

Table 1. Characteristics of three systematic reviews of quality improvement educational interventions in healthcare

Study	Study period	Context	Evidence Synthesis	Studies	Professions	Countries	Outcomes
[4]	2000-2016	Undergraduate only	Narrative	10	Nursing 5 Medicine 4 Pharmacy 1	USA 5 UK 3 Norway 2	Impact by Kirkpatrick Education Evaluation Model levels 1. Experience 2. Knowledge and attitudes 3. Behaviour 4. Organisation (4a) and patient benefit (4b) Enabling and Impeding factors
[5]	2000-2013	Postgraduate only 34 ^a Undergraduate only 3 Undergraduate & postgraduate 2 ^a	Realist	39	Medicine	USA 37 Canada 1 Israel 1	Characteristics of successful QI curricula
[6]	2007-2013	Postgraduate only	Meta-narrative(21)	99	Multiple	USA 84 Non-US 14 Both 1	Are three pre-specified curricular features associated with studies reporting outcomes of importance to patient care? 1. Inter-professional learner cohort 2. QI project 3. Coaching ^b

Notes

- a. In the review one study is cited as involving medical students, residents and fellows (5) but the original paper says that the students were from a Masters level nursing programme (22). We have classified this study as postgraduate only.
- b. Coaching was defined as: “*expertise provided to teams in applying QI methods during the educational intervention, which may or may not include a required QI project*” (6).

Table 2. Summary of results from three systematic reviews of quality improvement educational interventions in healthcare.

Study	Results		
[4]	<p>Kirkpatrick Levels:</p> <ul style="list-style-type: none"> • Level 1: Reaction of students was positive in all studies. • Level 2: Impact on attitudes was positive in all studies. Five studies reported improvement in QI knowledge (11, 12, 15, 17, 18) • Level 3: No studies included impact on behaviour. • Level 4: Only one study included impact on clinical processes and benefit to patients <p>Enabling and impeding factors</p>		
	Factor	Enabling	Impeding
	Teaching Approaches	Experiential learning; access to free e-learning from IHI (Institute for Healthcare Improvement)	Lack of practical opportunities; inadequate preparatory learning
	Clinical/Faculty Support	Mentor support in practice	Difficulty finding clinical mentors; clinical staff perceiving QI work as threatening; lack of QI expertise in academic staff
	Information Provision	Structured assignments; examples of completed QI projects; group work	Poor understanding of the task to be undertaken impedes students' ability to inform staff about what they are doing
	Curriculum Balance		Lack of dedicated time; instruction to work on QI projects when "more important tasks" were completed
	Data availability		Lack of information about where to collect data; perception that data were tedious, non-educational or irrelevant
[5]	<p>Characteristics of successful QI clinical QI curricula:</p> <p>Interface of educational & clinical systems:</p> <ul style="list-style-type: none"> • Medical students can, and should be expected, to contribute to quality of care in the clinical setting • Residents are front-line providers and have deep insights into the clinical processes and system. • The availability of clinical and systems data has a direct positive impact on learner satisfaction and engagement • Opportunities for inter-professional engagement and education can be found in teaching about QI within the clinical setting <p>Choice of QI work</p> <ul style="list-style-type: none"> • Identifying educational and clinically relevant project topics is challenging • Consider having trainees choose their own project. • Choose topics of clinical importance. Use near misses as a way to identify system errors <p>Appropriately trained faculty:</p> <ul style="list-style-type: none"> • Successful QI teaching in the clinical setting requires support from both educational and care delivery leaders. 		

	<ul style="list-style-type: none"> • Programs can be successful by either engaging all faculty around QI or by having dedicated QI faculty in the clinical setting <p>Outcomes:</p> <ul style="list-style-type: none"> • There is lack of clarity around whether educational and clinical outcomes are of equal or relative hierarchical importance • Sustainable projects can impact the culture of the clinical setting, but unsustainable projects may dishearten participants
[6]	<p>Association (Odds Ratio, 95% CI). between studies reporting clinical processes or patient benefit outcomes and three curriculum features:</p> <ul style="list-style-type: none"> • Inter-Professional Learning 6.55 (2.71-15.52) • Coaching 4.38 (1.79-10.74) • QI project in curriculum 13.60 (2.92-63.29)

Table 3. Five domains of the Clinical Leadership Competency Framework. Each domain has four elements. NHS Leadership Academy 2011 [61].

<p>1. Demonstrating Personal Qualities</p> <ul style="list-style-type: none">• 1.1 Developing self-awareness• 1.2 Managing yourself• 1.3 Continuing personal development• 1.4 Acting with integrity <p>2. Working with Others</p> <ul style="list-style-type: none">• 2.1 Developing networks• 2.2 Building and maintaining relationships• 2.3 Encouraging contribution• 2.4 Working within teams <p>3. Managing Services</p> <ul style="list-style-type: none">• 3.1 Planning• 3.2 Managing resources• 3.3 Managing people• 3.4 Managing performance	<p>4. Improving Services</p> <ul style="list-style-type: none">• 4.1 Ensuring patient safety• 4.2 Critically evaluating• 4.3 Encouraging improvement and innovation• 4.4 Facilitating transformation <p>5. Setting Direction</p> <ul style="list-style-type: none">• 5.1 Identifying the contexts for change• 5.2 Applying knowledge and evidence• 5.3 Making decisions• 5.4 Evaluating impact
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Table 4. Distinction between Service-Learning and other service programs with examples applied to medical education on healthcare improvement . Adapted from Furco [48].



SERVICE-LEARNING
 Service-learning programs intend to equally benefit the provider and the recipient of the service with equal focus on both the service being provided and the learning that is occurring.

 Examples: facilitated feedback to clinical teams and patients (Discover); working with teams and patients to narrow down options (Define); Develop and Deliver solutions (improvement practicum; Global Health Challenge)

COMMUNITY SERVICE
 The engagement of students in activities that primarily focus on the service being provided by the students as well as the benefits the service activities have on the recipients. The students receive some benefits by learning more about how their service makes a difference in the lives of the service recipients.

 Examples: collection of audit or patient experience data for clinical teams without structured learning.

FIELD EDUCATION
 Students perform the service as part of a program that is designed primarily to enhance students' understanding of a field of study, while also providing substantial emphasis on the service being provided.

 Examples: collection of individual patient experience or adverse event data with reflection on personal learning and service improvement.

VOLUNTEERISM
 The engagement of students in activities where the primary emphasis is on the service being provided and the primary intended beneficiary is clearly the service recipient.

 Example: volunteering to sit with patients who need some company

INTERNSHIP
 Programs that engage students in service activities primarily for the purpose of providing students with hands-on experiences that enhance their learning or understanding of issues relevant to a particular area of study.

 Example: clinical patient contact, observation of clinical teams and patients in practice with reflection on personal learning

Figure 1. The Habits of Improvers framework applied to undergraduate medical education for healthcare improvement. The Habits of Improvers framework is reproduced with permission from a Health Foundation Thought Paper (2). The text about application summarises teaching and learning in the University of Dundee’s MBChB curriculum. Text in yellow identifies learning about Healthcare Improvement



