hospitals: Trillium Health Partners, Michael Garron Hospital, William Osler Health System

Perceived ‘fit’ of the CQI position

The creation of the CQI position in 2012 provided many of the study participants with an academic position description that they regarded as aligned with their career interests and directions. Participants who had come on faculty prior to 2012 and then changed to the CQI job description shared the following reflections:

> In many ways, the existence of the CQI job description was the first glimmer of hope I had that what I was doing was actually academically meaningful. As opposed to, that it was a barrier. Actually, for me, it was the first like, "So what I am doing could be academic? Excellent!" And so in many ways that CQI role description was a game changer for me because it gave some legitimacy to what I was doing. So I think in that way I consider it a big gift. (CQI Interview #5)

> So, in that sense, I was always struggling with what my identity is. And I was kind of ambivalent with the university because I never fit in. But that was fine…I was just going to work around it regardless. So when the CQI role came in, I really felt it was a nice description because I felt I now had an academic description in a home. So that was good. (CQI Interview #16)

Other participants were at an advanced training or early career stage at the time that the CQI position was created. For some in this group, the existence of the CQI position created an awareness of the opportunities that the field of Q&I provided as a career pathway, encouraging them to pursue further training and an appointment as a CQI. Others were already interested in Q&I and embraced the development of this new academic pathway just as they had to make a choice about what type of faculty appointment to pursue.

> Then luckily, when that job description came about, [it] aligned perfectly for when I was looking to be appointed. So it was a bit of serendipity and a bit of my own passions and interests…aligning with the job description… (CQI Interview #12)

Some expressed concerns and uncertainties related to the newness of the CQI job description and lack of clarity about some key details. There was also a sense, though, that this open-ended nature of the position description could offer advantages:

> And so I think that my only hesitation was that it was such an unknown at the time, that it was going to be very difficult to navigate. And as much as there was a lot of support, there was also a lot of, I would say, genuine confusion about how it was going to be addressed, how it was going to be embraced, and what the parameters of the role were. (CQI Interview #17)

> ... Having that [CQI job] description gave validity to what I was already doing. And it gave me a career path within academia that valued the type of work and said “Yes, the problems that you're seeing and the things you're trying to solve, yes, that is academic work and yes, we do value it.” So I think that was important. And that wasn't a challenge. That was an opportunity. (CQI Interview #6)

Participants with more recent appointments to the CQI position include individuals who had been exposed to Q&I learning and mentorship during their training by more senior CQIs (e.g., the Resident-Faculty Co-Learning QI program developed by members of the Department), and

had subsequently pursued more advanced Q&I training. For others, their Divisional site chief or other Department Leaders introduced them to the CQI track when their interests or planned work were perceived to align with the job description:

> They said that, "Yeah, you're more in the quality improvement [track]." And I said, "I'm not sure that's the case…but I hear you as I am trying to make things better and improve things". And I agree that this work doesn't fully fit maybe traditional [name of specialty] research… (CQI Interview #28)

> And with the job description came that, "Hey, did you know, there's so many people across the Department that are leaders in quality safety, innovation." And so they knew there were a lot of mentors outside of [name of specialty]. So definitely having the job description articulated with scope with deliverables was very helpful to actually recruit CQIs. (Department Leader Interview #29)

Department Leaders explained that not all physicians doing Q&I in their Divisions/hospitals were classified as CQIs. One of the Department Leaders commented that there are likely people in other job descriptions whose work fits better in CQI than their current position:

> So maybe the other part of this conversation…is how do we cast a critical lens, evaluative lens on what other people are doing and actually saying, "You know what, that work is actually a CQI"? And they may be able to be more successful if they're in the right role description. And can we move people? (Department Leader Interview #30)

This Department Leader's comment is supported by CQI administrative data that includes an Excel database of all Department members who have a substantial focus on Q&I. In addition to the CQIs, this database includes with 21 faculty members in other academic positions, including Clinician Teacher, Clinician Educator, Clinician Investigator, and Clinician Scientist. This group includes individuals who were appointed prior to the CQI position was created and did not change positions as well as more recent faculty who did advanced Q&I training but ended up choosing another academic position.

Breadth of work

Participants described a wide range of academic activities and impacts across a range of domains of work, including improving health care processes, resource stewardship, developing new models of care, responding to COVID, clinical informatics, further developing QI capacity through education and training, and policy work. The results of targeted literature searches further fleshed out the activities carried out by the CQIs. **Table 2** outlines ten major domains of work carried out by CQIs as well as illustrative examples.

While some participants focused on projects falling within particular domains of CQI work (e.g., resource stewardship, informatics and digital health), many worked in multiple domains and also demonstrated a range of knowledge, skills and behaviours required to successfully perform within these domains. The knowledge and skills included, amongst others: standard QI methodologies, human factors principles (e.g., related to developing and user testing new checklists or informatics tools), clinical epidemiology and health services research methods, guideline development and implementation, policy development, education planning and

implementation, administrative and committee work, advocacy, teaching and mentoring. Department Leaders provided insights to the diversity of domains of work across and within CQIs as reflected in the following comments:

> A lot of the people are doing local things in the clinic. Some, for example, are doing things on a provincial basis where they're improving care through education around the province through virtual care or a new model of care. Other people were writing guidelines. Other people are involved with guidelines through various national or international organizations, but often those people are also doing, even when they're doing those macro undertakings, as I say, they're also doing things micro in their own clinic, or they also serve as the quality lead for a Division or for a program. So there are multiple things that these people are doing. (Department Leader Interview #19)

> I think it works really well when you've got someone who is both invested in internally, in what we are doing, really good at collaborating, and then can extend that across our borders… more of that spread and scale…it makes a difference to the system. And then you get your publications. It may be presented at a society's annual meetings…(Department Leader Interview #22)

The work of CQIs who had been in their academic positions for relatively longer periods of time showed sequential development of projects that built upon their prior work, just as in other scholarly endeavours. These scholarly trajectories followed the general outline of first understanding the clinical practice or healthcare process relevant to a quality problem of interest, developing an improvement strategy and examination of practice changes, followed by expansion of the practice/program, for instance in the form of developing guidelines or working with external organizations to expand the scope of impact. The following anonymized quotes from two participants described this iterative nature of their work:

> And that helped us to understand what were the barriers to flow for [clinical area]. And then I got involved in the guidelines for [clinical area] at a national level….And then we became very interested in implementing them in Ontario…Then we got involved with Ontario at the Ministry of Health. We implemented quality based procedures for [clinical area], which involved trying to look at implementation of standardized pathways…And then we evaluated them… and then I also translated that work into some work with the [name of provincial organization]…measuring the impact on [clinical area]…. (CQI Interview #2)

> I combine health services research with quality improvement work, and I find it very helpful to use both of those techniques. So I do health services research that looks at areas of safety and optimizing best practice, lots of practice guidelines work. And then on the QI side of things I'm often, instead of just stopping at the point where the health services research might say there's a problem, the health services research identifies that there's a gap in care or a problem, then I am involved often in taking that a step further. Well, let's see, what could we develop to try and address this problem and try and change it? (CQI Interview #6)

In addition to describing the iterative evolution of their work on a given problem, CQIs described trajectories through levels of the health system, moving for instance from micro to meso to macro levels in their Q&I work:

> …now I'm moving from innovation models of care per se, to more policy that also relates to models of care. But it's that bigger piece about policy, advocacy, strategy, that natural evolution from that models of care work…. (CQI Interview #16)

> I'm more interested now at the systems level. So I think if I had to describe how my skills grew, it also grew with my interest in the work. So I was doing very micro level stuff, and then more meso level, and now I'm interested in more meso and macro, and there I'm recognizing I need to build more skills at the leadership level. (CQI Interview #12)

This trajectory of moving up levels in the healthcare system, from micro to meso and macro was also accompanied by CQIs taking on leadership positions—as the director of quality and safety for a Division, Department or hospital. CQIs also hold leaderships positions for key operational services such as informatics and infection prevention and control.

Table 2: CQI Domains of Work

Domain of work carried out by CQIs	**Illustrative examples**
Improving health care processes	Order sets [1-4] and decision support[5-7] Implementing safety huddles[8] Medication reconciliation[9,10] Transitions of care[10-15] Reducing readmissions[16-23] Defaulting to single-lumen peripherally inserted central catheters[24] Medical directives for nurses to remove urinary catheters as soon as appropriate [25] Transitions from pediatric to adult care for patients with chronic conditions[26-28]
Reducing unnecessary tests and treatments	Many CQIs have played national roles in developing Choosing Wisely Canada lists of "Tests and Treatments to Question" for their subspecialty, some of which they published as first or senior author[3,29-32] Many examples of developing and evaluating interventions to reduce unnecessary care, including unnecessary tests [4,33-40]and unnecessary treatments[41-48], including examples related to reducing healthcare's climate footprint[49] Examples with CQI as first or senior author [3,4,30,33,50,51] Examples published in high impact general medical journals [25,36,45,51-58]
Antimicrobial stewardship, Infection prevention and control	Numerous publications in top specialty journals [59-64] and in high impact general medical journals[56,65-67]
New Models of care	New models of care in geriatrics[1,68,69] and long-term care[70,71] Care coordination for complex patients[72,73] Inpatient general medicine[74-76] Virtual care [77-81]– including work pre-COVID [81-87] Home dialysis[88,89]
Responding to COVID	CQIs authored 100 publications directly related to COVID First case of COVID in Canada was reported in the *Lancet* [90] with a CQI as senior author and the first author a trainee who had graduated from the QIPS Masters RCT of prone positioning for ICU patients with COVID appeared in a high impact general medical journal and had 3 CQIs as authors[91] CQIs published papers on adapting clinical care processes during COVID[92-94] and other ways of responding to the pandemic[95-101] Virtual care[77-81] CQIs also contributed to analyses of impacts of COVID on patients [102-106] and on the health system[95,104,107-110]
QI capacity building through education	Many CQIs teach in QI courses, including programs at the CME, PGME, and UGME levels or work at the interface of QI and medical education more generally[111-116]

	They have also written education papers/primers on QI topics or guidance on how to establish successful QI programs in their specialty E.g., CQIs in Emergency Medicine wrote a 3-part series on QI topics for the Canadian Journal of Emergency Medicine [117-119] and reported the establishment of a local QI program in their clinical setting[120] CQIs in Nephrology and Gastroenterology similarly wrote a series of primers of QI topics for one of their specialty journals[121-124]as did CQIs in Physical Medicine & Rehabilitation[125]
Leadership and operational support for hospitals	CQIs hold hospital leadership positions including Medical Directors of Quality and Safety at all 5 of the major teaching hospitals and roles supporting informatics at three of the hospitals. The Physician-in-Chief at one of the major teaching hospitals is also a CQI
Information technology and digital health	Numerous examples of development and/or evaluation of specific informatics tools including in top informatics journals and high impact general medicine journals[6] Policy issues and strategies related to digital innovation and virtual care [126-129] Mobile apps, portals and other technologies to support patients[83,130-135] Artificial intelligence and machine learning[136-140]
Research identifying or characterizing healthcare quality problems	Numerous examples of clinical epidemiology or health services research on topics relevant to addressing healthcare quality problems, including in high impact general medical journals, such as JAMA[23], JAMA Internal Medicine [22,141-143] and others[104,144-146] Many examples involved CQIs as middle authors, collaborating with other researchers. But, one example from a high impact general medical journal[22] involved 3 CQIs, including as first and second authors
Other forms of innovation and impact	Influencing policy: Fostering development of digital health technologies, regulation and privacy[131,134,147] Healthcare journalism[148-150] Innovations in care during air travel[151,152] Advocacy and innovation in geriatrics care[153,154]

Collaborations

The participants described the extensive collaborations that were central to their work. Collaborations critical to their work include collaborations amongst CQIs, collaborations across subspecialties of medicine as well as across medical departments (e.g., working with Surgery), interprofessional collaborations, regional and provincial collaborations, and national collaborations. For instance, as shown in Table 3, participants described interprofessional collaborations in the development of new models of care (e.g., in geriatrics, inpatient general medicine, antimicrobial stewardship, and rehabilitation) and developing changes to care delivery in response to COVID. They also have participated in multiple regional, provincial and national collaborations (e.g., with provincial and national agencies as well as Choosing Wisely Canada). Participants described various ways that networking and collaborations developed for them over time, such as specialties that had an existing emphasis on interprofessional teamwork to mentors facilitating connections to specialty groups to longitudinal relationship development and work with government groups.

> …we have that really rich community with doctors and nurses and OTs [occupational therapists] and PTs [physiotherapists] and admins [administrators], and it's been really, really nice. And I think that we've been able to strengthen the programs on the basis of the unique perspectives… (CQI Interview #17)

> A lot of my external work and sort of creative work is with [name of provincial agency and committee] which is quite influential and writes all the best practice guidelines for [name of clinical area] in the province that end up being adopted. Actually even internationally we discovered. (CQI Interview #3)

> …my job is to sit with them [CQIs] and listen to what their interests are, and help them think outside the box. And then say, "Okay yeah, if you want to do this, let's see if we can help make the connection." And not every connection works out…so okay, let's brainstorm again, figure out where else we can go with this...And then mostly being hands off, once they get a good trajectory, then they know what they're doing. (Department Leader Interview #13)

Table 3: Collaborations

Topic	Illustrative Examples
Collaborations amongst CQIs	***"…And the goal is basically to increase the uptake of interest in QI activity across the Division of [name of Division]. So we're at different hospital sites, and we work together collaboratively…" (CQI Interview #27)*** *In the most recent 5 years alone, CQIs published 135 papers with at least 2 CQIs as authors and some had multiple CQIs.* **Chartier LB**, **Masood S, Choi J**, McGovern B, Casey S, Friedman SM, Porplycia D, Tosoni S, **Sabbah S**. A blueprint for building an emergency department quality improvement and patient safety committee. CJEM. 2022 *Four CQIs from Emergency Medicine published this paper reporting their development of a QI program in their Emergency Department* **Rawal S**, **Kwan JL**, Razak F, Detsky AS, Guo Y, Lapointe-Shaw L, Tang T, **Weinerman A**, Laupacis A, Subramanian SV, Verma AA. Association of the trauma of hospitalization with 30-Day readmission or emergency department visit. JAMA Intern Med. 2019 *The 3 CQIs on this publication in a high impact journal are all in GIM, but based at 3 different hospital sites* **Piggott KL**, Mehta N, **Wong CL**, Rochon PA. Using a clinical process map to identify prescribing cascades in your patient. BMJ. 2020 *Paper in high impact general medical journal with two CQIs from same Division (Geriatrics) but different hospital sites)—and senior author from a third hospital* Al Hussona M, Maher M, Chan D, Micieli JA, Jain JD, **Khosravani H**, Izenberg A, **Kassardjian CD**, **Mitchell SB.** The virtual neurologic exam: instructional videos and guidance for the COVID-19 era. Can J Neurol Sci. 2020 *This examples involves 3 CQIs in Neurology from 2 different hospitals, with additional UofT hospitals represented by other authors* **Guo M**, **Dunbar-Yaffe R**, Bearss E, Lim-Reinders S, **Soong C.** Do not waste a crisis: physician engagement during the COVID-19 pandemic**.** Healthc Q. 2021. doi: 10.12927 /hcq.2021.26549. *Three CQI authors, including first and senior author, from different Divisions (GIM and PM&R) and hospitals* Pendrith C, **Nayyar D**, Chu C, O'Brien T, Lyons OD, Agarwal P, Martin D, **Bhatia RS**, **Mukerji G.** Outpatient visit trends for internal medicine ambulatory care sensitive conditions after the COVID-19 pandemic: a time-series analysis. BMC Health Serv Res. 2022 *CQI authors from GIM, Cardiology and Endocrinology (as well as the colleagues in Department of Family and Community Medicine, including the Department Chair)*

	Guo M, **Bayley M**, Cram P, **Dunbar-Yaffe R**, **Fortin C**, Go K, Linett L, Matelski J, **Mayo A**, Pelc J, Robinson LR, Rotteau L, Wolfstadt J, **Soong C.** Protocol for a stepped wedge cluster randomized quality improvement project to evaluate the impact of medical safety huddles on patient safety. Contemp Clin Trials Commun. 2022 *This protocol for a clinical trial builds on previous published work by 2 CQIs in PM&R. The new work now includes 4 CQIs in PM&R, 2 in GIM, and an orthopedic surgeon (Wolfstadt) who is a graduate of the QIPS Masters at IHPME*
Collaboration across Medical Departments	***"The CQIs have a broader scope. They're very good at collaborating within their specialties and across specialties..." (Department leader Interview #22)*** ***"I'm a co-investigator on a project on improving [clinical area] access at [name of hospital]. And some of it's using my skill set, so I'm on that grant with [name of specialty different than one's own] because they don't have anybody that's used to QI and they need to know how to do process mapping and diagnostics and that's my role in that grant." (CQI Interview #8)*** Hensel JM, Shaw J, Ivers NM, Desveaux L, Vigod SN, Cohen A, Onabajo N, Agarwal P, **Mukerji G**, Yang R, Nguyen M, Bouck Z, Wong I, Jeffs L, **Jamieson T**, **Bhatia RS.** A web-based mental health platform for individuals seeking specialized mental health care services: multicenter pragmatic randomized controlled trial**.** J Med Internet Res. 2019 *This example involves CQIs from Cardiology, Endocrinology, and GIM (based at two different hospitals), as well as colleagues in the Department of Family and Community Medicine, and the Head of Psychiatry at WCH* **Wong CL**, Al Atia R, McFarlan A, Lee HY, Valiaveettil C, Haas B. Sustainability of a proactive geriatric trauma consultation service. Can J Surg. 2017 *CQI as first author with colleagues in Surgery examined whether implementation of an orthogeriatric collaborative care model would improve key quality of care metrics* Lee JC, Koo K, Wong EKC, Naqvi R, **Wong CL** Impact of an orthogeriatric collaborative care model for older adults with hip fracture in a community hospital setting. Can J Surg. 2021 *The CQI first author, Dr. Camilla Wong, followed up the prior successful project from an academic medical centre by implementing a similar program in a community hospital*
Interprofessional collaboration	***"Yeah, it's key. We can't function in silos, especially in QI. It's so broad, interdisciplinary, your work will fail if you don't have those relationships."*** ***(CQI Interview #12)*** Peragine C, Walker SAN, Simor A, Walker SE, Kiss A, **Leis JA.** Impact of a comprehensive antimicrobial stewardship program on institutional burden of antimicrobial resistance: a 14-year controlled interrupted time-series study. Clin Infect Dis. 2020

	CQIs as senior author, with first and second author from Pharmacy reporting the clinical impact of an intrinsically interprofessional antimicrobial stewardship program involving clinical pharmacists—also the first (possibly only) demonstration of an antimicrobial stewardship program not just reducing excessive antimicrobial use but also significantly reducing the prevalence of resistant microorganisms **Soong C**, Ethier C, Lee Y, Othman D, Burry L, **Wu PE**, Ng KA, Matelski J, Liu B. Reducing sedative-hypnotics among hospitalized patients: a multi-centered study. J Gen Intern Med. 2022 *Two CQIs with co-author from Pharmacy developed and evaluated the implementation of a bundle of interprofessional practices aimed at reducing inappropriate sedatives and hypnotics among hospitalised patients* **Romanovsky L**, Magnuson A, Puts M. Cognitive assessment for older adults with cancer: a Young International Society of Geriatric Oncology and Nursing & Allied Health Interest Group initiative. J Geriatr Oncol. 2022 *CQI first author with senior author a Canada Research Chair holder from Faculty of Nursing* *Other examples of work by CQIs with interprofessional focus:* Cheung MC, Franco BB, Meti N…**Singh S**. Delivery of virtual care in oncology: province-wide interprofessional consensus statements using a modified delphi process. Curr Oncol. 2021 Lee DD, Teper MH, **Chartier L**…**Taher AK**. Experiences of healthcare providers with a novel emergency response intubation team during COVID-19. CJEM 2022 Seki JT, Vather T, Atenafu EG, **Kukreti V**, Krzyzanowska MK. Bridging efforts to longitudinally improve and evaluate VEnous thromboembolism prophylaxis uptake in hospitalized cancer patients through Interprofessional Teamwork (BELIEVE IT): a study by Princess Margaret Cancer Centre. *Thromb Res.* 2014 Smith-Carrier T, Pham TN, Akhtar S, Nowaczynski M, Seddon G, **Sinha S**. "A more rounded full care model": interprofessional team members' perceptions of home-based primary care in Ontario, Canada. *Home Health Care Serv Q.* 2015 Salbach NM, Wood-Dauphinee S, Desrosiers J, Eng JJ, Graham ID, Jaglal SB, Korner-Bitensky N, MacKay-Lyons M, **Mayo NE**, Richards CL, Teasell RW, Zwarenstein M, **Bayley MT**. Facilitated interprofessional implementation of a physical rehabilitation guideline for stroke in inpatient settings: process evaluation of a cluster randomized trial. *Implement Sci.* 2017 Lin W, Haq S, **Sinha S**, Fan-Lun C. Impact analysis of a pharmacist-led home-medication review service within an interprofessional outreach team. *Sr Care Pharm.* 2021
Regional and provincial collaborations	***"In my first few years, in my position, I was involved in a [clinical area] task force that worked with Health Quality Ontario, and that received provincial designation and recognition." (CQI Interview #9)***

	Lee JC, Koo K, Wong EKC, Naqvi R, **Wong CL**. Impact of an orthogeriatric collaborative care model for older adults with hip fracture in a community hospital setting. Can J Surg 2021 **Hall JN**, Ackery AD, Dainty KN, Gill PS, Lim R, **Masood S** et al. Designs, facilitators, barriers, and lessons learned during the implementation of emergency department led virtual urgent care programs in Ontario, Canada. Front Digit Health 2022 Wong BM, Rotteau L, Feldman S, Lamb M, Liang K, Moser A, Mukerji G, Pariser P, Pus L, Razak F, Shojania KG, Verma AJ. A novel collaborative care program to augment nursing home care during and after the COVID-19 pandemic. Am Med Dir Assoc. 2022 Wickerson L, Fujioka JK, Kishimoto V, **Jamieson T,** Fine B, **Bhatia RS**, Desveaux L. Utility and Perceived Value of a Provincial Digital Diagnostic Imaging Repository: Multimethod Study. *JMIR Form Res.* 2020 Boucher E, Iciaszczyk N, Feil C, **Sinha S**. A comparative impact analysis of different COVID-19 vaccination strategies for older adults across two Canadian provinces. *J Am Geriatr Soc.* 2022
National collaborations	**Gandhi S,** Brackstone M, Hong NJL et al. A Canadian national guideline on the neoadjuvant treatment of invasive breast cancer, including patient assessment, systemic therapy, and local management principles. Breast Cancer Res Treat 2022 . Wong S, Rajapakshe S, Barber D…**Leis JA**. Antibiotic prescribing for respiratory tract infection across a national primary care network in 2019. Can Commun Dis Rep. 2022 **Poon S**, Rojas-Fernandez C, Virani S et al. The Canadian Heart Failure (CAN-HF) Registry: A Canadian multicentre, retrospective study of inpatients with heart failure. CJC Open 2022 **Cheng AHY**, Campbell S, **Chartier LB** et al. Choosing Wisely Canada: Five tests, procedures and treatments to question in Emergency Medicine. CJEM 2017 Munce SE, Graham ID, Salbach N…**Bayley MT**. Perspectives of health care professionals on the facilitators and barriers to the implementation of a stroke guidelines cluster randomized controlled trial. BMC Health Serv Res 2017 National Institute on Ageing. (2020). An evidence informed national seniors strategy for Canada – Third edition. ON: National Institute on Ageing. http://www.nationalseniorsstrategy.ca/wp-content/uploads/2020/09/NSS_2020_Third_Edition.pdf

	CQI was lead author of 2015 National Senior Strategy and supervised the 2020 consultations and update

Enablers: Structures and processes

Over the past ten years, structures and processes have been created within the Department of Medicine and its Divisions (**Table 4a**), the hospitals at which CQIs work and the Centre for Quality Improvement and Patient Safety (**Table 4b**), and professional and national organizations and funding sources (**Table 4c)** to support CQIs and their work. Examples include the creation of senior hospital positions to represent interests of people engaged in Q&I work, hospital leaders creating opportunities for CQIs to get involved with hospital quality committees, DDDs' active support for CQIs, Department of Medicine CQI meetings, CQuIPS education programs, national organizations with Q&I on their agendas, and creation of funding sources for Q&I work. However, the findings also underscore the variability in these enablers across individual CQIs and workplaces, as well as limited CQI funding opportunities, demonstrating the need for further effort to create consistently supportive infrastructures for all CQIs to be supported in their work.

> There is a multi-departmental committee of all the people that are involved and interested in the area (Q&I). And this is far reaching from OB GYN to psychiatry, neonatology..." (Department Leader Interview #19)

> I think from the Department of Medicine level, what's been great to see…and I've been engaged with [name of committee] and that's been nice to learn from each other, see what's happening outside [name of Division]. We've had a lot of great discussions, we've shared our work. I've learned from colleagues in nephrology or ID, what they're doing. We've commented on each other's projects. Having that sort of Department of Medicine group has been really nice. We have meetings every few months and that's been really great to share my work and see what they're doing as well. (CQI Interview #12)

> …we're actually adding in an executive position to represent the interests and the advocacy at the executive level… for people engaged in quality improvement work, not just CQIs, but anyone who might be engaged in quality improvement. And I think that narrative is important as well… everyone in the department needs to be able to look at the executive and see themselves or their representative there… (Department Leader Interview #30)

Table 4a: Enabling processes and structures within the Department of Medicine

Processes/structures enabling CQI pathway	Key details	Example quotes
Department of Medicine	Participants described the role of the Department of Medicine in creating the position of CQI and working towards changes in how people think about Q&I. Many participants made references to the small group of individuals in the Department recognized as Q&I experts and leaders. These individuals were described by some as either formal or informal mentors. Others reported reaching out occasionally to ask questions. Many also described specific individuals providing guidance for putting together their promotions package. Department CQI meetings were generally well regarded and seen as an opportunity for informal networking, learning about what others are doing, and having discussions about shared interests (e.g., research ethics processes, promotion, protected time) Concerns noted: • Participants recognized that not all CQIs could be mentored by the small number of senior QI experts in the department • The CQI meetings served many beneficial purposes although they did not necessarily support collaborations	It's been nice to be able to have all of those connections. I think you need a network, I think you need a web, because you're always going to have that person who's like, "Well, this isn't research," or like, "This isn't worth a grant." But I think the fact that there's things like innovation grants where QI projects get funding now….that's the department and the Division saying this is important work. So just someone higher up saying that it's important and opening those doors, I think whether or not you have a mentor, it still helps facilitate you being successful. (CQI Interview #12) I do think having a community of practice, which I feel I do, from going through the [CQuIPS] program and from sort of loose interactions here and there and hearing about one person is doing something similarly elsewhere, I think that those connections are really critical. And I think there's a lot of learning that can happen that way. And so in fostering and nurturing an environment where people get to know each other, and having opportunities for CQI-based events and things like that to attend, I think there's a lot of informal networking that happens there, and there can be a lot of learning there. (CQI Interview #17) The last couple of sessions I attended, people were sharing their work and I think that just seeing the type of work that people were doing, actually talking about the challenges and how they actually got through them and the barriers and things like that. It gave you strength. And I got ideas for people to work with. So I really did value those parts as well." (CQI Interview #26)
Department of Medicine Specialty Divisions	Participants described the ways in which their Division plays a role in their CQI position. These include:	The work I've done has been across the program, it's like everyone sees the benefit of my work in helping to improve…and so I've always felt very supported by the Division in doing that work because it's helping all our patients... (CQI Interview #12)

	▪ DDDs having expertise in Q&I and therefore affording mentorship and collaborative opportunities ▪ DDDs providing support and encouragement for Q&I and CQI role ▪ DDD and/or CQIs facilitating Division-wide Q&I strategic priorities and work (e.g., Quality day, CQI in lead Division Q&I role) ▪ Presence of senior Q&I experts in one's Division or hospital provide mentorship or advice Concerns noted: • DDDs can provide support in time and kind but not necessarily provide methodological expertise • There are DDDs who continue to value a research oriented understanding of impact • CQIs can feel isolated when the only CQI in hospital Division and lack of connection with CQIs in one's Division in other hospitals • CQIs who are contemporaries are aware of each other's activities but not working together or able to provide mentorship because of similar career stages	One in particular is my Division Director….who really has embraced quality improvement in her work…and as in her role as a Division Director, I think she sees the merits of quality improvement…She has organized the entire team. So we have multidisciplinary team members…and really collectively, we have worked on quality improvement products…She was key in getting me on this track. She was key in helping me with some of the products that I've been working on. And she's been absolutely instrumental, not only as a Division Director, but as a mentor, she's been absolutely incredible. (CQI Interview #9) …So I think it's really providing the framework for, "…let's do something together." And they just went off and did it. It's talking at a lot of Divisional meetings, to say, "This (Q&I) is part of our strategic plan and we're really proud of it." (Department Leader Interview #13) And the goal is basically to increase the uptake of interest in QI activity across the Division of (name). So we're at different hospital sites, and we work together collaboratively. And mainly, what we do is we each have our own areas of focus, but we create more of a lab environment. We supervise trainees. We meet all together. We talk about individual projects. We participate in the Co-Learning and QI curriculum. And then we have the (group name) rounds, as well, and then a few (group name)-related projects that we do together on the staff level, as well. (CQI Interview #27) I was told by the university head, "I can't help you with that because that's not my area of expertise. So you're going to have to make sure you reach out to (names) because nobody's senior in our department who knows that. (CQI Interview #11)

Table 4b: Enabling processes and structures within the Hospitals and Faculty of Medicine

Processes/structures enabling CQI pathway	Key details	Example quotes
Hospitals of CQIs	Participants described the range of actions that have been undertaken at the hospital level to support the culture of Q&I at their organization and individual CQIs in their roles. These included: ▪ Creation of senior hospital positions to represent interests of people engaged in Q&I work ▪ CQIs appointed to hospital leadership positions and QI committees ▪ Development of infrastructure (e.g., information systems) to support Q&I work ▪ Creation of hospital QI communities of practice ▪ Hospital leadership 'opening doors' for CQIs ▪ Growth in number of people across hospital, in addition to CQIs, doing Q&I work ▪ Hospital providing institutional support for Q&I work ▪ CQIs having affiliations with hospital-based research centres that provide resources and supports or to research resources Concerns noted: Challenges to hospital-level Q&I efforts include the variability in Q&I interests and work across the hospitals, and time required to invest in nurturing opportunities to work together, which affects meaningful interactions and collaborations.	I'm doing a lot locally where I would say the primary goal of that work is to connect people. To make people successful at (name of hospital) to feel connected, to feel part of something, to help them achieve their goals. (CQI Interview #10) ...now that they've appointed (name of hospital quality lead) and they have this formal spot, I think it's (not having a culture of QI) not going to be so much of an issue anymore. I think they're reducing barriers to QI work. And more and more people, even outside of medicine, nurses, pharmacists, who are trained in it as well, there's fewer and fewer barriers in the perception issue at least from what I could tell. It's becoming less and less of a problem. (CQI Interview #15) We have a shared bio-statistician, for instance, at (name of hospital). And so for those of us who aren't 80% researchers, we are able to get some time to… support any of the projects that we do, and we pay on the basis of…I think that the culture at (name of hospital) has been very supportive in medicine of QI initiatives. I've never felt poorly supported. And I think I feel progressively more understood in the work that I do... (CQI Interview #17) I feel I'm very well supported actually…We have a (name) research group and they do assist with some of my QI and patient safety work, as well as our other, standard research. So we have RAs, we have people that recruit, I have people that help me write our REBs. So I feel very well supported in that. (CQI Interview #8)

Centre for Quality Improvement and Patient Safety (CQuIPS)	Some participants described their involvement with CQuIPS either as trainees or faculty in the Co-Learning program, participants of the Certificate in Quality Improvement or Excellence in Quality Improvement (EQUIP) programs, or as members of the Centre with responsibilities for mentorship and teaching. CQuIPS was therefore described as a Centre that promoted interest in QI as a career pathway, provided learning opportunities that complemented advanced training programs, and allowed faculty to provide mentorship and education to others. Concerns noted: A small number of people noted their limited connection to CQuIPS, noting that this might be a consequence of certain hospitals having a formal relationship with CQuIPS, but that further connections are developing overtime. A small number of participants noted that it would be helpful for CQIs to have access to QI and research support (e.g., statisticians, research assistants) through CQuIPS or the Department of Medicine given challenges of hiring these types of expertise and supports on a time-limited basis.	I'm the faculty lead for…the Co-learning Curriculum where…we had faculty led in this case, myself, residents, either the [name of specialty]trainees…. So they would work on various activities. And we would have workshops collectively with our colleagues, from other Divisions. And then we would have an Academic Research Day, and present, and we were able to get some of our work published in academic journals….” (CQI Interview #9) …right from the word "go," it was wonderful in our certificate course cohorts, to have such different backgrounds all represented in the room. So we had administrators from hospitals, we had nurses, we had doctors, and each was coming at their own project from their own angle, which was fascinating. It was so interesting to see how an administrator would approach a problem that is shared by a clinician as well, and to see the opportunities for collaborations there, and tackling a problem two ways. So I think really embedded in that course was that spirit of interprofessional collaboration. I think it's very easy when you're doing your clinical work day in, day out, to really only interact with a very, very small, narrow subset of people. And I think that it just tacks the door open for that. (CQI Interview #17) But the point is that you share those resources [e.g., research assistant, statistician] and it's paid for centrally. The university considers this important or CQuIPS considers important, so it's paid for. So we're not sitting there having to find $1,000 grants or whatever it is to pay someone to do a little bit of work…(CQI Interview #20)

Table 4c: Enabling processes and structures – External organizations

Processes/structures enabling CQI pathway	Key details	Example quotes
Professional, healthcare and government organizations	Participants described the key role of connections to professional, healthcare and government organizations that enabled their Q&I work and impacts (e.g., Choosing Wisely Canada, Cancer Care Ontario, Public Health Agency of Canada, etc.) Concerns noted: There was some concern that these connections might be increasingly difficult to make for newer faculty and disparities across faculty could be due to structural factors.	…the (name of professional society) was probably through sponsorship and mentorship. So even as a trainee, I got looped in very, very early. And then once you're involved and you show enthusiasm, you tend to get more opportunities...But that was very much within my subspecialty community. That wasn't within the QI world. It just happened that having those relationships was extremely important for being able to navigate a career as someone with the CQI portfolio. (CQI Interview #6) Having provincial deliverables was really key because it was kind of like the [name of specialty] program identified that supporting me was important because it was a deliverable for the [name of specialty] program. So they're like, "This is your report, has to be done, who's going to do it? (name of participant) 's going to do it. Well, we better give her resources." So I think that in itself was something that helped me to do the work and helped me to have direction. (CQI Interview #12)
Funding sources	Participants reported on the range of funding sources that supported their Q&I work. These included innovation grants (e.g., AFP, Department, Division), research grants (e.g., CIHR) as well as funding from government, industry, professional and specialty associations, hospitals, and donor funding. The creation of 'innovative' funding awards geared for Q&I was seen as particularly critical for CQIs. Participants recognized the opportunities for less-traditional sources of funding afforded for Q&I work. For example, one participant noted the need to find individuals or organizations where there are overlapping interests in the 'innovation'. Concerns noted:	Each year there are two $10,000 awards that go to people to do quality improvement research within the organization. So that's a way of getting some start-up money and some funding for people to be able to do some of this quality improvement research…And the (name) grants can be a stepping stone to getting a bigger AFP grant… (Department Leader Interview #22) I think that's been really great because that's the word innovation, it's targeted towards the work that I do. That's been really critical…that's been good financial support for the work that people like myself do. (CQI Interview #1) I've had some success in obtaining funding, but it's always putting on my health services research hat. Actually obtaining funding for real QI work is very difficult. And there's very, very few funding channels and far too many people trying to compete for that funding, so I would say that's a huge challenge. (CQI Interview #6)

	Participants expressed concerns that grants for Q&I tend to be competitive and for smaller amounts of money compared to traditional research grants. One strategy was to frame Q&I as research to obtain funding. However, this was not always feasible and was challenging to apply to grants for Q&I that are geared to research. Furthermore, participants noted that CQIs have less protected time and resources to undertake grant applications. Participants described instances of doing Q&I work that is not funded.	Not only are you being compared to their work, but you're being compared to them in the sense that these are people who have 50 to 80% of their time dedicated to research, whereas like, I don't know what most CQIs have, but for me, it's probably 30%. (CQI Interview #20) I think the lack of support is more, probably external. As far as the ability to get funding for projects that are actually QI and patient safety. (CQI Interview #8)

CQI pathway developments and future directions

The findings of participants' experiences with the CQI academic pathway over the past ten years have highlighted the creation of structures and processes to enable QI work to be undertaken and valued, as well as significant achievements as outlined above. The findings have also brought to the forefront key issues requiring attention to continue to both support individual CQIs and shape and strengthen healthcare improvement and innovation locally, nationally and internationally. These key issues include: Scope, training, academic status, and expectations in relation to the CQI role; Hospital and university alignments and tensions; Academic promotion; and Mentorship.

CQI position: scope, training, academic status, and expectations

As the number of physicians in the CQI academic position has increased steadily in the past ten years, the findings provide insight into current opportunities and deliberations about the role. These centre around four areas: 1. Scope of the CQI role – what work is included under the CQI umbrella; 2. Training – what kind of training is necessary? 3. 'Academic' dimension of the CQI role – how is it different than QI work as every clinician's responsibility?; 4. Job description expectations of the CQI role – funding, time and work arrangements.

Scope

The Department of Medicine website describes the academic position of CQI as broadly including "faculty whose primary academic interest is engaging in quality improvement, patient safety, knowledge translation, or other forms of healthcare innovation (e.g., advancing health informatics, developing new models of care)." The position description was intentionally worded to be inclusive of individuals who are not only doing traditional QI work, but who are engaged in other forms of Creative Professional Activity. This approach has contributed to two key issues, described below. First is the concern that the 'I' in CQI represents 'innovation', but is being widely perceived as improvement, with resulting implications. The second is the ongoing discussion about what counts as QI and what as research.

Based on the interview findings, participants could be loosely categorized as those: i) whose CQI work is largely based on the use of QI methodologies (e.g., PDSA cycles, fishbone diagrams, time series analyses); ii) who use QI methodologies informally or draw upon them selectively for particular projects; iii) whose work does not use these methodologies (e.g., participants who described their work as research in healthcare improvement or implementation science). Amongst those that did not use QI methodologies routinely themselves, many noted that they taught or mentored trainees in their use.

Despite the intended wording and conceptualization of the CQI position description, it was not uncommon for participants in the interviews to question whether their work falls within the CQI domain. This questioning was consistently related to those participants whose CQI work did not reflect common forms of QI, such as projects using the Plan-Do-Study- Act (PDSA) and other forms of rapid cycle change involving iterative refinement and implementation of an initial change idea.

> I feel there's the QI methodology, but you can't fit all the issues that you're trying to address exactly within the framework of QI and make it a hundred percent QI and design

> cycle. I mean, that's all part of it. For every change...kind of like PDSA cycles. So it was part of it, but I don't know if I can say that it's a purely QI type of initiative. There's a lot of different components, but QI is a part of it... (CQI Interview #25)

> I always feel a bit other…when I think about classic QI think about run charts and Pareto diagrams…I do a little bit of that but I do a lot of the models of care stuff…And so am I being led into this because they have nowhere else to stick me, or are other people actually working similarly and embracing this as their home. So I've never been told otherwise, but I wonder whether people think like, "Oh, well, that's an interesting interpretation of how to do this role. (CQI Interview #17)

Many participants positioned their work under the 'innovation' part of CQI. Although the wording CQI includes the word 'innovation', there was a perception that the acronym is commonly interpreted as Clinician in Quality Improvement, with the innovation part of the CQI role perceived as less prominent by some participants. For instance, one participant, commented that the various QI education programs and seminars at the University, which could refer to those run through the Department, as well as those run by the UofT Centre for Quality Improvement and Patient Safety (CQuIPS) and the Masters at IHPME, (both of which have had many teachers from the Department), tend to highlight QI methodologies with little attention to other forms of innovation. The dominance of 'quality improvement' (as demonstrated through language used, training opportunities, formal frameworks) over 'innovation' was perceived to have implications for people being able to see themselves in the CQI pathway. In addition, participants noted that there were implications for funding opportunities when 'innovation' work was not recognized as 'QI' work.

> It's called CQI, so a lot of people who aren't familiar with it, think that it's clinician in quality improvement and then the "I," which is actually innovation, gets totally neglected. I think that there's a very structured framework for the QI part. Whereas the innovation side, I still think, is quite nebulous. (CQI Interview #1)

A small number of participants who described their work as being research oriented (in contrast to those who combined QI methodologies and health systems research) deliberated about their position as a CQI, although they recognized the ways that their health system or implementation science research can be positioned in healthcare improvement. They were cognizant, though, that QI tools were not necessarily best suited to support the changes they were aiming to address, including system-level processes and practices.

> Because in my mind, I'm like, "Oh gosh, what I should be doing is boots-on-the-ground PDSA cycling, all of these things."…I guess part of me feels like I should be doing a particular thing that I'm not doing by doing research. I guess that's where the tension comes from. (CQI Interview #21)

> ... people in CQI might see that there are other opportunities for them at a larger level as well that they can do that may involve large data sets, population health, and even some epidemiology...If the goal is still ultimately to improve the quality of a healthcare system, then that can still be part of it. (CQI Interview #14)

As Department leaders described, there were also faculty in their hospitals or Divisions who were doing Q&I work but classified in another academic position description:

> And so [faculty name], she's classified interestingly as a clinician teacher, but we all think of her as a QI because she has got that background. And when she went for promotion, in fact, her CPA was all based around her quality improvement work, even though she's a phenomenal teacher. So she preceded that sort of formal training that people had in QI. Then we had [faculty name]…who also came from a different background in that he didn't do the QI Masters, but he helped train people in QI because he was early on in this whole area of development. (Department Leader Interview #22)

The ongoing discussions about the nomenclature of QI and its intersections with other fields such as knowledge translation and implementation science, as well as differentiations between QI and research, have implications for the CQI position in a local context. Participants' perceptions of how one fits with the CQI role affected their connections to the CQI community and also how they described advising others about pursuing a CQI or alternate pathway. Questions about boundaries for the CQI role were also expressed by Department Leaders:

> I think that the career path still tends to get a little muddied in terms of pure QI. Do we mix advocacy with QI and do we mix knowledge translation with CQI, or is all that just expected to be part of QI? So I think there's still a little bit of vagueness there. (Department Leader Interview #24)

A couple of participants in particular expressed their interests in the CQI domain evolving and being responsive to broad social, political and economic contexts. These comments were made in relation to discussions about the pandemic and increasing spotlights on equity and resilience, and the need to attend to system and structural factors in healthcare improvement:

> My head doesn't even want to think about this right now, because how are we going to possibly handle all this? But the reminders that these kinds of [pandemic] issues are going to continue to come up. And with what's happening with climate change, it may accelerate. And the way that the world has changed…we may be more vulnerable than ever. (CQI Interview #3)

> I think a lot of people are feeling this way when I think of my friends who are CQI in the Department of Medicine. The scope when I think of my unit, it feels a little bit inadequate or unsatisfying, given the scale of crises. I don't know what the right training is, because I don't know what the aim of quality [ought to] be right now. Is it another checklist or alert, or PDSA safety cycle at this micro level? Or is it actually trying to understand what skills are required to engage in broader change? (CQI Interview #21)

Training

The diversity of the work being done amongst CQIs can be linked to the varied training pathways of participants. Participants described themselves (or the CQIs in their Divisions and hospitals) as having had varied graduate degree training, from explicit graduate programs in quality improvement, such as the Masters in Quality Improvement and Patient Safety (QIPS) offered at IHPME, to Masters of Public Health and Clinical Epidemiology programs (some of which include QI material), to training programs in clinical informatics and health administration. Just over 30% of the 78 full-time CQIs did the IHPME Masters and the participants of this study

included five of these CQIs. Participants who had completed the IHPME Masters spoke positively about the program, noting that it provided a strong foundation for their CQI role. While many participants talked about the varied paths to becoming a CQI and the degree to which different pathways made sense for different people, there was general agreement that their formal training was important and probably should be required.

> I think some formal training is going to be critical. So be it, the master's program here at the University of Toronto…there are other programs around the world…but I think something of that is going to be required. I think there should be a definite focus on, on data acquisition and interpretation. So we're talking about run charts, and process control charts, and interpretation and that kind of thing. So, but I do feel the training that I received was able to prepare me for the work that I've done. (CQI Interview #9)

Some participants who had done other graduate degrees valued the additional learning in which they participated that allowed them to learn about QI methodology and 'lingo'. This included the Department Co-Learning QI program and Centre for Quality Improvement and Patient Safety Certificate and EQUIP programs.

> Then I got involved in the Co-Learning curriculum for QI…that's actually where I started to learn some other principles alongside the resident teams that I was helping to supervise on things like auditing, and measurement, and fish bones, and all those sort of technical elements…(CQI Interview #12)

Participants valued having a Masters QI program as a pathway for the CQI position, however there was a wide-ranging perception that there should be various acceptable pathways to the CQI position. This was due to various reasons. First, the IHPME Master's program has limited capacity to support the number of individuals interested in advanced QI training. Second, all participants interviewed felt that their training had provided them with the knowledge and skills to embark on the CQI pathway. They noted that their different degree programs and expertise allowed for the variable types of work undertaken in their CQI roles. Furthermore, participants described the importance of continued learning in practice over time, and that the learning required changed over time as their work and positions evolved. This included, as noted above, acquiring QI methodology skills if needed, or, other types of knowledge and skills such as leadership training.

> I don't know what the right training is, because I don't know what the aim of quality be right now. Is it another checklist or alert, or PDSA cycle at this micro level? Or is it actually trying to understand what skills are required to engage in broader change? For me, that's what I've been reflecting on …and maybe there's stuff that we can learn from advocacy and social movements around how to change things. (CQI Interview #21)

This openness to different qualifications was reinforced by Department Leaders who described hiring physicians to the CQI appointment who had different qualifications and career experiences. These quotes below reflect the opportunity for some flexibility in the background training for CQIs and how they might come to develop expertise in Q&I over time:

> And I think if you restrict it to having to have the right letters after your name and the right formal teaching, I think that restricts it. And there's no reason why somebody couldn't change to [C]QI as a job description from being a CT or a clinician investigator because their body of work has actually become focused on QI. I don't like limiting things. I think you then restrict out people who, as they develop their career, they develop their interest and their affinity and their talents and their skills and the people they're working with…(Department Leader Interview #22)

> If you asked me 10 years ago, or eight years ago, it was very rigid. Did you do a Master's in quality? Because that's how you become a CQI. But I'll tell you last couple years, very much broadening of the criteria... if, even though the training was a bit off the beaten path for this particular faculty it's aligned with QI and maybe we can appoint this person six or 12 months after starting as a clinical associate to allow them experiential learning, collaboration, a starting project… (Department Leader Interview #29)

Academic status

The ten years of appointing Departmental members in the CQI job description have given rise to various discussions, both internal and external (e.g., with the Chair of the Decanal committee), and efforts to increase the extent to which Q&I is recognized as legitimate academic activity. Numerous participants described the need to differentiate between the academic activity of a CQI and QI as an everyday responsibility of all clinicians. This differentiation underscores a key point in the JAMA commentary concerning 'innovation local quality improvement' activities versus 'routine QI activities', that launched the CQI description.

> I think our next big step with CQI is to actually make sure that quality improvement…is seen as a foundational responsibility for everyone who participates in the healthcare system. And you have this smaller group of people whose academic work specifically focuses on. I think that's probably the next big leap…really embedding it in the fabric of academic medicine. (Department Leader Interview #30)

Participants described their experiences with negotiating their role as a CQI, and what responsibilities it should entail. In some situations, they welcomed opportunities such as leading morbidity and mortality rounds or being involved with local QI projects. These opportunities allowed them to contribute to learning and workplace practices, and learn about local processes and network within their organization. In some cases, these activities led to academic projects. However, there was also uncertainty about requests for local QI activities and challenges with saying no to them. Some participants noted that the expertise of CQIs was not maximized by focusing on 'small local problems', nor were they 'academically productive'.

> …every Division has quality care issues, of course. We could all improve things. So the question is, who's going to lead those things?...So, let's say somebody just determines there's a quality of care issue, is it my job to fix it? (CQI Interview #15)

> I mean, everything needs improvement, but it's hard to make sure that it's also an academic problem that you're trying to solve. So I've helped out with a few different things over the last year or so, but they haven't been things that I want to sort of talk about as my academic accomplishments. (CQI Interview #25)

There was a perception amongst participants that there has been, and continues to be, a learning curve over the past ten years of what to request of CQIs. In addition, participants who had been in the CQI role for a relatively longer period of time described developing a greater ability overtime to discern between different types of QI engagement as one's academic focus becomes more defined.

> I found that there have been lots of opportunities on the one hand, but on the other many are distracting from what I would perceive to be my core body of work. And so being supportive and certainly embracing all of the different things that the QI role can lead to is one. And I think that's great, and starting broad and really exploring, that is great. On the other, being able to sort of say, "Well, yes, I am a CQI, but this is my focus, and this is what I do."...I think that's going to evolve. And I think it already has…(CQI Interview #17)

The healthcare leaders interviewed described the ways that they see the CQIs bringing a different level of expertise to QI compared to other clinicians. For example, they talked about leadership in QI, advancing evidence for delivery of care and education, passion for improving the way that care is delivered, having a different mindset and a broader scope, collaborating within and across specialties, and bringing an evaluative and iterative lens to their work.

> I think it's much more robust than everyone else doing it. So we all contribute, but we don't contribute necessarily in a formal way. The CQI is not only expected to just join in some projects, the CQI person is expected to lead projects, is expected to make impact, be the leader in quality safety, innovation, improvement, and not just be a participant. That I think is a huge difference. We can all be participants, observers, passive believers, but the CQI are really the leaders, the people who take it by the horn say, "I want to take this further. I want this to be national impact. I want to publish on it." The other people just want to be participants, put up their hand and say, "Yeah, I can help. Invite me to the meeting." And the CQI will be, "Well, I'm going to get some help, arrange the meeting, set the agenda and set the outcomes…" (Department Leader Interview #29)

> And I think that they really bring an important structure even if it's just the analytic approach and approach to evaluating, intervening, and then disseminating the results of an initiative are a very important contribution on their part. And I do think that it's one thing to have really good ideas and say, "We should do this. We should do that. This doesn't make sense," but they seem to be the ones who are able to really take an organized approach and get it done. (Department Leader Interview #24)

Expectations

Participants recognized that all faculty experience challenges with job expectations regardless of academic position description, particularly during the pandemic, yet there were some concerns that were perceived to be particular to the CQI job description. One issue was the funding structures for CQI, that they get less protected time for academic work. Participants described the implications for their academic productivity and work-life balance; they described strategies such as working evenings and weekends and choosing to decrease the amount of clinical work they do (resulting in lower income) over time. There were also references made to physicians trained in QI moving to roles in community hospitals.

> …my job description as a CQI is to do, I don't know, 30 or 40% academic stuff. Well, the reality is that, I work enough clinical, and everybody else does, that really my expectations should be similar to a teacher. It should be like 10 to 15% academic because the amount of money and time that people are giving me is not enough to be competitive, to be able to do that. (CQI Interview #18)

> So first of all, is time spent in clinical care, which is 60 to 75%. And there's no way I could do the work I do, if actually I had to do 60 to 70% clinical time. I don't know if "traditional" QI could, but I see myself needing similar amount of protected time as a clinician investigator. I'm still applying for grants. I'm still doing full, proper research methodology that requires ethics submission... (CQI Interview #28)

Participants who had been in their CQI position for a number of years and were aiming for academic growth and impact, with a move towards national and international work as required by university promotion standards, struggled with how to make clinical practice changes given their clinical demands:

> How do I change my clinical practice so it allows for more academic growth and impact?... my passion is improving (healthcare area). Locally, provincially, yes, but also nationally and internationally. (CQI Interview #8)

A small number of participants who had been in their role for a longer period of time and were in leadership positions were eager to see the CQI job description evolve to recognize the scope and magnitude of Q&I work being done by individuals in senior positions. A few people referred to the Clinician Administrator position that is only used for physicians in select senior roles; they felt that there needs to be some type of designation for those in the CQI role spending a majority of their time on healthcare improvement work that recognized and valued this type of work.

> How does it make sure that it can continue finding ways to nurture and grow that (CQI) community? And then how does it find ways to kind of sustain that community as CQIers mature and don't necessarily need to seek a new job description to fit in, but actually can maintain that CQI identity, but also financially, or whatever, also feel like they always have an academic home, if that makes sense. (CQI Interview #16)

Some concerns were also expressed about processes and clarity regarding CQI position descriptions in the context of specific Divisions and hospitals. A few participants described lack of clarity about Division expectations of them as a CQI. A few described having a Division QI leadership role although struggled with defining the goals and outputs of this role. A participant in a Division with a very small number of CQIs expressed concern about lack of clarity and transparency about work requirements (e.g., billing targets, number of clinics, bonus structures) for individuals in the CQI position compared to other academic positions. At one site there were concerns about processes for funding allocation to CQIs including favouring of traditional research metrics, disadvantages to clinicians who take on parental leave, and disseminating the rankings of the applications for funding. As noted above, there was also concern about the funding structure of the CQI role for senior people who were spending a majority of their time doing healthcare improvement and innovation work. It was also mentioned that the deliverables

listed in the CQI job description (e.g., morbidity and mortality rounds, PDSA cycles) could be expanded to reflect the diversity of what could be delivered as a CQI.

As this quote from a Department leader signifies, the CQI role has contributed to both a range of expectations which could be challenging with limited allocated academic time, but also flexibility to define one's CQI pathway amidst these opportunities:

> …it's a job description that has everything from teaching and admin through to their academic research type work. And it can be hard to fulfill all the expectations because you're expected to be a master of everything…these are people who are often 30 to 40% of academic. And then the rest is the teaching and clinical. So it can be hard, they have a lot of demands coming their way along with a gig still in its infancy really, as far as an academic job description is concerned, but it has the advantage of people being able to develop it the way they want to be able to develop it. (Department Leader Interview #22)

Hospital and academic (mis) alignments

The CQI academic position has contributed to changes for physician roles and responsibilities in relation to both hospitals and universities, with many benefits being reported:

> I really recognize their value both from within what we are doing clinically and academically within the hospital and how they can be an asset to the university, to the system. (Department Leader Interview #22)

Department leader participants described the tremendous perceived value of CQIs to hospital leaders given their focus on improving healthcare services. Given that top priorities of hospitals are to "see patients, teach trainees and medical students, and improve care", CQIs are viewed as being a natural fit. There were varied discussions of such 'fits', but some examples included those in relation to emergency medicine, where physicians have historically been doing QI work but it was not formally labelled and recognized as such, in infection prevention and control where the work is intrinsically QI, and in relation to a hospital's focus on development of new models of care. Hospital leaders described their strategic priorities for hiring CQIs, noting that recruitment could be challenging given the limited number of trained candidates and physicians with QI training being valued by community hospitals as well:

> …I think it's just alignment of both the person being recruited and the people who want to recruit. (Department Leader Interview #29)

> …if you ask me, we need more people doing that [training in Q&I]. I would hire those people in a second. We don't have access to many of those people. (Department Leader Interview #19)

Interviews with both Department Leader participants and CQIs also demonstrated the ways in which the CQI role has contributed to the development of hospital leaders. CQIs described the essential learning about hospital operations that was required for Q&I work and, importantly, the development of relationships with hospital employees who play various roles in hospital administration. Participants with paid hospital leadership positions described the work they do in creating the hospital infrastructure and playing a role at senior level decision making to support

improvement at a systemic level and enable other CQIs, in addition to other clinicians doing Q&I work, to succeed.

> …[name of senior hospital leader] and many others in leadership identify this job description as a critical one to the success of the hospital operations and physician leadership in it. (Department Leader #19)

CQI participants described the importance of aligning QI work with hospital strategic directions and priorities; this was essential to their work being supported and having a sustainable impact. This perspective was also recognized by Department Leaders:

> …They can't be just trying to swim along on their own because they're not going to be successful. They actually need to have the support, I need to be bringing in our director of… make sure that she understands that it's not just somebody that's taking up a whole bunch of resources that actually the use of those resources can actually lead to improved outcomes, better efficiencies. (Department Leader Interview #22)

Many participants described the strategy of aligning hospital and academic QI activities, the ways in which hospital work led to academic work or informed each other, selecting committees strategically, and creating a narrative of how the different activities fit together. However, this alignment took time to develop and was not always straightforward. In some cases, participants noted that their clinical or interest area was not a top priority of their organization but it was a gap in the Q&I field; others noted the tension between the academic side that emphasizes individual achievement versus collaboration of hospital Q&I work:

> …my general sense has been that, at least from a hospital perspective….there isn't that much interest in my work per se. Although we've published in high-impact journals and et cetera, I don't think that it's of great interest to the institution. (CQI Interview #21)

> So I think in some ways then there's a bit of an attribution problem with myself, because I can't really swoop in, and take everyone's credit, and just be like, "Oh, [name of participant] did that." Because I didn't really do it, even if I facilitated it. And also too, I think, because I work in the hospital within an administrative structure that has so many different people, and so many different roles, and so many different staff, it's also wrong to kind of be like, "Oh, [name of participant] did that." I mean, it's not at all. I mean, it's a giant team of people did it. And I have a very important leadership role. But I think a lot of that stuff does inherently fall into that QI bucket. (CQI, Interview #7)

Given the relatively small number of CQIs, participants questioned who will do the hospital-related work of teaching, supervising trainee QI projects, decreasing infections rates, etc. if they are expected, from a university academic perspective, to pursue national and international QI work.

Promotion and ‘impact’

CQI faculty members have had a 100% success rate with the Department’s Continuing Faculty Appointment Review (CFAR). They have also had a 100% success rate with promotion, including 12 promotions from Lecturer to Assistant Professor, 13 promotions to Associate Professor, and 2 promotions to Full Professor. It is expected that many faculty members in the CQI job description will demonstrate their impact through the creative professional activities (CPA) framework defined by the University of Toronto. The CQIs and Department Leader

participants reported overall positive experiences with promotion processes at the junior stages of promotion. However, participants expressed concerns and uncertainties given the relatively small number of CQIs (17) who have undergone senior promotion (to Associate or Full Professor), as well as ongoing concerns about assessment and promotion structures.

Participants described supports and system changes geared towards the promotion of CQIs. There was a perception that messaging from the Department of Medicine about promotion processes and expectations was encouraging for CQIs. In addition, many participants talked about the mentorship they received from senior QI experts in the Department concerning the pathway for promotion and developing their promotion applications. In addition, there was embracement of having a broader space for demonstrating impact for CQI work.

> I was recently on a call looking at promotion, and I marveled at how different the tone was in terms of the value of CPA and how things were going to be measured. And it was really heartening and really exciting to know that even over a fairly brief span everybody at every step of the way has really evolved. And their thinking right up to the chair of medicine, so, I think it's great. (CQI Interview #17)

> “I've liked being a CQI because I think it gives a lot of flexibility for exploration. And in some ways, it's nice to have slightly amorphous benchmarks, because you can do what makes sense for the area that you're interested in. And you're not tied to grants and...this number of papers or X amount of...So it is a bit liberating in that sense. I think there is that tension once again, but it's probably a benefit to people's creativity and taking their work in the direction that they think is most appropriate. I think that's really great. (CQI Interview #21)

Although participants perceived support from the Department, they reported on various concerns with the promotion process. There is a general feeling that there has been movement from an exclusive focus on funding and publications as indicators of success, particularly due to the existence of the CPA, and that this shift takes time; however, there continued to be uncertainties and struggles. Participants described having to manage leaders who continue to view academic work solely through the lens of traditional research. Leaders who are supportive of CQIs are still learning how to position CQI work within existing frameworks which remain primarily shaped by research metrics such as grants and publications:

> I think some people in [name of specialty] still... A very traditional profession where they expect papers, and grants, and impacts. They still struggle a little bit with when they see a traditional CV of someone in CQI saying, "How have they actually done the work they do?" And some people get it, and some people, they're still a little bit old school in that regards. (CQI Interview #14)

> So how do you frame... Like [name] did a lot of work on facilitating patient flow throughout the system. So how do I articulate the impact that had? And the promotion is all about impact. So they ask for reference letters. "Okay, what impact did this individual have on practice? And what impact did it have outside our local region? Did it have an impact nationally?" So figuring how to articulate those is a little bit more challenging. That's what I think we could use help with for promotion. (Department Leader Interview #19)

Some participants described experiences where they perceived that that their outputs were being compared to research metrics and reviewers did not understand their work as a CQI, and therefore feedback received was not relevant or constructive. They felt there is a need for the promotions process to further support the nature of CQI work:

> I feel like some of the things that they ask you for are still very, I don't want to say archaic, but are built on a time of a very research based sort of lens. I think you have to do more work to demonstrate that CPA is impactful and I think there's more stress involved with trying to demonstrate that. I feel like the framework could be updated a little bit more to reflect the job description…I think that can improve. (CQI Interview #12)

A small number of participants talked about the ways in which the university Decanal committee dictates promotion processes, and the challenges that exist when there are different perceptions of what should be counted for promotion. Some described strategies to work within the existing system while others identified the need for changes to what is valued and counted for promotion.

Participants described a number of issues specific to CQI that they perceived to affect working within the existing system. CQIs spend tremendous time on doing the 'process work', and the duration required to do Q&I work may not align with 'an academic time chart'. Consequently, the time to apply for promotion could be longer for CQIs.

> I think when sometimes when you're doing a lot of work on guidelines or standards and then implementing them, people don't realize, some people who haven't tried it don't realize how hard it is… how do we make sure that the randomized control trial that actually got published actually gets into practice?" (CQI Interview #2)

Others noted that the work and impacts produced can sometimes be challenging to share. For instance, government-related work is not always publicly accessible.

> So this is what happens when you're working with government. I have no control over that, but it's actually limited my ability to show the impact. (CQI Interview #3)

In addition, Q&I work is usually a collaborative effort, making it harder for an individual to claim ownership.

> …the other part is that often you might not be leading things. You might not be leading everything, but you still fill a very important role in it. So it's people who don't always lead undertakings, but still make valuable contributions and how to recognize that from an academic perspective. (Department Leader Interview #19)

Participants who had been successful with promotion reflected on their own experiences and implications for others. There was particularly a concern about demonstration of national and international impacts:

> But I think for a lot of people who are doing really important work, the work that matters the most to patients, it's hard to get national or international recognition for that because there's someone doing that locally in their centre too. So I just think that the narrative

> around national and international reputation is probably harder for many people engaging in very impactful, meaningful CQI work. (Department Leader Interview #30)

> So if I was purely doing local QI efforts, for sure it would be hard. Definitely. And I wouldn't have those outputs that are valued, right, the publications and the grants and the other things. (CQI Interview #6)

Many participants discussed the need to expand the ways in which metrics and impacts are conceptualized to account for the variable work of CQIs. For instance, participants advocated for greater recognition of leadership work that impacts either “within four walls” or regionally, provincially or nationally, but is not captured through publications.

> And so I would say that the work that's really been the greatest impact has actually been the national work that I'm doing. The provincial work, the regional work, absolutely, it's been, I think, a huge contributor to our ability to move forward. I mean, but it's just not... It doesn't meet what we normally would use to gauge people academically. So, I don't know what to do about that. (CQI Interview #3)

> And to be honest, getting onto guidelines in some of the big specialties is all about networking and who you’re connected to. And that can be really difficult for someone that's a [C]QI. And particularly if you're a woman or you're someone from an underrepresented community. And so I think we need to come up with some metrics for what it really means to have meaningful impact when you are implementing quality improvement. And it shouldn't have to be national….Obviously it has to be the whole faculty that will accept those metrics the way they have the CPA. I think the CPA helps a lot. Yeah. But maybe they need to think about what the CPA looks like for someone who's a [C]QI to help them make sure that they're successful. (Department Leader Interview #22)

Some participants did not view promotion as a high priority. They did not see the benefits of promotion and derived professional satisfaction from the impacts they were having in relation to, for example, patient care, organizational processes, education, and advocacy. There was also discussion about promotion being only a ‘small piece’ of clinicians’ lives in work-balance decisions and the need to ensure expectations are reasonable so that CQIs are encouraged along the academic pathway.

> I think, at this present moment, I'm not really sure what the benefit of that would be. And I think given everyone’s limited bandwidth at this point in the pandemic, it doesn't seem something I want to devote time or emotional energy to, until I understand how it fits into a greater, more immediate sense of a career trajectory...(CQI Interview #21)

Department Leader participants noted that it would be helpful for them to have more training on supporting CQIs in their promotions, as well as having access to exemplars, templates, details of what is required, and more consistent frameworks for evaluation. As one participant noted, having senior Q&I experts’ input into promotion letters has been extremely helpful to bringing a Q&I lens.

> Well, the quantitation of their output is always important and how that will be regarded at promotion level. I think we're still relatively early in the promotion process in terms of we don't have so many people who have gone for senior promotion in the [C]QI role yet. I

> think I need training to how to evaluate that. And I think faculty leadership who are involved in promotions and CFAR process have to have a bit more training for how to quantify output and coach our faculty as well in terms of even on a CV level, how to best describe their output and activities….The leadership needs training for that. Obviously, the faculty as well. (Department Leader Interview #24)

Mentorship

Participants recognized that the relatively short existence of the CQI position, the innovative work being done and the relatively small number of senior Q&I faculty has affected mentorship experiences. Participants, particularly those who were appointed as CQIs in the early years of its creation, described seeking out different mentors at varied stages of their career, both locally and outside of University of Toronto. Others described the challenges of not having mentors.

> [Name of senior Q&I faculty] helped me when I first started, but when my work started to diverge a bit, I really didn't have a mentor for most of my time. So I really was on this on my own, trying to navigate my own pathway, which I think was obviously, it was very difficult….It's been tough. I think I would've appreciated…having more mentorship and more colleagues doing that, and so I think for the current CQIs, that's really important is that community. (CQI Interview #14)

There were varied perceptions of current availability of mentors, with variability depending on whether there were senior Q&I experts in one's Division and hospital and the support and/or expertise of Division heads. Some participants described very positive experiences with formal Q&I mentors, in a small number of cases benefitting from mentors who had been mentored themselves by senior Q&I experts. Others described gaps in such mentorship. For this group of participants, they had some opportunities but were limited; for instance, they could send an email or call a Q&I senior expert for ad hoc advice, receive mentorship for promotions process, or have a mentor from another institution. Given that in many instances CQIs in a Division were appointed at similar times to teach other, there was not a 'senior' person to provide mentorship; in some instances peer group mentorship also occurred. There were a small number of people who noted that individuals are not always seeking out or embracing of mentorship.

Participants offered some considerations in relation to CQI mentorship. Department Leader participants discussed the importance of helping CQIs to focus their interests and develop a trajectory, facilitating connections, ensuring CQIs are not taking on too much and that some of the work is considered as academic credit, and enabling the availability of both clinical area and Q&I mentorship. Amongst the CQIs, some participants were particularly eager for mentorship in relation to their next career stage of national and international work, and there was a comment in relation to female mentorship:

> …I think it is important for women to have female mentorship. And I've never had a female mentor of any kind, so I feel like that would be helpful because there are unique challenges for women, especially in CQI, that I've experienced that I think would be helpful. (CQI Interview #27)

There was recognition of the value of working with an experienced mentor given the healthcare improvement learning that occurs through experience, the social and political processes inherent to Q&I work within an organization, the resources and power needed to do healthcare improvement and innovation and drive change, and the need to establish "trust and a track record" when doing healthcare improvement and innovation work. Given these understandings, a few participants advocated for a more formal mentorship model as described by one participant:

> The person who clears the deck gets stuff done, finds you resources, finds you budget, finds you space, finds you interested VPs, like that sort of stuff. And I think the CQI doesn't really have that latter role very well. And I think now that we have a good cadre of CQIs... I mean, I don't know how long has it been? 10 years now? Kind of close, yeah. I mean, now that we have a lot of people who are practiced, I think leveraging those people who are already out there, and using them as ways to allow the new people to get real work done from day one…(CQI Interview #7)

As the following quote demonstrates, there were a small number of instances of this mentorship model occurring. One participant wished they had such an arrangement given how challenging it is to "hit it right the very first time" and the value of working together on a couple of projects "before flying solo". Another participant in a Division with a relatively larger number of CQIs described having this kind of opportunity:

> …I think finding a person or having that mentor really show you the potential for change, number one. And number two, how to actually... You learn all the theory, but until you see in practice, like how do you actually write up the project charters? How do you form the committees, and how do you navigate all the interpersonal issues of trying to change management and all these things. And having someone like [name of senior CQI in Division], I was very grateful…to see someone with a big drive and vision and a huge skillset to be able to show you what is possible. (CQI Interview #26)

Participants described providing Q&I mentorship to others, including medical school students and residents within and outside of their Divisions as well as learners in QI education programs (e.g., CQuIPS Certificate, IHPME Masters). They described both the need for further exposure amongst trainees about a CQI academic pathway, and opportunities to expand and formalize opportunities for them to provide mentorship to others as exemplified through the following two quotes from one of the participants:

> Even though we do the Co-Learning Curriculum, at the end of every year I'm hoping that there will be one PGY5 that wants to do a QI service. There's been a couple, a lot more now than there were before. I feel like people don't get it enough and see how impactful it could be as a career. (CQI Interview #12)

> I would love to mentor a new CQI to be like, well, this is how you do it. This is how you get data, this is how you present, this is how you figure things out. This is how you engage stakeholders here and there. Now that opportunity is there. When I started, there were no CQIs. We were the first crop. I think that is important. (CQI Interview #12)

CONCLUSIONS AND RECOMMENDATIONS

The 'Clinician in Quality and Innovation' pathway has met its principal goal of providing an 'academic home' for faculty whose scholarly work primarily relates to assessing and improving healthcare quality, developing new models of care, or pursuing other forms of scholarship and innovation outside of traditional 'discovery research'. The existence and growth of the CQI position has also fostered greater awareness amongst Department leaders and would-be faculty members about the value and academic legitimacy of Q&I work.

The work of CQIs has had clear impacts at local, regional, provincial, and national levels. The number of publications and reports highlighted in this report demonstrate impact by the accessible metric of publications. Further demonstration of impacts were clearly evident through CQIs' descriptions of changes in clinical practices, organizational processes and patient care outcomes in their healthcare contexts. This work has been accomplished through individual knowledge and skills developed through advanced education programs and continuing professional development over time, institutional changes in definitions of academic work and impacts, creation of hospital and Department infrastructures to support quality and innovation work, evolution of the Q&I field and funding and publication opportunities, forging of collaborative approaches across professional groups, medical specialties and organizations, and the increased focus on quality and safety strategic priorities of healthcare organizations.

Looking forward, opportunities to optimize continued progress for clinicians in the CQI academic position and the impacts of their work include the following:

1. **Recruitment to the CQI academic pathway**:
    a. Ongoing efforts are needed to expose trainees to Q&I during training years, particularly in Divisions with a smaller number of CQIs.
    b. Department Leaders play a key role in supporting potential new faculty who may not see the fit of their work with the Q&I academic position, and therefore ongoing communication is needed about the role and its opportunities.

2. **Support CQI in academic promotions**: While progress has occurred on this front, additional efforts are needed to support CQIs in their academic promotions:
    a. Continued advocacy for assessment criteria that align with CQI work to ensure that assessments of impact reflect the nature of CQI work and outcomes beyond traditional metrics of grants and publications.
    b. The processes and structures (e.g., forms, committee membership) require ongoing attention to ensure they are structured to collect information that is relevant to the CQI pathway and provide relevant feedback and assessments.
    c. Attention to the above will prevent clinicians from choosing another academic position that is perceived to be an 'easier' pathway to promotion despite their main focus being Q&I.
    d. Resolve tensions between work valued by hospitals and activities likely to garner academic credit and recognition. An analogue to 'sustained excellence in teaching' for CQIs might be helpful in this regard. Sustained excellence in teaching is demonstrated using scores on evaluations from trainees as well as winning teaching awards. Sustained excellence in Q&I would probably involve compiling a dossier with enough details about the projects undertaken and their impacts that a referee could judge the body of work as meritorious or not. Supporting letters from hospital leaders might also play a role.

e. Provide training and resources (e.g, exemplars letters of support) for Department Leaders who provide guidance and feedback to CQI faculty.

3. CQI position

a. Increase support and recognition for broader Q&I work, with particular attention to legitimizing the 'innovation' of Q&I (e.g., through courses, language used, profiling examples, mentorship) so that CQIs not engaged in PDSA-type improvement projects feel included and relevant training, job expectations, and mentorship are available.
b. Support opportunities for CQIs to engage in work in response to 'bigger picture priorities' (e.g., social determinants of health, climate crisis, the need for fundamental changes to the organization of the healthcare system) while not undermining ongoing attention to microsystem problems in clinics and on hospital wards.
c. Continued attention is needed to ensuring transparency about work expectations of the CQI position and its alignments with other academic positions (e.g., protected time for academic work, billing targets, number of clinics, funding allocation processes).

4. Mentorship

a. The larger number of more experienced CQIs should now be seized as an opportunity to formalize mentorship opportunities and provide CQIs with formal recognition for the mentorship work that they are doing.
b. New models of mentorship for early career CQIs should be developed as relevant to contexts given the recognition that successful Q&I work is contingent on alignments with experienced mentors, hospital priorities and resources.

5. Training and continuing professional development

a. Continued attention is needed to ensure potential CQI faculty demonstrate a combination of relevant graduate training for their particular interests that could be complemented by QI training offered at places such as CQuIPS as well as workplace experiential training.
b. Further continuing professional development programs can be developed that reflect the range of knowledge and skills CQIs require given the diversity in their work and work trajectories over time.

6. Continued CQI community development

a. CQIs in hospital leadership roles are playing key roles in fostering CQI activity as well as their relationships and collaborations with other healthcare providers. Their work should be recognized and learnings from across hospitals can foster infrastructures that are supportive to CQIs across all of the hospitals in which CQIs are located.
b. The above includes efforts to support recognition for Q&I work, with particular attention to legitimizing the 'innovation' of Q&I so that all CQIs feel connected to the community of CQIs and that their work is supported.

APPENDIX A: Interview guides

Interview guide for Clinicians in Quality and Innovation (CQI)

1. Can you begin with a brief description of your current professional role?

2. What was your pathway to becoming a CQI?
   Probe: training, decision making in becoming a CQI, factors that influenced your decision to become a CQI, mentors that influenced your decision to become a CQI

3. What work do you do under the label of the CQI designation?
   Probe for specific examples and details, probe whether and how this work has changed over time

4. What factors have influenced the opportunities that you have had as a CQI faculty?
   Probe: resources, support, respect, protected time

5. What has been your experience of mentorship in your CQI position?

6. What have been your experiences with assessment and promotion in your CQI position?

7. What impacts do you perceive that you've had in your CQI position?

8. Can you describe the nature of support that you receive from your clinical site for your CQI position? From your Division?
   Probe: How do you feel about this support/lack of support? What do you think needs to change to optimize your opportunities?

9. Do you feel you were prepared for the CQI position?
   Probe: If yes, describe in what ways you were prepared
   Probe: If no, what preparation do you see as needed?

10. Do you think the CQI should continue to exist as an academic position?
    Probe: Do you have any suggestions for changes to the position?

11. Do you have suggestions for the kind of training needed for the CQI position?

12. Is there anything I have not yet asked you that you think would be useful to share with me in relation to your experiences being a CQI or suggestions about how to improve this academic position?

Interview guide for Physician-in-chiefs, Division heads, Institutional quality leads

1. Can you describe your professional role and specifically your role in relation to CQI faculty in your Division and department?

2. Can you describe the nature of the work that the CQI faculty are doing in your hospital/Division?

3. How do you see CQI faculty contributing to the academic output of your hospital/Division?
   Probe: How does this differ from those in research or education academic positions?

4. What do you do in your role to support the work of CQI faculty?
   Probe: resources, mentorship, support

5. What challenges do you see existing for faculty in the CQI position?

6. Can you describe your experiences with the assessment and promotion of people in the CQI position?

7. What training do you think faculty in the CQI position require to succeed?

8. Do you think the CQI should continue to exist as an academic position?
   Probe: Do you have any suggestions for changes to the position?

9. Is there anything I have not yet asked you that you think would be useful to share with me in relation to your experiences being a CQI or suggestions about how to improve this academic position?

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