Evaluating Investment in Quality Improvement Capacity Building: A Synthesis of the Literature

Gustavo Mery, MD, PhD
Mark J. Dobrow, PhD
G. Ross Baker, PhD
Jennifer Im
Adalsteinn Brown, PhD

University of Toronto
Institute of Health Policy, Management and Evaluation
Health Sciences Building, 155 College Street, Suite 425, Toronto, Ontario M5T3M6 Canada.

Toronto
August 2015
Acknowledgements

This project was supported and received funding from the IDEAS Collaborative – Improving and Driving Excellence Across Sectors. The views expressed here are those of the authors with no endorsement from supporting organizations.

Competing Interests: The authors declare that they have no competing interests.

Reproduction of this document for non-commercial purposes is permitted provided appropriate credit is given.


This report is available online at the following websites:

- Institute of Health Policy, Management and Evaluation: http://ihpme.utoronto.ca
- IDEAS Collaborative – Improving and Driving Excellence Across Sectors: http://ideasontario.ca
- Health Quality Ontario: http://hqontario.ca

The authors welcome comments, suggestions, and inquiries to this document and would like to encourage an open discussion on the ideas and concepts expressed here; from knowledge and service users, providers, decision makers and researchers in Ontario and the national and international community. Contributions can be made through our partner’s institutional websites, or directly to ihpme@utoronto.ca.
Contents

Executive Summary ................................................................................................................................. 4
Background ................................................................................................................................................ 6
  The Opportunity that Quality Improvement Hides .............................................................................. 6
  Building System Level Capacity to Improving Quality ..................................................................... 6
Research Objectives ............................................................................................................................... 8
Methods .................................................................................................................................................. 9
Results .................................................................................................................................................. 10
  Evaluations of ROI in QI Initiatives ................................................................................................. 12
  General evidence on QI capacity building evaluation ...................................................................... 15
    Findings on Characteristics of QI Training ...................................................................................... 23
    Findings on Characteristics of QI Activity ...................................................................................... 25
    Findings on Individual Enablers/Barriers ....................................................................................... 26
    Findings on Organizational Enablers/Barriers ............................................................................... 28
    Findings on Impact (outcomes) ...................................................................................................... 30
Discussion ............................................................................................................................................ 32
References ............................................................................................................................................ 36

Figures

  1: Searching and scanning process ..................................................................................................... 10
  2: Number of articles identified by research objective ..................................................................... 11
  3: Framework to Guide System Level Capacity Building Evaluations ......................................... 33

Tables

  1: General characteristics of studies included .................................................................................... 11
  2: Comparative frameworks on QI ROI assessments ...................................................................... 13
  3: Investments and benefits of The Productive Ward ....................................................................... 15
  4: Findings from selected articles, organized by themes ................................................................. 16
Executive Summary

Poor quality of care places a heavy financial and human burden on health care systems worldwide. Low quality care is widespread and persists despite the fact that more organizations than ever before are actively engaged in Quality Improvement (QI) efforts.

System level assessments of the impact of QI capacity building are essential to link investments to health system performance improvement and transformation.

The objectives of this study were to explore existing QI capacity building evaluations that allow assessment of the return on investments (ROI) or other types of economic evaluations, and to gather and review the literature on the current knowledge in QI capacity building evaluation.

Methods

We conducted a systematic review of the health care services and policy literature to identify evaluations of QI capacity building and evaluations of QI training programs. The search included the most relevant indexed databases in the field and a strategic search of grey literature. The latter included direct electronic scanning of 85 relevant government and institutional websites internationally.

Results

The search identified 2,335 articles, of which 47 were included in the final analysis. Two ROI assessments of QI capacity building were identified, though none at the system level.

The seven key steps in ROI assessments in QI capacity building identified were:

1. Planning – perspective and timing
2. Discerning costs
3. Discerning benefits
4. Discerning attribution
5. ROI calculations
6. Sensitivity analysis

We identified 16 evaluation components, grouped under five overarching themes that should be included in assessments of QI capacity building:

A) Characteristics of QI Training:
   1. QI projects as part of QI training program.
   2. Coaching/mentorship as part of QI training program.
   3. Use of e-learning resources.
   4. QI training partnerships.
   5. QI training during residence or undergraduate health care studies.

B) Characteristics of QI Activity:
   6. Opportunities to apply QI skills.
   7. Informal QI training and coaching as part of the working environment.
   8. Patient and community participation in QI.

C) Individual Enablers/Barriers:
   9. QI skills and knowledge.
   10. Motivation and interest in QI activity.
11. Individual barriers to QI training.

D) Organizational Enablers/Barriers:
   12. Organizational culture and leadership support to QI.
   13. Teamwork, team empowerment and resources for QI.
   15. QI strategy and work with health authority.

E) Impact:
   16. Patient and Care Outcomes.

Conclusions

The literature on QI capacity building evaluation is limited in terms of the number and scope of studies. Further research is needed to gain a better understanding of system level ROI in QI capacity building.

Our findings, summarized in a Framework to Guide Evaluations of System Level Investment in QI Capacity Building, can be used to start closing this knowledge gap.
Background

The Opportunity that Quality Improvement Hides

Poor quality of care is harmful and costly, and far too common. Evidence over the last few decades has consistently demonstrated that low-quality care related to the overuse, misuse and underuse of health care places a heavy financial and human burden on health care systems worldwide (Øvretveit, 2009; Dentzer, 2011).

More recent evidence suggests that the risk of preventable adverse events might not be getting any better. Today, poor quality of care is widespread and persists despite the fact that more organizations than ever before are actively engaged in QI efforts (Adler et al., 2003; Chassin & Loeb, 2011). Consequently, there is a compelling need to better understand what works and what does not in QI.

Concurrently, fiscal sustainability continues to be an important issue for health care systems across jurisdictions, and simply limiting spending does not seem to be a viable solution in the long term. Instead, advances to solve broad quality issues represent an important opportunity to improve financial sustainability (Bevan, 2010; Canadian Foundation for Healthcare Improvement (CFHI), 2014). However, the existing body of research is insufficient. To the question “Does improving quality save money?” Øvretveit (2009)’s answer is: “sometimes, but sometimes not, and mostly we do not know because the research is limited.”

As observed, many health care delivery organizations have implemented QI programs, either to comply with regulations or to realize some of their advantages, such as controlling costs, managing growing complexity, protecting against claims, differentiating from competition, and achieving better patient outcomes (Øvretveit and Staines, 2007). However, improving health care quality requires active participation and interdisciplinary collaboration of a workforce skilled in QI (Batalden & Davidoff, 2007; Robert Wood Johnson Foundation (RWJF), 2011a).

Building System Level Capacity to Improving Quality

Studies have shown that professionals are often ill-prepared to promote QI efforts and are frequently reluctant to change (RWJF, 2011b; Dobrow et al., 2011). QI in services with little experience or infrastructure to support improvement can be especially costly and ineffective (Øvretveit, 2009). This might be in part the reason for actual improvements in quality of care not spreading as quickly as QI activity has done. It might also be a major cause for not realizing the expected ROI in QI.
systematic approach to capability building for improvement has been identified as the most common characteristic of healthcare systems that deliver high performance in cost and quality (Bevan, 2010). For Bevan, skill building is a critical component of any systematic approach to large-scale change. QI capacity building increases the self-sustaining ability of organizations to recognize, analyze and improve quality issues by more effectively controlling and using available resources (Crisp et al., 2000). For Potter and Brough (2004) it is important to recognize that there is a hierarchy of capacity building needs. To address systemic capacity building, they identified a four-tier hierarchy of capacity building needs: (1) structures, systems and roles, (2) staff and facilities, (3) skills, and (4) tools.

Capacity Building

Cognizant of the diversity of definitions of ‘capacity building’, and recognizing that organizations are typically an integral component of health capacity building (Crisp et al., 2000), for the purpose of this study we defined ‘capacity building’ as the planned development of knowledge, skills and other capabilities of an organization to fulfill its mission; in this particular case, improving quality (Wing, 2004).

Following Bevan’s (2010) definition, ‘capacity’ refers to having the right number and level of people who are actively engaged and able to conduct improvement, while ‘capability’ refers to the confidence and the knowledge and skills to lead the change.

Health Care System Level

By system level we mean the governance, financial and service delivery arrangements that together represent an identifiable health care system that is inclusive of all efforts to improve the ability of health care providers, managers, and other front-line staff to design, implement, and evaluate QI activities. This definition includes national or sub-national systems (such as state or provincial systems depending on the jurisdiction) and can represent autonomous closed health care systems (such as military services) or larger health care organizations that provide a range of services to a geographically dispersed population (e.g., Kaiser Permanente).
the benefits of improved care are spread among multiple stakeholders, providing a strong incentive to seek short-term results from initiatives within the exclusive control of a single provider organization (CFHI, 2014). Consequently, evidence is fragmented and context specific, generating insufficient systemic and transferable knowledge. In the current context of restricted healthcare budgets and urgent need for improving the quality of care, evaluations of the system wide impact of QI capacity building efforts are essential to determine the ROI in QI.

Building QI capacity has been a key component of system transformation efforts, but it is generally lumped in with other activities, making it hard to separate out and to assess the importance of QI activity. Understanding the linkage between QI capacity building and care improvement can help answer important questions in health policy (RWJF, 2013; CFHI, 2014), such as:

- How much should be invested in QI?
- Where should QI investments be directed for optimal system benefits?
- How does QI capacity evolve over time in response to investments and other system wide efforts?
- What are the extent and nature of costs (direct and indirect) borne by trainees, organizations, programs, and the health care system, related to QI training and projects?

The first step in studying the system level impact of QI capacity is to gather any existing knowledge that can be used to inform such evaluation. The paper reports on that effort.

**Research Objectives**

The **first** objective of this study was to search for system level evaluations of QI capacity building/training that assess the benefits perceived by health care systems from their QI investments.

**Secondly**, we aimed to identify from the literature existing evaluations of the investment in QI capacity building/training (ROI or other types of economic evaluations), even if these were not at the system level, but instead, at the initiative level.

Regardless of the limited number or absence of studies with the characteristics searched for in the first and second objectives, our **third** objective was to gather the current knowledge in QI capacity building evaluation from any useful source in the literature. Specifically, we searched for any evaluation of QI capacity building/training at the initiative level.

This information was used to identify key elements that should be included in any potential evaluation of the system level impact of QI capacity building investments.
Methods

We conducted a systematic review of the health care services and policy literature to identify two types of studies: a) evaluations of QI capacity building; and b) evaluations of QI training programs. The search included the most relevant indexed databases in the field and a strategic search of grey literature.

The following eight indexed databases were searched: Medline, EMBASE, Social Work Abstracts, HealthSTAR, Health and Psychosocial Instruments, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Social Sciences Abstracts, and Scopus. We used the following search terms: Quality Improvement/Assurance and Capacity Building/Assessment/Evaluation or Training Assessment/Evaluation. Given the nature of our search, we anticipated that a substantial proportion of relevant articles would not be captured by indexed sources. Therefore, an extensive grey literature search was conducted, which included: a search in Google Scholar; a direct electronic scanning of relevant government and institutional websites; reference searches; and additional targeted searches based on research team input. The search terms used for Google Scholar were combinations of the same terms used for indexed databases, in addition to healthcare/health care. Our scan of institutional websites included 85 organizations in Canada, US, UK, Australia, New Zealand, South Africa, and global organizations. All searches were completed between November 2014 and January 2015.

Identified articles were screened based on their title and abstract. All articles describing the following types of studies were identified for retrieval of full-text articles: quality improvement or quality assurance (QA) assessments or evaluations; QI/QA training assessments or evaluations; and QI/QA capacity building initiatives or projects. This screening was undertaken by two study investigators (GM, JI). Double screening at the beginning of this process and regular meetings between these two investigators were done to monitor inter-rater reliability. Full-text articles retrieved were then screened, applying the following exclusion criteria: QI/QA initiatives or training without an assessment or evaluation; assessments or evaluations of QI/QA initiatives not primarily focused on QI/QA capacity building; and training in areas other than QI/QA (e.g., training in clinical skills). Only articles written in English were included, with no restrictions on publication date or type.
Results

A total of 1,562 references were initially identified through indexed databases and an additional 663 through Google Scholar. After the first screening, which focused on title and abstract, 65 articles were retrieved for full-text scanning through these sources. Forty-five additional articles were identified through institutional website scanning and research team expertise. These two sources are reported together because part of the website search was actually guided by expert advice. A total of 110 full-text articles were scanned, and further 15 articles were identified through reference searches. Finally, 47 articles met the inclusion criteria and were included in the study. A flow chart summarizing the search and screening process is presented in Figure 1.

Figure 1: Searching and scanning process.

Figure 2 pairs our research objectives with the number of articles identified. We did not identify any system level QI capacity building/training evaluations, i.e., evaluations targeting efforts that have broad system wide, cross-sectoral, multi-professional focus. All evaluations identified in our search had narrower foci on specific initiatives within particular sectors, professions, or programs. Two evaluations of the ROI in QI capacity were found, which coincided with our second research objective. Forty-five articles representing other evaluations of QI initiatives or training were identified in relation to our third research objective of gathering the current knowledge in QI capacity building evaluation to identify key elements that should be included in evaluation of the system level impact of QI capacity building investments.
Figure 2: Number of articles identified by research objective.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 1</td>
<td>System level evaluations (economic or not) of QI capacity building/training</td>
<td>0</td>
</tr>
<tr>
<td>Objective 2</td>
<td>Initiative level economic evaluations of QI capacity building/training</td>
<td>2</td>
</tr>
<tr>
<td>Objective 3</td>
<td>Initiative level evaluations (other than economic) of QI capacity building/training</td>
<td>45</td>
</tr>
</tbody>
</table>

General characteristics of the 47 articles selected are summarized in Table 1. None of these articles described ‘system level’ evaluations. As shown in Figure 2, only two articles included economic evaluations of QI capacity building/training, specifically evaluations of the ROI. Of the remaining 45 articles, 19 corresponded to evaluations of QI training programs; five were evaluations of QI capacity building initiatives, and an additional five described evaluations of QI capacity not related to a specific intervention. Sixteen articles were classified as assessments or analysis related to capacity building. Most of these articles originated from North America, and were based on the hospital setting, multiple or undefined health care settings, or related to education of health care providers.

Table 1: General characteristics of studies included.

<table>
<thead>
<tr>
<th>Type of QI assessment</th>
<th>#</th>
<th>Country</th>
<th>#</th>
<th>Setting</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluations of ROI in QI initiatives</td>
<td>2</td>
<td>US</td>
<td>33</td>
<td>Hospital</td>
<td>11</td>
</tr>
<tr>
<td>Evaluations of QI training program</td>
<td>19</td>
<td>Canada</td>
<td>8</td>
<td>Primary care</td>
<td>2</td>
</tr>
<tr>
<td>Evaluations of QI capacity building initiative</td>
<td>5</td>
<td>UK</td>
<td>4</td>
<td>Community health</td>
<td>1</td>
</tr>
<tr>
<td>QI capacity assessment</td>
<td>5</td>
<td>Ethiopia</td>
<td>1</td>
<td>Public health</td>
<td>4</td>
</tr>
<tr>
<td>Assessment or analysis related to QI capacity building</td>
<td>16</td>
<td>Uganda</td>
<td>1</td>
<td>Health leadership</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Health care education</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Multiple care settings</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Evaluations of ROI in QI Initiatives

The Rapid Impact Assessment of the Productive Ward: Releasing Time to Care program (NHS Institute for Innovation and Improvement, 2011), developed by the NHS Institute for Innovation and Improvement, represents a large scale performance improvement initiative that targets hospitals in the UK. Although this initiative is intended to be implemented at large scale across NHS hospitals, the evaluation is limited to this initiative instead of representing a broad system-wide, cross-sectoral evaluation of QI capacity building across the NHS. The Productive Ward aims to empower ward teams to identify areas for improvement by giving staff the information, skills and time they need to improve the way they work and the care they provide to their patients (NHS Institute for Innovation and Improvement, 2011). The Rapid Impact Assessment represents an evaluation of the ROI of the implementation of the Productive Ward based on case studies in nine selected English hospitals.

A second identified study depicts a ROI assessment of a QI initiative focused on the costs and benefits of an educational intervention to improve a back office process in a US hospital setting (McLinden et al., 2010). Specifically, the objective of the evaluation was to estimate the ROI of a training intervention to facilitate the adoption of a new supply purchasing system.

Table 2 shows the conceptual framework used to calculate ROI in these studies, compared to one another and to Phillips’ ROI Model in Training and Performance Improvement Programs (Phillips, 2003), a commonly referenced work in this discipline.
Table 2: Comparative frameworks on QI ROI assessments.

<table>
<thead>
<tr>
<th>Phillips’ ROI in Training and Improvement Model</th>
<th>The Productive Ward Rapid Assessment</th>
<th>Value of QI Educational Intervention</th>
<th>Common Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Gather relevant material</td>
<td>Who Benefits: the value of outcomes depends on the stakeholder perspective.</td>
<td>Planning</td>
</tr>
<tr>
<td>- Develop evaluation plan and baseline data</td>
<td>- Collate existing work.</td>
<td></td>
<td>- Perspective of the economic assessment</td>
</tr>
<tr>
<td></td>
<td>- Investigate ROI approaches adopted elsewhere.</td>
<td></td>
<td>- Timing of the economic assessment</td>
</tr>
<tr>
<td></td>
<td>- Decide on which perspective we need to address.</td>
<td></td>
<td>Discerning costs</td>
</tr>
<tr>
<td></td>
<td>- Clarify the aims and objectives of the improvement initiative.</td>
<td>Discerning Benefits: a tangible measure of value is needed. Determine if changes in purchasing could be attributed to the training program.</td>
<td>Discerning benefits</td>
</tr>
<tr>
<td></td>
<td>- Define the time period for the ROI analysis.</td>
<td></td>
<td>Discerning attribution</td>
</tr>
<tr>
<td>Data Collection</td>
<td>Define the elements of economic appraisal</td>
<td>Cost Analysis: consider all costs used in service provision.</td>
<td>Calculate the ROI</td>
</tr>
<tr>
<td>- Reaction/Satisfaction</td>
<td>Identify data</td>
<td>Discerning Benefits: a tangible measure of value is needed. Determine if changes in purchasing could be attributed to the training program.</td>
<td>- Estimate intangible benefits</td>
</tr>
<tr>
<td>- Learning</td>
<td>Obtain improvement evidence</td>
<td></td>
<td>Calculate the ROI</td>
</tr>
<tr>
<td>- Application</td>
<td></td>
<td></td>
<td>Assess the Sensitivity to changes in assumptions</td>
</tr>
<tr>
<td>- Business Impact</td>
<td></td>
<td></td>
<td>Sensitivity Analysis</td>
</tr>
<tr>
<td>Isolate Effects of Program</td>
<td>Discerning % attribution to each measure</td>
<td></td>
<td>Sensitivity Analysis</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>Produce ROI impact assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Convert data to monetary value</td>
<td>- Insert data into ROI calculator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Return in investment</td>
<td>- Report an overall ROI result.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Identify intangible benefits</td>
<td>- Report costs and benefits to each organization/sector.</td>
<td>Calculate the ROI</td>
<td></td>
</tr>
<tr>
<td>Reporting</td>
<td>- Include an assessment of the risks.</td>
<td>Assess the Sensitivity to changes in assumptions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Articulate any assumptions made.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As depicted in the fourth column in Table 2, the ROI model in the assessment of the Productive Ward and the assessment of Value of QI Educational Intervention studies share common elements with Phillips’ model. Drawn from these studies, key steps in ROI assessments in QI capacity building are:

a) **Planning - Perspective**: The magnitude and value of an economic evaluation will vary depending on the stakeholder perspective selected. In the Productive Ward for instance, the analysis took a ‘public value perspective’, attempting to include all benefits and costs allocated to every relevant stakeholder.

b) **Planning - Timing**: The timing of the evaluation is another key element considered in these studies. The economic evaluation may be retrospective (should the program be undertaken?) or retrospective (what were the results of the program?), or a mix of them (should the program be changed?). In addition, the evaluation should allow enough consideration of mid- and long-term outcomes, especially for long term interventions (Phillips, 2003).
c) **Discerning costs:** Discerning costs implies identifying all relevant costs used in the intervention and only those that are affected by the intervention. The Productive Ward assessment used national and local data sources and included in-depth interviews to retrieve all relevant costs.

d) **Discerning benefits:** Discerning benefits should also identify all relevant benefits, including both monetary and non-monetary benefits. Although this is an element recognized by the two evaluations cited in this analysis, neither of them quantified or transformed non-monetary to monetary benefits. Therefore, intangible benefits were not included in the ROI calculations.

The four elements considered for the Productive Ward economic appraisal were: quality outcomes, productivity and efficiency outcomes, financial benefits, and implementation costs. The main metric used for the evaluation was the percentage of direct patient care time, directly related to the main objective of the intervention. However, financial benefits generated by increased direct patient care time were only calculated indirectly through benefits generated from excess bed days, length of stay, and hospital readmission. Financial benefits were also estimated through opportunity cost of rates of staff absence and through stock reduction. Additional elements considered were patient experience, staff satisfaction, and harm events; although these metrics were not directly quantified, and therefore, they were excluded from the ROI appraisal.

e) **Discerning attribution:** Discerning attribution means determining whether changes in cost and benefits are attributable to the intervention and in what proportion. For instance, in order to isolate the effect of training in the assessment of value of a QI educational intervention, a group of stakeholders were asked to consider the multiple factors that could be responsible for the financial benefits and then to estimate the percentage attributable to training. Attribution of changes to the Productive Ward was also obtained from the judgement of managers involved in the implementation of the program during the interviews.

f) **ROI calculations:** Return on investment is calculated as the net benefit (benefits minus cost) divided by cost, and it is usually expressed as a percentage (Phillips, 2003). Calculations for the assessment of the Productive Ward are shown in Table 3.

Although the nine acute trusts studied were selected and willing to participate, the estimated total potential economic impact of implementing the Productive Ward was calculated by scaling up the evidence to all 139 wards in England; with an estimated in £270m benefit (Table 3). The assessment estimated that for every £1 spent on implementing The Productive Ward, on average, £8.07 will be returned.

g) **Estimate intangible benefits:** Non-monetary or intangible benefits should always be measured or estimated and reported, even if sometimes they cannot or should not be converted to monetary values by design (Phillips, 2003).

h) **Sensitivity analysis:** The results of an economic evaluation are based on assumptions that bring uncertainty to the final ROI estimate. A sensitivity analysis needs to be performed in order to understand the probabilities and magnitude of the variation in evaluation results. The Productive Ward evaluation used a table of risk assessments to discuss the implications of using the wrong assumptions in the model. The assessment of value of QI educational intervention explored the impact of variations in costs and benefits in the calculations of ROI.
Table 3: Investments and benefits of The Productive Ward*

<table>
<thead>
<tr>
<th>Investments</th>
<th>Acute Trust</th>
<th>Commissioner</th>
<th>Total per trust</th>
<th>England†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average estimated results March 2010 to March 2014</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investments</td>
<td>£375k</td>
<td>£141k</td>
<td>£516k</td>
<td></td>
</tr>
<tr>
<td>Savings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced staff absence</td>
<td>£582k</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced excess bed days</td>
<td></td>
<td>£766k</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced re-admissions due to improved discharge planning processes</td>
<td>£72k</td>
<td>£150k</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock reduction</td>
<td>£492k</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total savings</td>
<td>£1,075k</td>
<td>£916k</td>
<td>£1,990k</td>
<td>£270,000k</td>
</tr>
<tr>
<td>Net benefit</td>
<td>£700k</td>
<td>£775k</td>
<td>£1,322k</td>
<td></td>
</tr>
</tbody>
</table>

Source: NHS Institute for Innovation and Improvement, 2011.
* Numbers shown do not add up, as in the original article.
† Over a total of 139 trusts.

General evidence on QI capacity building evaluation

Our third objective was to gather the current knowledge in QI capacity building/training evaluation from any useful source of evidence in the literature, notwithstanding the absence or limited number of studies with the characteristics searched for in the first and second objectives. This information was used to identify key elements that should be included in any potential evaluation of the system level impact of QI capacity building investments.

The remaining 45 articles identified through the literature review contributed evidence for this section of the analysis. Table 4 summarizes the main content that was assessed in these articles, which were grouped into five recurrent thematic areas: a) Characteristics of QI Training; b) Characteristics of QI Activity; c) Individual Enablers/Barriers; d) Organizational Enablers/Barriers; and e) Impact (outcomes).
Table 4: Findings from included articles, organized by theme

Legend: Letters in brackets group themes according to the following themes:

Characteristics of QI Training:
A) QI projects as part of QI training program.
B) Coaching/mentorship as part of QI training program.
C) Use of e-learning resources.
D) QI training partnerships.
E) QI training during residence or undergraduate health care studies.

Characteristics of QI Activity:
F) Opportunities to apply QI skills.
G) Informal QI training and coaching as part of the working environment.
H) Patient and community participation in QI.

Individual Enablers/Barriers:
I) QI skills and knowledge.
J) Motivation and interest in QI activity.
K) Individual barriers to QI training.

Organizational Enablers/Barriers:
L) Organizational culture and leadership support to QI.
M) Teamwork, team empowerment and resources for QI.
N) Monitoring, accountability and diffusion.
O) QI strategy and work with health authority.

Impact:
P) Patient and Care Outcomes.

Note: Merged cells below indicate that the same content was included in more than one related article.

<table>
<thead>
<tr>
<th>Characteristics of QI Training</th>
<th>Characteristics of QI Activity</th>
<th>Individual Enablers/Barriers</th>
<th>Organizational Enablers/Barriers</th>
<th>Impact (outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QI coaching from supervisors (B). Partnership between the Ministry of Health, international and local universities, and research and training institutes (D).</td>
<td>Self-assessed capacity for improvement work (I). Involvement of community stakeholders (H).</td>
<td>Motivation for participation in improvement work: deaths, achieving health goals, and positive experience with QI (J).</td>
<td>Perception of district culture and leadership commitment and support for QI (L). Local team empowerment (N). Use of QI data; results-oriented accountability; and diffusion across teams (O).</td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Description</td>
<td>Training Location</td>
<td>Key Factors</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Matovu et al., 2013</td>
<td>QI project as part of QI training (A). Coaching and mentorship as part of QI training (B). In collaboration with local university (D).</td>
<td>QI training at the working site (F).</td>
<td>Organizational culture receptive to change, senior executive support, and engagement of operational and improvement managers (L).</td>
<td></td>
</tr>
<tr>
<td>Runnacles et al., 2013</td>
<td>QI project as part of QI training (A). Coaching and mentorship as part of QI training (B). Program directed to physicians during residency (E).</td>
<td>QI training at the working site (F).</td>
<td>QI strategic priority, participatory from top and lower management to physicians (M). Key QI capability factors: teamwork, communication, specialized QI staff and committees, and HR management (N). Information infrastructure, performance measurement, oversight and accountability, and incentives to cross-unit collaboration (O).</td>
<td></td>
</tr>
<tr>
<td>Adler et al., 2003</td>
<td>In-hospital QI training (D). Efforts to integrate QI training into medical education (E).</td>
<td>QI training at the working site (F).</td>
<td>Motivation included positive past experience with QI, example from other organizations, need to meet specific improvement goals, and external pressures (J).</td>
<td></td>
</tr>
<tr>
<td>Health Quality Ontario, 2011 (Learning Community program)</td>
<td>QI coaching is a key element of this improvement program (B). Virtual workspace and knowledge sharing (C).</td>
<td>QI training at the working site (F).</td>
<td>Confidence to conduct QI activities (I).</td>
<td></td>
</tr>
<tr>
<td>Cornett et al., 2012</td>
<td>Experiential learning through QI intervention (A). Use of coaching (B) and distance learning (C).</td>
<td>QI training at the working site (F).</td>
<td>Achievement of project goals, as measurable outcomes or processes (P).</td>
<td></td>
</tr>
<tr>
<td>Authors and Year</td>
<td>Description of Activities</td>
<td>Outcomes and Barriers</td>
<td>QI Training and Support</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------</td>
<td>----------------------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td>Davis et al., 2014</td>
<td>Barriers to QI: lack of time, resources, perceived low relevance, poor leadership and teamwork commitment to QI, and insufficient QI training and experience (K). Mandatory QI for accreditation may be a QI driver (J).</td>
<td>Leadership support (L). National QI initiatives, number of staff trained in QI and regular contact between teams and decision-makers (M). Data collection and monitoring (O).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davis et al., 2012</td>
<td>Webcast participants had high receptivity to QI training (C).</td>
<td>Receptivity to learning about and implementing QI activities (J).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riley et al., 2009</td>
<td>QI project as part of QI training (A). Full distance learning (C). Program developed in partnership (D).</td>
<td>QI training at the working site (F). Kirkpatrick model, including ‘learning’ and ‘behaviour’ (I). QI program relevance rating (J). Self-efficacy and willingness to conduct a future QI project (I).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ruud et al., 2012</td>
<td>QI project as part of QI training (A). Developed internally by the organization for employees (D).</td>
<td>Transfer of knowledge and skills gained back to the work setting (G). Kirkpatrick model, including ‘learning’ and ‘behaviour’ (I). Project outcome metrics.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ng and Trimmell, 2015</td>
<td>QI project as part of QI training (A). Coaching and mentorship as part of QI training (B).</td>
<td>Assessment of the spread of QI knowledge (G). Kirkpatrick model, including ‘learning’ and ‘behaviour’ (I). Meeting patient outcomes targeted by QI projects (P).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daugherty et al., 2013 (Emory Healthcare)</td>
<td>QI project as part of QI training (A). Coaching and mentorship from previously trained staff (B). Developed internally for front-line managers and staff (D).</td>
<td>QI training at the working site (F). Support from supervisor and from senior leadership and ongoing institutional support (L). Improved teamwork (N). Barriers included financial resources (Rask et al.) (N). Participant perception of impact on processes and outcomes, including patient satisfaction, access or safety (P).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rask et al., 2011 (Emory Healthcare)</td>
<td></td>
<td>Ability in the use of data (I).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blake et al., 2013 (Emory Healthcare)</td>
<td></td>
<td>Confidence to train others (I).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
<td>Methods/Outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lavigne, 2012</td>
<td>QI training in pharmacy curriculum (E).</td>
<td>Assessed motivation, importance, usefulness, awareness impact on patient health (J). Self-reported ability to identify quality issues and knowledge of and ability to implement QI methods (I).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warholak et al., 2011</td>
<td>QI training during pharmacy education (E).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batalden et al., 2002a</td>
<td>Practice-based learning and improvement (PBLI) as one of six general competencies of graduate medical education (E).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diaz et al., 2012</td>
<td>Impact after QI training during family medicine residency (E).</td>
<td>QI training during residency increases subsequent family physician QI involvement (J).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canal et al., 2007</td>
<td>QI project as part of QI training (A). QI training during surgery residency (E).</td>
<td>QI training at the working site (F). Self-assessed QI efficacy (I). Sponsorship and involvement from team leaders on improvement initiatives (N).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Djuricich et al., 2004</td>
<td>QI project as part of QI training (A). QI training during internal medicine and paediatric residency (E).</td>
<td>QI training at the working site (F). Interest scale (J). Self-assessed QI efficacy (I).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ogrinc et al., 2004</td>
<td>QI project as part of QI training (A). PBLI training during internal medicine residency (E).</td>
<td>QI training at the working site (F). Self-assessed confidence and proficiency in PBLI (I). Project sponsor and involvement from team leaders of improvement initiatives (L).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lawrence and Tomolo, 2011</td>
<td>Assessment tool for QI during medical education (E).</td>
<td>Self-efficacy in QI plan development and implementation, developing a data collection plan, and teaching QI principles (I).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Findings/Topics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Didic et al., 2011</td>
<td>Assessment of training program directed to board member and executive leaders of healthcare organizations. Includes questions on board relationship with CEO and clinical leadership, culture, information, and measurement (L).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robert Wood Johnson Foundation, 2013</td>
<td>Importance of QI coaches and mentor at the organization (G).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robert Wood Johnson Foundation, 2014</td>
<td>Key enablers: organizational support, infrastructure for QI, and effective incentives (L).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morganti et al., 2012</td>
<td>Training reinforcement and coaching (G). Measures of QI training dosage included informal coaching (G). Patient-centred QI, involvement of family and friends at all levels (H).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morganti et al., 2014</td>
<td>Understanding of QI principles and ability to apply QI skills (I). Importance of QI training (2014).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weiner et al., 2006</td>
<td>Organizational culture of QI and excellence, and leadership involvement (L). Team empowerment and financial resources; team effectiveness; end-user involvement (N). Information technology systems; performance monitoring and diffusion (O).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gagliardi et al., 2010</td>
<td>QI progress achieved in interventions following the QI training program, using outcomes variables from the organizations (Kirkpatrick I4: ‘results’) (P).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario Hospital Association, 2013</td>
<td>Extent of organizational deployment; senior management, hospital staff and physician participation (M). Diffusion across units (O).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>British Columbia Patient Safety and Quality Council, 2012</td>
<td>Hospital level outcomes quality measures.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butterworth et al., 2011</td>
<td>Support of their organizations is critical for QI trainees (L).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate QI training for nurses and doctors (E).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Education</td>
<td>Focus</td>
<td>Evaluation</td>
<td>Engagement and Use</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>-------</td>
<td>------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Headrick et al., 2012</td>
<td>Use of web-based resources (C). Partnership between IHI, universities, and health care organizations (D). Interprofessional QI training for undergraduate nurses and doctors (E).</td>
<td>Focus on application in care setting (F).</td>
<td>Evaluation on knowledge and skills (I); and perceived importance of QI.</td>
<td>Focus on interprofessional communications and teamwork (N).</td>
</tr>
<tr>
<td>American Academy of Family Physicians, 2012</td>
<td>Family medicine resident should have knowledge in specific QI tools (E).</td>
<td>Family medicine resident should have hands-on experience leading performance improvement initiatives (F).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saskatchewan Health Quality Council, 2010</td>
<td>Lectures in QI to students in various health science programs (E).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hutchison et al., 2011</td>
<td>Partnership with provincial medical associations for QI training in primary care (D).</td>
<td></td>
<td>Performance measurement (P).</td>
<td></td>
</tr>
<tr>
<td>Farley et al., 2008</td>
<td>Integration of patient perspective into QI (H).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headrick et al., 2011.</td>
<td>QI training for medical students (E).</td>
<td>Patient and family engagement (H). Health professionals engaged and teaching QI (G). Learners engaging in care and improvement (F).</td>
<td>Leadership involvement in QI (L). Data transforming into useful information (O).</td>
<td>Use performance methods to assess and improve outcomes (P).</td>
</tr>
<tr>
<td>American Association of Colleges of Nursing, 2006</td>
<td>Knowledge and skills in leadership, quality improvement, and patient safety among nursing educational standards (E).</td>
<td></td>
<td>Effective working relationships and open communication and cooperation within the interdisciplinary team, and use of information and communication technologies to enhance care and improve outcomes (N). Employ data for QI and safety (O).</td>
<td></td>
</tr>
<tr>
<td>Cronenwett et al., 2007</td>
<td>QI competency should be developed during pre-licensure nursing education (E).</td>
<td>QI competency skill on seeking information about QI projects (F).</td>
<td>QI competency requires skills on the use of QI methods, tools, and quality measurement (I).</td>
<td>QI competency requires knowledge and skills on reviewing and improving outcomes of care (P).</td>
</tr>
<tr>
<td>Cronenwett et al., 2009</td>
<td>QSEN competencies are appropriate for advance practice nurses, including QI (E).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference</td>
<td>Summary</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batalden et al., 2002b</td>
<td>Mentoring is a critical part of the program (B). Use of distance learning technologies (C). Collaborative program between universities and VA care sites (D). Most important venues for learning are the program sites themselves (F). Physicians trained by this program should be able to teach QI (G).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Splaine et al., 2002 &amp; 2009</td>
<td>Curriculum knowledge domains include customer/beneficiary knowledge and social context (H).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bevan, 2010</td>
<td>Capability building needs to be ‘hard-wired’ into the practice (F). Train initially those who can spread the skills most widely (G). Enable service users to drive and influence change (H). Importance of assessing knowledge and skills in improvement (I) and interest (J). Performance management should include incentives (J). Insufficient time as barrier (K).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batalden and Davidoff, 2007</td>
<td>Domains of QI interest include knowledge of customer/beneficiary and the social context (H). Knowledge of particular contexts is involved in QI (F). Knowledge on improvements methods (I).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Curriculum domains include:** leading and following (L); collaboration (N); measurement, variation and accountability (O).
- **Capability building strategies need to take account of how change spreads in complex adaptive systems (M). Key elements highlighted relate to culture and leadership support (L); teamwork and human resources management (N); measurement, use of evidence and benchmarks (O). Connect skill building to results and realising benefits. Importance of evidence from economic assessments (P). Performance measurement to assess the effect of changes (P).
Findings on Characteristics of QI Training

QI projects as part of a QI training program (A)

Participation in QI projects or interventions is an essential component of most QI training programs identified in this review (Ogrinc et al., 2004; Djuricich et al., 2004; Canal et al., 2007; Riley et al., 2009; Cornett et al., 2012; Ruud et al., 2012; Runnacles et al., 2013; Matovu et al., 2013; Daugherty et al., 2013; Rask et al., 2011; Blake et al., 2013; Ng and Trimnell, 2015). In a review of articles on QI training, the RWJF (2011) concludes that QI training must be experiential.

Coaching/mentorship as part of QI training program (B)

Quality improvement training programs often include coaching and mentorship activities as part of their learning experience, with positive evaluation from trainees (Batalden et al., 2002b; Splaine et al., 2002 & 2009; Health Quality Ontario, 2011; Cornett et al., 2012; Matovu et al., 2013; Runnacles et al., 2013; Ng and Trimnell, 2015). An important component of capacity building of the Emory Healthcare QI training program for front-line managers and staff included mentorship from other staff who had taken this or other QI courses (Daugherty et al., 2013; Rask et al., 2011). The MaNHEP program included QI coaches who were already supervising health care workers in QI teams (Stover et al., 2006).

Use of e-learning resources (C)

Distance learning methods are commonly used to provide QI training (e.g., Batalden et al., 2002b; Splaine et al., 2002 & 2009; Headrick et al., 2012). The feasibility of providing QI training to a large number of providers may be increased through distance learning methods, especially for working professionals and those at geographically distant locations (British Columbia Patient Safety and Quality Council [BCPSQC], 2011). Davis et al. (2012) reported that webcast training participants had high receptivity to QI training. One of the key components of the Learning Community program in Ontario is a virtual workspace for sharing knowledge and resources (Health Quality Ontario, 2011). In the evaluation of a standardized QI training program for local health departments, Cornett et al. (2012) describe the combined use of webinars, conference calls and face-to-face communication and workshops. The QI training program of the Minnesota Quality Improvement Collaborative fully relies on distance learning methods (Riley et al., 2009).

QI Training partnerships (D)

Health care organizations frequently rely on collaboration and partnership with other organizations to provide formal QI training and build capacity among their staff. In the U.S., the QI training program of the Minnesota Quality Improvement Collaborative was developed in partnership between the state’s Department of Health, a local university, and the Local Public Health Association (Riley et al., 2009); and the Retooling Health Professions Education for Quality and Safety initiative was conducted in partnership between IHI, six universities, and affiliated health care organizations (Headrick et al., 2012). The Veterans Administration National Quality Scholars Fellowship Program (VAQS) has been implemented in collaboration between VA care sites and several US universities (Batalden et al., 2002b;
Splaine et al., 2002 & 2009). In-service work-based QI training programs in Uganda were also developed in collaboration with a local university (Matovu et al., 2013). The Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) program was implemented in six Ethiopian districts by the Federal Ministry of Health, in collaboration with research and training institutes and local and international universities (Stover et al., 2014). In Canada, a survey by the Ontario Hospital Association showed that almost 50% of hospitals in Ontario engage with external partners when developing their QI plans (Ontario Hospital Association, 2013). Hutchinson et al. (2011) refer to several partnerships between primary care and provincial medical associations to develop QI learning initiatives.

Distinctively, we found several examples of healthcare delivery organizations that have developed their own QI training programs (Adler et al., 2003). Emory Healthcare developed their own in-house QI training program for front-line managers and staff (Daugherty et al., 2013; Rask et al., 2011; Blake et al., 2013). Similarly, the Mayo Clinic’s Quality Academy Teams Training is an initiative to train employees developed by the healthcare provider organizations themselves (Ruud et al., 2012).

**QI training during residence or undergraduate health care studies (E)**

In 2003, the Institute of Medicine released the report Health Professions Education: A Bridge to Quality, to develop next steps for reform of health professions education in order to enhance patient care quality and safety. The IOM vision is that all health professionals should be educated to (a) deliver patient-centered care (b) as members of an interdisciplinary team, (c) emphasizing evidence-based practice, (d) quality improvement approaches, and (e) informatics (Institute of Medicine, 2003). Several health care professional organizations have responded with recommendations and requirements for professional education during undergraduate, graduate, and residency programs.

The US Accreditation Council for Graduate Medical Education (ACGME) in its 1999 Framework for Physician Competence identified Practice-Based Learning and Improvement (PBLI) as one of the six basic competencies for physicians. Afterwards, ACGME and the American Board of Medical Specialties agreed upon the same six competencies (Batalden et al., 2002a). The American Academy of Family Physicians requires that, at the completion of residency training, a family medicine resident should have knowledge in specific QI tools, in addition to hands-on experience leading performance improvement initiatives (American Academy of Family Physicians, 2012; Diaz et al., 2012). In Canada, the CanMEDS Physician Competency Framework includes participation in ‘systemic quality process evaluation and improvement’ as part of the key competencies that physicians should be able to perform in their role as ‘managers’, which is one of seven roles that “all physicians need to have, to be better doctors” (Royal College of Physicians and Surgeons of Canada, 2014). Several QI or PBLI training programs have been developed to specifically target medical residents (Runnacles et al., 2013; Adler et al., 2003; Canal et al., 2007; Djuricich et al., 2004; Ogrinc et al., 2004).

The American Association of Colleges of Nursing included “knowledge and skills in leadership, quality improvement, and patient safety” among its educational standards (Headrick et al., 2012). The Quality and Safety Education for Nurses (QSEN) initiative deemed QI as a necessary competency that should be developed during pre-licensure nursing education (Cronenwett et al., 2007), and it was considered appropriate and relevant to all nurses, including advance practice nurses (Cronenwett et al., 2009). The QI competency was defined as the use of data to monitor the outcomes of care processes
and the use of improvement methods to design and test changes to continuously improve the quality and safety of health care systems (Cronenwett et al., 2007 & 2009).

The American Association of Colleges of Pharmacy and the Accreditation Council for Pharmacy Education also recognize the need for future pharmacists to understand patient safety and QI and encourage the addition of these topics to the curricula of colleges and schools of pharmacy (Warholak, 2011). The Educating Pharmacy Students and Pharmacists to Improve Quality (EPIQ) program has been used by a number of schools of pharmacy in the US (Warholak, 2011; Lavigne, 2012).

The Robert Wood Johnson Foundation (RWJF, 2011), in a report on QI training, highlights the importance of QI content in clinical curricula. QI training has been introduced into the undergraduate education programmes for nurses and doctors by the NHS and IHI in tandem with universities (Butterworth et al., 2011; Headrick et al., 2011 & 2012). In Canada, the Saskatchewan Health Quality Council has delivered lectures in QI to students in various health science programs (Saskatchewan HQC, 2010).

**Findings on Characteristics of QI Activity**

**Opportunities to apply QI skills (F)**

Aside from the importance of experiential learning in QI training, a key factor identified in the literature is the importance of having opportunities to apply QI knowledge and skills in everyday work, with or without previous formal QI training. The RWJF’s report on QI training program assessments highlights the importance of generating adequate opportunities to apply new knowledge and skills learned from QI training participation (RWJF, 2013). Moreover, most training initiatives identified in our review were delivered at the working site, enabling direct application of QI theory to improvement projects (Batalden et al., 2002b; Batalde and Davidoff, 2007; Splaine et al., 2002 & 2009; Health Quality Ontario, 2011; Headrick et al., 2011; Cornett et al., 2012; Matovu et al., 2013; Daugherty et al., 2013; Rask et al., 2011; Blake et al., 2013). A similar approach is used for medical residency training in QI (Runnacles et al., 2013; Canal et al., 2007; Djuricich et al., 2004; Ogrinc et al., 2004). For example, at the completion of residency training, a family physician should have hands-on experience leading at least one performance improvement initiative (American Academy of Family Physicians, 2012). Among the requirements for a competent nurse in QI, QSEN defined skills on seeking information about QI projects in the care setting (Cronenwett et al., 2007 & 2009). Headrick et al. (2012) used a focus on application in the care setting to teach interprofessional QI skills.

For the NHS Productive Ward: Releasing Time to Care, skill building needs to be ‘hard-wired’ into the day-to-day practice of healthcare staff. Rather than using classroom-based courses or even special improvement projects, ward teams are taught key change skills by improving the actual processes they work on, in real time and on the job (Bevan, 2010; NHS Institute for Innovation and Improvement, 2009).

**Informal QI training and coaching as part of the work environment (G)**

QI training and coaching at work and through personal study are important sources of QI capacity building, especially given the difficulty of reconciling work with formal training (BCPSQC, 2011).
Bevan (2010) highlights the importance of spreading change in capability building strategies, suggesting training initially those who can spread the newly acquired skills most widely. Physicians trained by the VAQS program should be able to teach QI skills (Batalden et al., 2002b; Splaine et al., 2002 & 2009).

Evaluations of QI training programs have included the extent of sharing of QI tools with other staff members as a measure of organizational change (Cornett et al., 2012), or reinforcement training and coaching as relevant factors of success (Morganti et al., 2014). On their QI training program evaluation, Morganti et al. (2012 & 2014) measured total training dosage adding formal training and coaching components. Spread of QI knowledge through sharing program learning with others in their organizations was included in the assessment of the Improving and Driving Excellence Across Sectors (IDEAS) program in Ontario (Ng and Trimnell, 2015). Ruud et al. (2012) assessed the frequency and extent to which participants transferred knowledge and skills gained from the training back to the work setting. The RWJF’s report on QI training refers to the importance of the availability of QI coaches and mentors at health organizations (RWJF, 2011). Quality managers in Ontario hospitals identified education and training as a key component of organizational QI activity (Gagliardi et al., 2010). Headrick et al. (2011) highlight the importance of health professionals engaging in and teaching QI for health care professional education.

Patient and community participation in QI (H)

The involvement of patients, families, and the community in the different aspects and phases related to QI activity assumes growing importance (Splaine et al., 2002 & 2009; Batalden and Davidoff, 2007; Bevan, 2010). RAND Health’s Report Assessment of the National Patient Safety Initiative suggested that the US Agency for Healthcare Research and Quality (AHRQ) should pursue the integration of patient perspective into QI and patient safety activities (Farley et al., 2005). In Canada, The Ontario Hospital Association QI Survey showed a growing importance of patient and community involvement in the delivery of high quality care (Ontario Hospital Association, 2013). Morganti et al. included a section of their Survey to Assess Success of QI training focused on patient-centred care, including “involvement of family and friends at all levels of care processes and the organization”. In addition, representation on the QI implementation team included patient and other community stakeholders (Morganti et al, 2012 & 2014). The MaNHEP in Ethiopia included community stakeholders on QI teams, such as traditional birth attendants, pregnant women, families, and community representatives (Stover et al., 2014). Headrick et al. (2011) highlight the importance of this perspective in QI training during health care professional education.

Findings on Individual Enablers/Barriers

Quality improvement skills and knowledge (I)

Every QI training evaluation identified assessed the level of QI knowledge and skills gained from participating in the program. For example, the evaluation by Morganti et al. (2012 & 2014) explored QI trainees’ understanding of QI principles and ability to apply QI skills. Riley et al. (2009), Ruud et al. (2012), Ng and Trimnell (2015), and Headrick et al. (2012), all based their training program evaluations on the Kirkpatrick’s four-level model (2015), including participant ‘learning’ and ‘behavior’ levels to assess improvements in QI knowledge and application of new skills.
The evaluation of public health QI training by Cornet et al. (2012) included measures of participant confidence to conduct QI activities. Also in public health departments, Riley et al. (2009) assessed self-efficacy and willingness to conduct future QI projects. At Emory Healthcare, Rask et al. (2011) assessed QI training participants’ ability to view data over time and draw conclusions regarding true trends. In an evaluation of the Emory Healthcare QI program specific to nurses and others in leadership positions, trainees’ confidence to train others was assessed (Blake et al, 2013). Self-assessed capacity for improvement work was included in the evaluation of the MaNHEP (Stover et al., 2014). Batalden and Davidoff (2007) and Bevan (2010) also recognized the importance of these assessments.

Multiple assessments of medical residents included questions on self-assessed confidence or self-efficacy with QI skills (Lawrence and Tomolo, 2011; Ogrinc et al., 2004; Djuricich et al., 2004; Canal et al., 2007). Lawrence and Tomolo (2011) evaluated self-efficacy in the following areas: QI plan development, data collection plan, project implementation, and teaching of QI principles. In the evaluation of the EPIC curriculum, Lavigne (2012) found improved self-reported ability to identify quality issues and knowledge of and ability to implement QI methods. Among the requirements for a competent nurse in QI, QSEN defined skills on the use of QI tools, experiential learning methods, such as Plan-Do-Study-Act (PDSA), and quality measurement (Cronenwett et al., 2007 & 2009). Batalden and Davidoff (2007) included knowledge of the variety of methods available for connecting evidence to particular contexts as a knowledge system involved in improvement.

*Motivation and interest in QI activity (J)*

Understanding the individual motivation to participate in QI initiatives and pursue QI training can be important when planning capacity development. An evaluation of the Learning Community program in Ontario identified the following motivation factors to participate in the program: positive past experience with QI; examples from other successful organizations; the motivation to meet specific improvement goals; and external pressures (e.g., from the Ministry of Health) (Health Quality Ontario, 2011). Stover et al. (2006) explored the motivation for participation in maternal and neonatal care improvement through an open-ended question. The most mentioned factors were: a) averting deaths or having experienced deaths; b) achieving health goals; and c) observing change after project interventions. Bevan (2010) also suggests assessing interest in QI evaluation. Davis et al. (2014) notes that mandatory QI for accreditation may be a driver for QI activity, which can also be inferred from Gagliardi et al’s (2010) study on hospital quality managers. In their comparison of different training types, Davis et al. (2012) also assessed receptivity to learning about and implementing QI activities.

In the evaluation of the EPIC curriculum, students considered QI activity to be important and useful for their careers, even before training exposure (Lavigne, 2012). Assessments included motivation to implement QI methods, awareness of the impact of quality issues on patient health, and perceived importance for pharmacy students to learn about QI improved after QI training. Headrick et al. (2012) also explored perceived importance of QI training. Djuricich et al. (2004), in an evaluation of a continuous QI curriculum for internal medicine and pediatrics residents, included a 5-point interest scale. Riley et al. (2009) asked QI trainees from public health departments to rate the perceived relevance of QI methods. Diaz et al. (2012) evaluated positively the impact of QI training during residency on family physicians’ involvement in subsequent QI activity.
Individual Barriers to QI training (K)

Davis et al. (2014) conducted case studies in 10 US Public Health Agencies that were implementing QI efforts and identified the following as barriers to QI: lack of time (also in Bevan, 2010), lack of resources, perceived low relevance of QI to daily work, poor leadership and teamwork commitment to QI, and inexperience and insufficient training about the use QI tools and concepts. The RWJF reports that the cost of some QI programs may be a barrier to widespread QI training and participation (RWJF, 2011), a concern shared by the British Columbia Patient Safety and Quality Council (BCPSQC, 2011). Insufficient opportunities for formal QI training may be limiting capacity development in Ontario hospitals (Ontario Hospital Association, 2013).

Findings on Organizational Enablers/Barriers

Organizational Culture and leadership support to QI (L)

The existence of a favourable organizational culture and leadership support were consistently identified in this review as key elements to successful QI capacity (e.g., Bevan, 2010, Riley et al., 2009). Stover et al. (2014) defined culture as the environment and support for implementing improvement activities, and leadership as the actual administrative and leadership actions taken to support improvement activities. They used perception of district culture and leadership commitment and support for improvement activities, before and after the intervention to evaluate their QI capacity building initiative in Ethiopia. The Evaluating QI Training Programs Report by the RWJF identified common themes across multiple QI training program evaluations, and concluded that an organizational culture oriented to QI, with leadership support and clear sponsorship of QI projects, were effective influences for staff to accept and engage in QI activity (RWJF, 2013). In a prior review, the RWJF reported organizational support, infrastructure to support QI and effective incentives as key enablers to QI activity (RWJF, 2011). Organizational culture of QI and excellence, and leadership involvement were included as key variables for QI success in QI training evaluations by Morganti et al. (2012 & 2014). In their evaluation of the Enabling Doctors in Quality Improvement and Patient Safety (EQuIP) program, Runnacles et al. (2013) included organizational culture receptive to change, senior executive support, and engaging operational and improvement managers as key factors of success in QI. Similarly, support from supervisors and senior leaders and ongoing institutional support have been identified as critical in evaluations of QI training programs (Rask et al., 2011; Daugherty et al., 2013). The BC Patient Safety and Quality Council’s Report Education for Quality and Safety Leaders concluded that support of their organizations is critical for QI trainees, especially from direct supervisors, which is also critical for conducting QI projects within the training program (BCPSQC, 2011). Leadership support was also highlighted by Davis et al. (2014) from case studies in US Public Health Agencies implementing QI initiatives; and by Headrick et al. (2011) in medical education. Ogrinc et al. (2004) describes how PBLI elective courses for internal medicine residents included a project sponsor and involvement from team leaders of improvement initiatives. The VAQTS curriculum trains physicians into how to lead and follow others to facilitate change in health care (Batalden and Davidoff, 2007; Splaine et al., 2002 & 2009).

The importance of top management leadership involvement and support for QI is reflected in the Effective Governance for Quality and Patient Safety program, developed in Canada to train board members and executive leaders of health care organizations. A program assessment by Didier et al. (2011), included questions on the Board relationship with the CEO and clinical leadership, the Board’s role
In monitoring information, performance measurement, and building a culture of quality. Senior management and Board involvement in QI was also mentioned by Gagliardi et al. (2010) in their study in acute-care hospitals, as fostering a QI culture was identified as a key responsibility for quality managers. Hospital survey data in Ontario showed high levels of involvement from leadership in the execution of QI plans (Ontario Hospital Association, 2013).

**QI strategy and work with health authority (M)**

Adler et al. (2003) suggest making performance improvement a strategic priority, with more participation at different levels, from top management to physicians and to lower levels of hospital management. The authors identified the following key components of organizations performance improvement capability: skills, culture, systems, structure, and strategy. For Bevan (2010), capability building strategies need to take account of how change spreads in complex adaptive systems. For Batalden and Davidoff (2007), organizational strategy of a particular setting is a key driver of change, together with operational and human resource realities.

Related to the QI strategy adopted by hospitals, Weiner et al. (2006) studied the impact of organizational deployment in QI on outcomes. Organizational deployment in QI was measured as the average level of hospital unit involvement in QI efforts, using separate measures for the percentage of hospital senior managers, staff and physicians participating in QI teams. Hospital quality managers should be part of QI strategic planning (Gagliardi et al., 2010).

Davis et al. (2014) conducted case studies in US Public Health Agencies implementing QI initiatives and found that involvement in national QI initiatives, higher proportion of staff trained in QI, and QI teams that met regularly with the decision-making authority were significant factors related to stronger QI activity.

**Teamwork, team empowerment and resources for QI (N)**

Having strong and empowered teams is an organizational advantage recurrently referred to in QI capacity assessment (e.g., Bevan, 2010; Canal et al., 2007). The evaluation by Stover et al. (2014) included measures of local team empowerment. Morganti et al., in two QI training evaluations (2012 & 2014), used measures of team empowerment, team collaboration, team effectiveness in defining a project strategy and plan, end-user involvement (staff whose work is affected by the intervention but who were not members of the implementation team), team autonomy, and implementation empowerment among key variables for QI success. Adequacy of financial resources for QI was also assessed as a component of team empowerment by Morganti et al. (2012 & 2014) (also in Riley et al., 2009). Participants of the Emory Healthcare QI training program reported improved aspects of teamwork (Rask et al., 2011; Daugherty et al., 2013); and Rask et al. (2011) identified lack of financial resources as a barrier to QI implementation. The VAQS includes a curriculum domain in collaboration (Splaine et al., 2002 & 2009; Batalden and Davidoff, 2007); and the QI training program described by Headrick et al. (2012) focused on building skills for interprofessional teamwork and communication. This last aspect is also highlighted by the American Association of Colleges of Nursing (2006) together with the use of information and communication technologies to enhance care and improve outcomes.
Adler et al. (2003) conducted case studies on seven US paediatric hospitals and highlighted the need for specialized performance improvement staff and standing committees, stronger teamwork, communication systems, and human resources management systems. Acute hospital quality managers in Ontario described facilitating communications and working with or supporting teams and clinical staff as one of their roles (Gagliardi et al., 2010).

Monitoring, accountability and diffusion (O)

Other organizational enablers identified in this review were related to the use of data, monitoring results, adequate accountability mechanisms and diffusion of successful QI practices. Stover et al. (2014) assessed the use of QI data for decision making, the existence of results-oriented accountability, and the degree of diffusion of QI learning across teams. Morganti et al. (2012 & 2014) included among key variables for QI success the use of information technology systems, monitoring performance, and diffusion within units and across organizations. Davis et al. (2014) identified as key factors the existence of data collection and monitoring systems and methods in place. Bevan (2010) highlights the importance of measurement, use of evidence, and benchmarks. The importance of data in QI training is acknowledged by the American Association of Colleges of Nursing (2006), Headrick et al. (2011), and the VAQS (Batalden and Davidoff, 2007; Spline et al., 2002 & 2009), the latter including measurement, understanding variation and use for accountability purposes.

Adler et al. (2003) identified the need of counting with effective oversight and accountability mechanisms, information infrastructure, performance measurement, and incentives that encourage cross-unit collaboration. Key QI roles for acute hospital quality managers are data analysis and monitoring of performance (Gagliardi et al., 2010). Hutchison et al. (2011) highlight performance measurement as key for QI in primary care. Weiner et al. (2006) concluded that future research should explore the diffusion of QI across organizational units.

Findings on Impact (outcomes)

Patient and Care Outcomes (P)

The assessment of the impact of QI activity in terms of patient and care outcomes is essential to any evaluation, although data are not always easily available. For Batalden and Davidoff (2007), accurate and powerful measurements are needed to know that change is producing improvement. In evaluations of QI training programs, new skills need to be connected to building results and realising benefits, which should be appropriately measured and included in economic appraisals, such as ROI (Bevan, 2010; Phillips, 2003). A recurrent strategy is to use outcomes of QI projects developed as part of QI training. The evaluation of the IDEAS program includes meeting specific patient outcomes targeted by QI projects developed as part of the program (Ng and Trimnell, 2015). Cornett et al. (2012), in their evaluation of training programs for public health departments, included achievement of project goals, as measurable outcomes or processes. In the case of the Perfecting Patient Care (PPC) University program, although it did not include QI interventions, Morganti et al. included in their evaluation QI progress achieved in interventions following the QI training program. Using data on QI outcomes provided by the participant organizations, they constructed four externally rated measures of success, and measures of sustainable monitoring and diffusion within unit and across the organization.
A different approach used in the evaluation of the Emory Healthcare QI training program was to directly ask how participants perceived the impact of the QI projects developed as part of the program on processes of care and patient outcomes, including patient safety, access to services, and satisfaction (Rask et al. 2011; Daugherty et al., 2013).

Healthcare organizations typically monitor adverse events and patient satisfaction, as reported by quality managers of hospitals in Ontario (Gagliardi et al., 2010).

For the American Association of Colleges of Nursing (2006), nurses should provide care that contributes to safe and high-quality patient outcomes, and use performance methods to assess and improve outcomes of individuals and communities. The QSEN QI competency requires knowledge on improvement strategies and skills on seeking and reviewing information about outcomes of care (Cronenwett et al., 2007 & 2009). Although minimally observed in their study, Headrick et al. (2012) recognized the importance of measuring changes in behaviour and outcomes in training evaluation.
**Discussion**

Improving the performance of our health care system requires managing limited resources in an effective, efficient and equitable way. To progress, we need to be able to assess the results and advances of our work and investments, in order to know if we are going in the right direction and how far we have come.

Research in QI capacity building assessment is limited both in the number and scope of studies. To our knowledge, and after completing this systematic review of the literature, there are no system level QI capacity building evaluations. This finding can be translated into two basic conclusions: first, health care systems across jurisdictions are not well aware of the resources available to improve quality of care; and second, despite considerable resources invested in QI, the ROI for QI capacity building at the system level is largely unknown.

Although several studies have shown improvement in quality outcomes related to building QI capacity, we do not really know how much we are getting out of these investments. Without this information, we have limited knowledge to make judgements regarding the appropriate level of QI investments, where these investments should be directed for optimal impact, and the extent and nature of costs related to QI training and projects borne by trainees, organizations, programs, and governments.

Our review of the literature was partially successful at meeting our second research objective of identifying evaluations of ROI in QI capacity building/training at the initiative level. The two studies identified present several common elements that may be used to guide economic evaluations in QI capacity building at the system level. Together with these findings, the review was successful at meeting our third research objective of gathering the most current knowledge in QI capacity building evaluation, regardless of a lack of linkage to investments or limited scope of assessment.

The main elements identified in our review were consolidated in the Framework to Guide Evaluations of System Level Investments in QI Capacity Building, presented in Figure 3. This framework contains the seven identified key steps of a QI ROI assessment, 16 evaluation components grouped in five themes, and exemplifies the connection between these elements.
Figure 3: Framework to Guide Evaluations of System Level Investment in QI Capacity Building

**Characteristics of QI Training**
- QI projects as part of QI training program
  - Are QI projects being conducted as part of QI training programs? Are the investments and outcomes of projects being distinguished from those of training?
- Coaching/mentorship as part of QI training program
  - Is coaching part of the cost of QI training?
- Use of e-learning resources
  - Should e-learning capacity and infrastructure be considered as cost of QI capacity development and in what proportion?
- QI training partnerships
  - Are there partnerships involved? Is the evaluation going to take the perspective of all or only some of them?
- QI training during residence or undergraduate health care studies
  - Is pre-licensing QI training being distinguished from post-licensing QI training?

**Characteristics of QI Activity**
- Opportunities to apply QI skills
  - Are QI projects and training integrated in the same initiative, so they should be included as part of the same economic evaluation?
- Informal QI training and coaching as part of the working environment
  - What proportion of the outcomes can be attributed to informal QI training and coaching?
- Patient and community participation in QI
  - Is the patient perspective considered when planning the evaluation?

**Individual Enablers/Barriers**
- Quality improvement skills and knowledge
  - Are new QI skills and knowledge changing behaviour and, ultimately, outcomes?
- Motivation and interest in QI activity
  - Is lack of motivation or interest in QI activity offsetting the effect of QI initiatives?
- Individual barriers to QI training
  - Are there barriers present that if removed could enhance the impact of QI training?

**Organizational Enablers/Barriers**
- Organizational culture and leadership support to QI
  - Are there intangible benefits of building organizational culture of QI?
- QI strategy and work with health authority
  - Is the evaluation plan congruent with organizational or system level QI strategy? Is QI activity being coordinated across health organizations?
- Teamwork, team empowerment and resources for QI
  - Are differences in leadership support affect the transferability of results in QI initiatives? Are variations in teamwork, empowerment and resources major elements to be considered in the sensitivity analysis?
- Monitoring, accountability and diffusion
  - Are data monitoring processes aligned with the assessment outcomes?
  - Are accountability and diffusion being optimized to increase the impact of QI activity?

**Impact (outcomes)**
- Patient and Care Outcomes
  - Are all the most relevant patient and care outcomes being included in the benefits of the evaluation?
  - Are essential nonmonetary outcomes going to be transformed into monetary benefits?
  - What are the intangible, nonmonetary outcomes that are not worth transforming into monetary benefits and will be reported as complementary benefits of the intervention?
The evaluation questions included in Figure 3 are only examples of the many aspects that need to be considered when planning and executing an economic assessment on QI capacity building, especially at large scale.

The 16 evaluation components in this framework represent a useful toolkit that can be applied when designing and conducting both economic and noneconomic evaluations in QI capacity building. In this sense, it is important to make clear that we do not expect these elements to be an exhaustive list of the components that need to be part of QI capacity building evaluations. Rather, they should be accompanied by other elements that will specifically depend on contextual characteristics of the situation where the evaluation is being carried out and the purpose for conducting the evaluation. Some examples of potential additional elements to be considered are: a) funding sources and amounts; b) opportunities for formal and informal QI training; c) who should be targeted by QI training opportunities and when; d) what are the barriers to achieving higher returns on QI investments in terms of capacity and quality of care.

The extensive use of ROI evaluations in most industries contrasts with their slow introduction in health and social care evaluations. A feature of the delivery of health care is that third party payment systems tends to separate transactional factors between customer and provider that normally help quantify value in other industries (McLinden et al., 2010). Another key issue is converting intangible benefits to monetary value to be included in economic evaluations given the central importance in health care of non-monetary outcomes, such as client satisfaction, quality of care, or leadership capacity. This is especially critical in QI at the health care system level and for population health, where target outcomes can be as “non-monetary” as wait times or quality of life and as “intangible” as innovation or autonomy in activities of daily living. As Phillips (2003) stated, “there is no measure that can be presented to which a monetary value cannot be assigned”, key issues are credibility, cost of estimating this conversion, and stability over time, among others.

Isolating the effect of capacity building and training interventions is already challenging, even more if doing so at the system level, with multiple asynchronous initiatives and programs. Typical approaches include the use of control groups and time-series analysis, techniques that are not always plausible. Alternatively, estimation of training impact can be obtained through focus groups or questionnaires, generally including participants and supervisors, as shown in the examples depicted here (Phillips, 2003). The important point is to always address this issue. Depending on the robustness of the estimation, error adjustments should be large enough to show reliable evaluation results (Phillips, 2003).

From the findings just presented we can conclude that there is an important gap in QI capacity building knowledge and assessment, particularly at the system level. However, the necessary elements to start addressing this research gap are known and can be made available. A more extensive use of ROI or other types of economic evaluations of QI capacity building can help close this knowledge gap. After all, ROI assessments are no more than evaluations of the balance between costs and benefits (better care and better health), which is also coincidental with widely accepted ‘value’ frameworks in health, such as the Triple Aim.

As Øvretveit (2009) observed, “even though investments in QI and patient safety have not broadly closed the quality ‘chasm’, the cost of inaction and of not using the available knowledge is likely to be high, both financially and with regard to human suffering.” Even though the results of QI efforts may have been disappointing in many aspects, there are numerous examples of successful improvement
that show that transforming our health care systems is possible; but we need to see more than fragmented pieces. To achieve transformation, we need to work collaboratively to make available the human and financial resources necessary to improve quality at the care site and where health care professionals are trained. We need to do better at fostering a culture of QI, and at helping good practices and innovation spread across the system. A high-priority step at this point is to broaden our vision; we need to be able to evaluate and monitor our advances in QI capacity building and the impact of our investments from a system perspective, all this in order to truly achieve a better health care system for all.
References


- Batalden PB, Leach D, Swing S, Dreyfus H and Dreyfus S. (2002a). General Competencies And Accreditation In Graduate Medical Education. *Health Affairs*, 21, no.5: 103-111.


