

**REPORT TO THE QUALITY IMPROVEMENT AND INNOVATION
PARTNERSHIP (QIIP)**

**An overview of evidence on the effectiveness of quality improvement
interventions in primary healthcare**

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OBJECTIVE

This systematic review was commissioned by the Quality Improvement and Innovation Partnership (QIIP) of Ontario, as part of an initiative in Quality in Primary Healthcare. The objective of this component of the initiative is to identify evidence regarding the effectiveness of quality improvement initiatives that could inform decisions about future QI investments, as well as evidence gaps that need to be addressed in future research and evaluation efforts.

RESEARCH QUESTION

This review set out to determine the evidence of effectiveness of quality improvement interventions in primary health care based on literature from published systematic overviews.

Refining the question: Through several meetings and discussions, the project team worked with QIIP and the provincial QI stakeholder group to further refine the research question. Most of the discussion related to articulating the definition of a QI initiative or intervention. For the purpose of this review, the initiative must have embedded performance measurement of a process or outcome in the initiative to enable reflection and change. Single one-time interventions that do not employ a mechanism of feedback to the primary health care professionals were excluded. Also of interest were reviews that addressed training of health care professionals in QI methods.

Inclusion Framework: The focus of the project was to identify systematic reviews that reflected the evaluative and reflective nature of the QI process, rather than a specific type of approach or intervention such as reminder systems or financial incentives. This definition necessitated a wide and inclusive search strategy, along with clarity on exclusion criteria of papers and discussion among reviewers to ensure agreement.

The inclusion framework that was agreed upon was:

Included Design: Systematic review or meta-analysis

Included Population: Any study that included primary health care providers

Included Intervention(s): Goal is to improve processes or outcomes of care through:

- training in QI methods or;
- an intervention or program that includes performance measurement (e.g. breakthrough series, accreditation, learning collaboratives, benchmarking)

Included Outcome(s): Care processes or outcomes, patient or provider experience, health care costs

Definitions

Quality Improvement Interventions

While examining initial articles from the searches, key words and phrases reflecting quality improvement interventions that aligned with this review's objectives were noted and used in revised search strategies. We continued updating this list during stage 1 and 2 of full paper review. Examples of terms and phrases encountered included: *quality improvement program, chronic care model (if it included measurement/feedback loop), continuous quality improvement program, quality improvement collaboration, quality improvement learning collaborative, learning collaborative, breakthrough series, breakthrough collaborative, plan do study act (PDSA), six sigma, total quality management, process and outcome measurement, evaluation and management, and routine reporting and feedback loops.*

METHODS

This was a systematic overview of overviews of published literature on programs and interventions to improve quality of health care in primary care.

Search strategy for reviews

A multi-pronged and comprehensive search strategy was carried out that included the following:

Test searches: Searches were conducted to determine the relevance of various search words and phrases and the scope and number of results obtained. Terms selected to capture systematic reviews and meta-analyses were developed according to those published by Hunt & McKibbin.⁴ This assisted in creating a comprehensive list of terms for quality improvement initiatives.

Bibliographic database searches: Medline, EMBASE, NHS EED, IPA DARE, Rx for Change, Cochrane Collaboration, and Health Systems Evidence databases were electronically searched for systematic reviews that met our inclusion criteria. Databases were searched from 2005 to March 2010.

All electronic citations were uploaded into RefWorks where possible (with the exception of Rx for Change and Health Systems Evidence), and organized by the database searched. The number of citations each search yielded and the finalized search strategies were recorded. Each database was searched for duplicates within individual databases, as well as between databases. The search strategies are shown in Appendix A.

Data bases were searched in the following order:

1. Medline (OVID HealthStar)
2. EMBASE (Exerpta Medica)
3. Cochrane Database
4. NHS EED (Health Economic Evaluations Database)
5. DARE (Database of Abstracts of Reviews of Effects)
6. Rx for Change (Canadian Agencies for Drugs and Technologies in Health)

7. Health Systems Evidence (created by McMaster Health Forum- Health Systems Evidence is a continuously updated repository of syntheses of research evidence about governance, financial and delivery arrangements within health systems, and about implementation strategies that can support change in health systems)
8. IPA (International Pharmaceutical Abstracts)

Review of reference lists of included articles: All published scientific articles that are included in the final review had their reference lists and bibliographies hand searched for other systematic reviews of studies or programs that may not have been previously identified.

Study Selection

For feasibility purposes, the searches were restricted to English language articles. We acknowledge that this likely excluded some studies or articles published in countries where the first language was not English.

Inclusion criteria were applied to focus the selection of reviews. Inclusion and exclusion criteria were developed, with corresponding codes for each reason for exclusion (Appendix B). The inclusion/exclusion criteria were first tested by 2 reviewers using 100 practice citations, and then refined.

Citation Review

Due to the large number of citations identified from the searches and the poor specificity of the searches, it was not feasible for two reviewers to independently review all titles/abstracts (>2500) and agree on inclusion by consensus. Four reviewers were trained together and divided into 2 pairs to review a sample of 50 citations (title/abstract review only), each reviewer independently. The pairs then met together with the trainer and reviewed agreement and discussed reasons for disagreement. The inclusion and exclusion criteria were further elaborated and discussed. The individual reviewers of each pair then reviewed another 100 citations and met again with each other and the trainer to review decisions. At this point it was felt there was high enough consensus for the 4 reviewers to divide the remaining citations for independent initial examination. Nearly all the ineligible citations were clearly not related to the topic of interest and specific exclusion coding was not done at this stage. The four reviewers were instructed to err on the side of being inclusive if a citation was unclear. At this stage, double review (abstract/title) of potentially eligible articles was done on the smaller list by the more experienced trainer. The full text of articles for abstracts that appeared to meet the inclusion criteria were then downloaded, and subjected to a Stage 1 full article review. During the Stage 1 assessment, reviewers used a form (Appendix C), specifically developed for this project, to ensure the population, setting, and intervention focus was appropriate before performing a detailed data abstraction of the complete article. A consensus process was not used during this stage – if either reviewer included the article, it was included for data abstraction. Specific reasons for exclusion were recorded at the full article review stage (Stage 1). As a final step to ensure relevant reviews had been captured, the references of the included articles were reviewed.

Data Abstraction and Study Evaluation

Following this, included articles moved on to data abstraction. Two data extraction forms were developed (Appendices D & E). One form was used to extract detailed methods and content of interventions and results (single review done by 2 research coordinators experienced in health services research methodology and systematic reviews). The second form was used to capture the overall trends of the results and interpretations as they pertained to the primary care setting (double review done by 2 experienced primary care clinicians with expertise in quality initiatives in primary care– DP, LH).

Often a systematic review included papers from both primary care and other settings such as hospitals. Only data on primary care papers were extracted. Due to the variation in how reviews presented their included studies, it was not always possible to extract all the information we sought. We did not examine original papers to locate information that was not available.

The data extraction form covered the following areas:

1. Types of QI initiatives
2. Number of studies in review that included primary care setting
3. Year(s) in which primary care studies were conducted
4. Participants (number of practices involved, number of providers delivering or receiving the intervention/control, number of patients involved)
5. Type of setting as described in article (e.g. primary care practice, ambulatory care practice) and number of practices in each setting
6. Whether the practices were physician-only or multidisciplinary teams
7. Study design(s) of included papers
8. Outcome categories (process of care, patient clinical outcomes, patient experience/satisfaction, provider experience/satisfaction, health care utilization, costs)
9. Summary of effects (improvement or change, statistical significance of effect)

Data Synthesis

There were varying levels of information on original studies contained in the reviews, making standardized data collection and summary difficult. In addition, only interventions that took place in a primary care setting were of interest, therefore the results tables display information from selected studies within the reviews, rather than information on the entire review. The list of studies referred to in the tables is provided in Appendix F.

Description of the objectives and methods of the reviews is shown in Table 1. Table 2 shows the results of the primary care relevant aspects of the reviews. Table 3 shows the different types of QI strategies in primary care from the included reviews, with a non-quantitative summary of outcomes improved and not improved, along with the study designs employed, to give the reader a sense of the methodologic rigour that produced the findings. The categorization of QI strategies was developed by the authors of this review, based on language and terminology used in the papers, and readers should be aware that these may be somewhat artificial boundaries.

Data Extraction and Analysis Limitations

Several limitations were identified during data extraction and analysis. Firstly, if information was absent in the review article we did not go back to original articles to populate the fields of our results tables – it was left blank. Secondly, often only a part of the systematic review contained a relevant QI program; therefore, data collection was restricted only to the intervention or program that met the inclusion criteria. Thirdly, results of effectiveness are stated qualitatively because in the majority of reviews, there were no specific results presented (e.g. relative risks, means), or it was cumbersome to present individual study results for some studies but not others in a helpful way. Lastly, there is overlap in the findings of some reviews since they included the same original articles.

RESULT OF SEARCHES

There were 5695 articles identified from all databases initially, with 3812 remaining after duplicates were removed. 512 were chosen in the first round of citation review (title/abstract), and this was reduced to 106 after second citation review (title/abstract). After phase 1 full paper review, 16 articles were included, and after data extraction began, 4 reviews were found to be ineligible. Twelve articles were included in for full review. A summary of the search results is presented in Figure 1. Characteristics of the included articles are summarized in Table 1.

Many of the articles that were excluded after phase 1 full paper review were originally selected because of search terms that identified papers using approaches that included components of reminders or audit and feedback. Most of these papers, after full review, were found not be QI interventions with a routine reporting and feedback loop. However, they likely represent tools that could augment successful implementation of QI programs, and we have included them in the bibliography of this report and summarized the interventions studied in Appendix G.

FINDINGS AND DISCUSSION

All reviews included some papers that were based in primary care and some that were not. Of the 11 reviews where it was possible to determine, there were 123 studies based in primary care settings of 471. In one review, there were 112 studies in sites where chronic disease management care was provided but the number of primary care versus other care settings was not described and we used all results from this review³. A list of the individual primary care studies found within the included articles is shown in Appendix F.

Reviews were conducted by authors in various countries: 4 from the U.S., 3 from the Netherlands, 2 from Canada, 1 from Scotland, 1 from Germany and 1 from Australia.

Most reviews were comprised of studies targeting interprofessional teams of providers. A variety of QI approaches were used including breakthrough series, learning collaboratives, disease management/chronic care models with feedback on performance, Continuous

Quality Improvement, Total Quality Management and education in PDSA cycles. A taxonomy of the quality improvement interventions found in the included articles is presented in Box 1. This taxonomy gives the descriptions as the articles provided them, rather than standard definitions. Several reviews described a quality improvement strategy that included feedback on performance but did not name a specific program or method. Two reviews specifically assessed the effectiveness of teaching QI methods to practicing clinicians⁶, or trainees in family medicine⁷.

All 12 reviews included at least some primary care studies that measured processes of care as an outcome and ten reviews^{1-3;5;6;8-12} included studies that measured clinical patient outcomes (Table 2). Five reviews measured patient experiences^{2;5;9;11;12}, three measured provider experiences^{5;7;12}, and five measured health care utilization or costs^{3;5;8;10;11}.

Eight reviews addressed quality improvement for specific disease areas including COPD¹¹, asthma¹³, diabetes¹, mental health^{9;12;14}, or chronic disease generally³. The remainder focused on QI strategies rather than disease areas.

All reviews showed some promising but usually mixed results (Table 2). Table 3 shows that the chronic care model/ disease management strategy has the most promising results based on consistency of positive effects across studies, and rigour of methods used in the individual studies (mainly RCTs). This finding was mainly influenced by the large CCM review by Tsai³. Of the two individual studies that examined a CCM strategy with a QI process involving feedback for assessment, one showed positive results and one showed no difference.

The 12 studies reviewed in detail have many similarities in their conclusions. To be most successful in showing improvement in processes or outcomes, multiple strategies need to be employed and targeted at patients, providers, interprofessional teams and systems in primary care. When thinking about the complexity of primary care it is not surprising that multiple strategies are needed to show change; providers cannot be targeted by education initiatives in isolation of patients being willing to learn or adopt new ideas or plans, just as system changes cannot be imposed without gaining the co-operation of the providers. Most QI interventions were not studied alone but were studied in conjunction with system or patient level interventions. This suggests that a coordinated systems approach to QI that can create synergy of action for QI strategies involving reflection and action (such as PDSA cycles at multiple levels) addressed to the system, practice, provider and patient would be effective.

The majority of studies were carried out in hospitals and hospital outpatient settings, and those that took place in primary care settings were not described in enough detail to understand their comparability to Canadian primary care. Many original studies were done in the U.S. where settings included ambulatory care or pediatrics. Therefore it is difficult to know if findings can be directly applied to Ontario's group practices or FHTs. However, most QI interventions, regardless of setting, mentioned or implied interprofessional team involvement and targeted outcomes such as chronic disease parameters or management processes that would be considered important in primary care in Ontario. Having said that, most studies were undertaken in multidisciplinary teams, therefore adaptation to solo physicians and small practices with a

limited number of care providers would need to be considered when trying to undertake quality improvement in these settings.

With so many different types of outcomes it is difficult to look across studies and draw any general conclusions on the effectiveness of any specific strategy. There was a consistent trend for greater improvements in processes of care than in clinical outcomes. This may be because the interventions were not potent enough, studied long enough to show clinical outcome changes, or process changes were considered a proxy for clinical outcome improvements and thus studied more often than patient important outcomes. Most studies were relatively short (6-12 months) or of unknown duration, so we do not know the effectiveness of any of these interventions once they have been implemented beyond the initial stages or truly embedded into care. A major limitation of all of the studies was lack of follow-up to see if change was sustained, let alone consider whether a culture of CQI was established.

All studies used different strategies for different purposes (e.g. different disease groups targeted, and varying types of providers). Generally, change was so targeted to a specific aspect of practice or disease that it is difficult to know if the methodology could be applied to another similar CDM. Primary care is patient centered with most people having multiple morbidities. Therefore, focusing solely on one chronic disease, as was the case in most studies, does not reflect the realities of clinical practice or help us understand how it would work in another situation.

The types of QI interventions identified from the review can be broadly grouped into 6 categories. Table 3 provides an overview of the QI strategies, their design and outcomes summarizing how often there were improvements in reported outcomes versus no improvement. This table represents our groupings of strategies and is an overview only and open to interpretation. Again most QI interventions were not studied alone but were studied in conjunction with system or patient level interventions and this should be considered during interpretation.

QI interventions focused on the health care provider were often combined with system changes such as health care provider role changes, system changes or self management support directed to patients. Although it seems accepted that single strategies are unlikely to be effective and that QI must address many practice and patient areas, when studies demonstrate effective multifaceted approaches, we are left unsure of the critical parts or an understanding of how to tailor them to our setting.

Several studies assessed health care utilization outcomes, and one mentioned costs in the context of medication costs increasing with proper management of a condition. There was no measurement of actual cost-effectiveness of interventions. It would be challenging to conduct traditional cost-effectiveness analyses of strategies that are intended to change the culture for quality improvement beyond the initial intervention.

Although time limitations in this review did not allow us to systematically grade the strength of evidence of the included reviews, we can conclude that using a system such as GRADE¹⁵, there is low quality evidence at least because of inconsistency of results and indirectness of evidence

available to Canada and Canadian healthcare settings despite there being a good number of randomized trials included in the reviews.

Having said that, only the most effect strategies from this systematic review are discussed below:

The Chronic Care Model (CCM)/Chronic Disease Management (CDM) appeared to be the most successful strategy, likely because it is inherently multi-faceted and applies to many conditions. CDM is also the method most studied compared to other methods so there is more opportunity to show benefit. CDM allows care providers to be proactive and in some cases has (surrogate) outcomes that are amenable to change over a short period of time (and so can be studied). Clinical improvements reported in some CDM studies were often statistically significant but possibly only of borderline clinical significance and not always clinically meaningful.

Minkman et al.⁵, the authors of the review that included CCM as well as the European excellence model and the Baldrige award noted that although the latter 2 models are in widespread use, there has been no rigorous evaluation showing benefits (multiple case studies only), and the CCM model has been studied almost entirely in the U.S. in specific patient groups. They also note that the first two quality programs are ‘experience-based’ and have not been designed to incorporate rigorous research design, whereas the CCM is ‘evidence-based’.

The systematic review on learning collaboratives suggested that evidence of the impact of quality improvement collaboratives is positive but limited and most effective when combined with CDM. Other studies in primary care settings show learning collaboratives/breakthrough series produce improvements in process and clinical outcomes and can be considered modestly effective. However, the critical elements of why this strategy is successful have not been defined enough to know why it works.

Several studies suggest self management has the most impact on patient behaviour and therefore improved clinical outcomes. Many of these studies were in primary care settings although the detail of the settings is limited. Overall, interventions that are based on a theoretical framework, use multiple educational sessions, have longer durations, and use combinations of instructional modalities are more likely to result in improvements for patients. This also is not too surprising as self management is directed at patients, who are critical players in implementing changes that may result in clinical improvements.

FUTURE DIRECTIONS AND RECOMMENDATIONS

Any QI strategies considered for Ontario need to use multi-faceted approaches that could include:

- CCM/CDM, including a strong self-management component
- Consideration of expanding team composition or defining or expanding roles for team members already present
- Collaboratives/breakthrough series for patients and providers
- PDSA cycles, self-audit and feedback for providers,
- CQI/awards programs for providers and organizations

One strategy of particular relevance for Ontario was the addition or role expansion of non-physician health professionals, which was shown to be beneficial. The findings also highlight the importance of including specialists in some capacity in the primary care team. However, there needs to be more rigorous evaluation of the effects of interprofessional teams on improved clinical outcomes for patients in primary care settings/practices.

Another learning from this project was the extent of heterogeneity in how the concept of quality improvement is used in the literature. The definition for article inclusion into this review required that there was a routine reporting and feedback loop (which in itself was described in various ways), an element that was often missing on examination of articles. Based on the number of reviews that were rejected at the final stage that described themselves as quality improvement but did not have this element, it appears that ‘quality improvement’ is used to describe a multitude of interventions aimed primarily at providers or their work settings, with the intent of improving outcomes for patients. There is a clear taxonomy of effective practice and organization of care interventions within the Cochrane Collaboration (www.epoc.cochrane.org) that is helpful for classifying intervention approaches, but it does not distinguish between one-time interventions and programs that promote and enable culture change for continuous improvement. A clear definition for QI that could be used in evaluation efforts would be very helpful for comparing across QI strategies.

There were settings described as being primary care in the literature, which forced us to consider the types of settings we wished to include when searching and choosing articles, to try to ensure results were as applicable as possible. For example, our definition of primary care was a setting with continuity of care or opportunity for follow-up; however, we could not be certain that all of the studies within the included reviews met this criterion. We included the broader scope of primary care in the U.S. such as pediatrics and ‘ambulatory care’. There may be an opportunity to try to define what is meant by a “primary care site” in Ontario and what type of practice settings should be included in future primary care QI studies (i.e. outpatient clinics, ERs/walk-in clinics, descriptions of group practices and inter-professional teams etc). It may be worthwhile to do a systematic review of original articles on QI in the primary care setting, since so many of these reviews included substantial content from other settings. This would also provide more understanding of the key components of the many interventions described only briefly in the reviews. Despite the relative lack of primary care specific evidence, we should also investigate the findings from other settings and use relevant elements.

The main recommendation from this review is that a primary care quality improvement program should be multi-faceted in the sense that it addresses the system, providers, and patients, and changes culture in a way that enables continual reflection and assessment of outcomes.

Box 1. Taxonomy of quality improvement interventions in the systematic reviews

Continuous Quality Improvement. Interventions explicitly identified as using the techniques of continuous quality improvement, total quality management, or plan-do-study-act, or any iterative process for assessing quality problems, developing solutions to those problems, testing their impacts, and then reassessing the need for further action¹. pg 428

Learning Quality Improvement Collaboratives/Breakthrough Series. Multidisciplinary teams from various healthcare departments or organizations join forces for several months to work in a structured way to improve their provision of care....The term quality improvement collaboratives seems to be used for different multifaceted packages that focus on accelerating better outcomes². pg 1

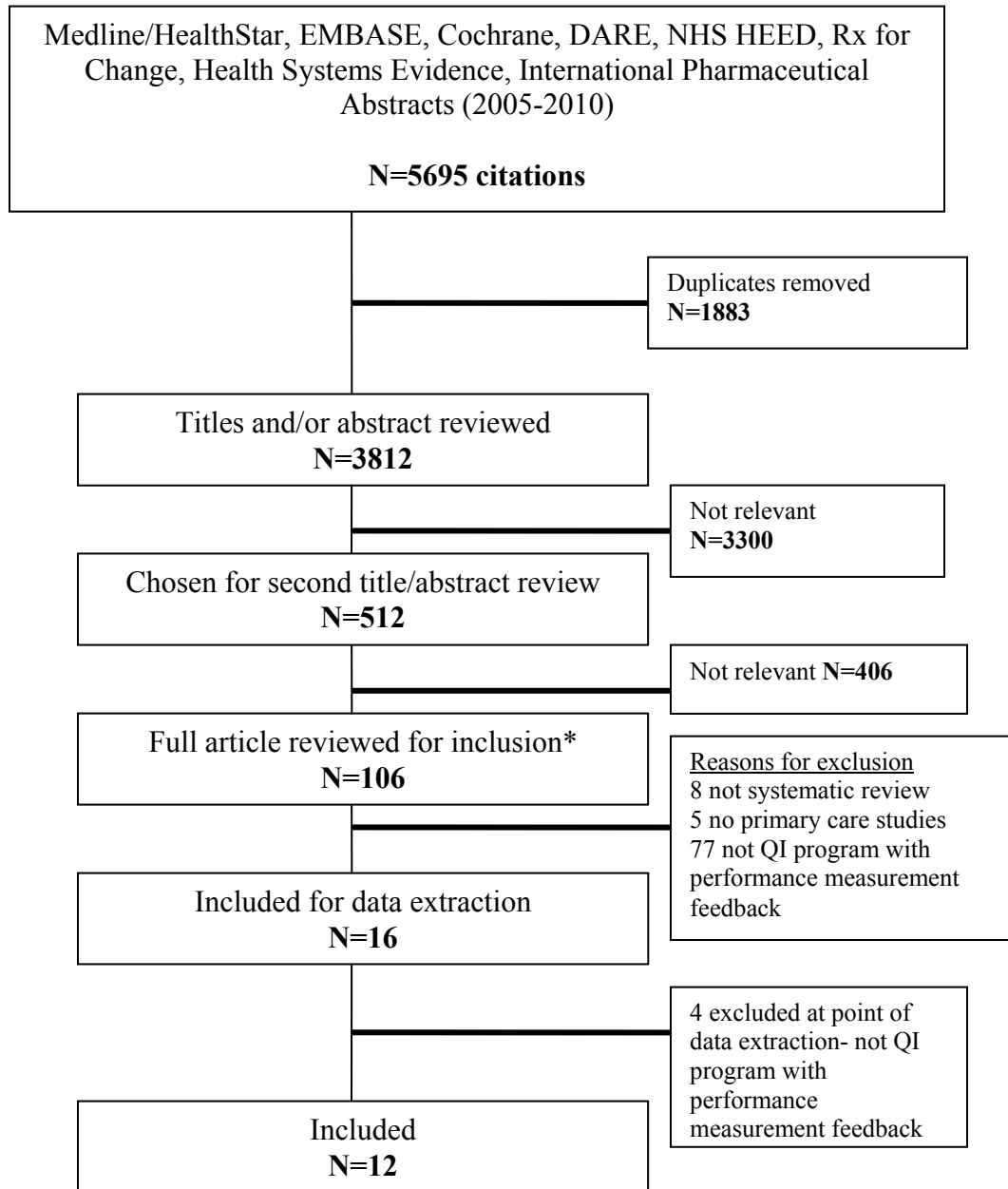
PDSA cycle, self-audit programs. Summary of information on performance in a practice or organization, which may be used iteratively in a plan-do-study-act cycle to monitor progress after an intervention or change

Chronic care model/Disease management. Multiple components including delivery system design changes, self-management support, decision support, clinical information systems community resources, and changes in health care organization³.

Total Quality Management (European Federation for Quality Management, Balridge Quality Award). Developed from private sector as operationalization of Total Quality Management philosophy and include elements of leadership, strategic planning, customer and market focus, measurement, analysis and knowledge management, human resource focus, process management and results⁵.

QI not otherwise described supplemented with ‘supplemented educational interventions’ or learning collaboratives. “Package of QI instruments such as patient educational materials or customized flow sheets” with teaching of QI concepts and methods along with audit and feedback⁶. pg 1026

Figure 1: Flow diagram of review study search and selection



* assessed by 2 reviewers-included if either reviewer included

Appendix A: Search Strategies

Medline

	Searches	Results
1	meta-analysis.pt.	23147
2	meta-anal:.tw.	26762
3	metaanal:.tw.	894
4	quantitative:.tw.	302855
5	review:.tw.	817930
6	4 and 5	12231
7	overview:.tw.	58103
8	4 and 7	1221
9	6 or 8	13000
10	systematic:.tw.	123703
11	5 and 10	32184
12	7 and 10	1807
13	11 or 12	32978
14	methodologic:.tw.	40125
15	5 and 14	13012
16	7 and 14	1008
17	15 or 16	13528
18	review.pt.	1496991
19	medline.tw.	30632
20	18 and 19	23482
21	1 or 2 or 3 or 9 or 13 or 17 or 20	92739
22	quality of health care.tw.	2982
23	"Quality of Health Care"/	44373
24	delivery of health care/st [*Standards]	5679
25	delivery of health care.tw.	1180

26	performance measurement.tw.	602
27	"Outcome and Process Assessment (Health Care)"/ or "Outcome Assessment (Health Care)"/	52377
28	outcome assessment.tw.	1423
29	(audit and feedback).mp. [mp=title, original title, abstract, name of substance word, subject heading word, unique identifier]	796
30	Quality Assurance, Health Care/	40145
31	quality assurance.tw.	14269
32	quality improvement.tw.	8921
33	Organizational Innovation/	17488
34	organizational innovation.tw.	33
35	outcomes framework.tw.	109
36	PDSA.tw.	70
37	PDSA.mp.	70
38	Plan, Do, Study, Act.tw.	82
39	Plan, Do, Study, Act.mp.	82
40	Accreditation/	9744
41	accreditation.tw.	7035
42	collaboratives.tw.	135
43	22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42	174348
44	21 and 43	4316
45	limit 44 to english language	3988
46	quality improvement research.tw.	39
47	Program Evaluation/	33999
48	program evaluation.tw.	1684
49	learning collaboratives.tw.	6
50	learning communities.tw.	45
51	43 or 46 or 47 or 48 or 49 or 50	203197

52 21 and 51	4852
53 limit 52 to english language	4498 *
*After limiting to ≥ 2005: 1672	

Embase

	Searches	Results
1	meta-anal:.tw.	25879
2	metaanal:.tw.	1335
3	quantitative:.tw.	251952
4	review:.tw.	726111
5	3 and 4	11032
6	overview:.tw.	52804
7	3 and 6	1125
8	5 or 7	11730
9	systematic:.tw.	109833
10	4 and 9	30550
11	6 and 9	1704
12	10 or 11	31289
13	methodologic:.tw.	31868
14	4 and 13	11360
15	6 and 13	952
16	14 or 15	11811
17	review.pt.	997285
18	medline.tw.	27342
19	17 and 18	16486
20	quality of health care.tw.	2082
21	health care quality/	60123
22	delivery of health care.tw.	637

23	health care delivery/	44392
24	performance measurement.tw.	413
25	outcome assessment.tw.	1332
26	(audit and feedback).mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer name]	705
27	quality assurance.tw.	11279
28	quality improvement.tw.	5927
29	organizational innovation.tw.	31
30	outcomes framework.tw.	123
31	PDSA.tw.	40
32	Plan, Do, Study, Act.tw.	42
33	accreditation/	8168
34	accreditation.tw.	4029
35	collaboratives.tw.	84
36	quality improvement research.tw.	37
37	Program Evaluation.tw.	1054
38	learning collaboratives.tw.	4
39	learning communities.tw.	24
40	1 or 2 or 8 or 12 or 16 or 19	79058
41	20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39	116541
42	40 and 41	2629
43	limit 42 to english language	2378*
*After limiting to \geq 2005: 1788		

Cochrane

Search	Hits
(Quality Improvement):ti,ab,kw or (Collaboratives) or (Audit and Feedback) or (Accreditation) and (Primary care) in Cochrane Reviews, Technology Assessments and Economic Evaluations	845*
*After limiting to ≥ 2005: 553	

NHS EED

Primary care AND Quality Improvement AND systematic review = 168 (limited to ≥ 2005)

DARE

Quality Improvement OR audit OR feedback OR collaboratives OR accreditation AND primary care = 2248*

***After limiting to ≥ 2005 : 1122**

IPA

	Searches	Results
1	meta-anal:.tw.	2021
2	metaanal:.tw.	83
3	quantitative:.tw.	7702
4	review:.tw.	46965
5	3 and 4	350
6	overview:.tw.	17514
7	3 and 6	51
8	5 or 7	386
9	systematic:.tw.	3638
10	4 and 9	1760
11	6 and 9	97
12	10 or 11	1807
13	methodologic:.tw.	859
14	4 and 13	338
15	6 and 13	32
16	14 or 15	355
17	review.pt.	22105
18	medline.tw.	2470
19	17 and 18	826

20	1 or 2 or 8 or 12 or 16 or 19	4409
21	quality of health care.tw.	170
22	delivery of health care.mp. [mp=title, subject heading word, registry word, abstract, trade name/generic name]	76
23	delivery of health care.tw.	76
24	performance measurement.tw.	48
25	outcome assessment.tw.	62
26	(audit and feedback).mp. [mp=title, subject heading word, registry word, abstract, trade name/generic name]	46
27	quality assurance.tw.	2268
28	quality improvement.tw.	1135
29	organizational innovation.tw.	1
30	outcomes framework.tw.	8
31	PDSA.tw.	17
32	Plan, Do, Study, Act.tw.	15
33	accreditation.tw.	1326
34	collaboratives.tw.	4
35	quality improvement research.tw.	2
36	program evaluation.tw.	88
37	21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36	4878
38	20 and 37	73
39	limit 38 to (english language and yr="2005 - 2010")	33

RxforChange & Health Systems Evidence = entire databases searched (limited to \geq 2005)

Appendix B: Inclusion/Exclusion Criteria

Code	Exclusion reason
<i>Overall design</i>	
1	Not a systematic review
<i>Setting</i>	
2	Does not include at least some studies conducted in office-based primary care (i.e. all studies in review are done in-patient hospital or LTC, home based primary care)
<i>Intervention-Quality improvement initiatives</i>	
3a	Not focused on interventions to improve quality i.e. -defines what is to be accomplished -defines improvement to be observed -defines changes that will be made to improve
3b	Does not involve use of performance measure feedback as part of intervention
<i>Intervention-Training of quality improvement methods</i>	
3c	Does not involve training of health professionals in quality improvement methods
<i>Outcomes</i>	
4	Does not evaluate care processes or outcomes, patient or provider experience, or health care costs to system or patient
<i>Language</i>	
5	Language not English
<i>NS= Not sure-need to see paper</i>	

Appendix C – Stage 1 Full Article Review Form

Reviewer: _____ Refworks ID [_____] or Other database citation:

Topic	
1) Evaluates a method/strategy to improve an aspect of quality of care OR evaluates training of health professionals in QI methods	[] Yes [] No [] Yes [] No (if both No, exclude)
2) Mechanism of method/strategy involves feedback of performance to clinician- could be: <ul style="list-style-type: none"> • Mentions strategies like PDSA cycles, learning collaborative, breakthrough series, ‘The Model for Improvement’, benchmarking, accreditation • Aggregate feedback on group of patients/practice as a whole • Individual feedback on patients? • Reminder of action to be taken for individual patient (i.e. prescribing alerts)? 	[] Yes [] No (If no but addresses one of below, separate pile for counting/alternate review) [] Yes [] No [] Yes [] No [] Yes [] No
3) Includes at least some primary care providers e.g.: Community Family Practice (OK if something done in community fed back to PCP) <ul style="list-style-type: none"> • Primary care practice • Walk-in clinic/after-hours clinic that offers follow-up • Hospital out-patient primary care clinic • Nursing outpost • Nurse-led primary care clinic 	[] Yes [] No (If none, exclude)
4) Design of review mentions ‘systematic review’ or ‘narrative review’ and uses standard SR methods* e.g. <ul style="list-style-type: none"> • describes databases searched, timeframe, search terms • describes process of selecting articles • describes process of data extraction and synthesis 	[] Yes [] No (if No, exclude)
INCLUDE-FINAL DECISION	[] Yes [] No –Main review [] Yes [] No – alternate review

* **May use words like:** quantitative, "methodological," and "systematic" to describe either "reviews" or "overviews. Also included are “meta-analysis”

Appendix D – Detailed Methods and Contents Data Abstraction Form

ID:

Reviewer:

Describe which sections of the review were extracted for the table below (e.g. if intervention is training trainees and practicing clinicians in QI methods, data extracted only for practicing clinician studies):

	Intervention 1	Intervention 2	Intervention 3
Type of QI strategy/intervention			
Number of primary care QI studies			
Years covered in QI primary care studies			
Number of practices, provider and patients			
Setting(s)	<input type="radio"/> Community Family Practice n= _____ <input type="radio"/> Walk-in clinic/after-hours clinic n= _____ that offers follow-up n= _____ <input type="radio"/> Hospital out-patient primary care clinic n= _____ <input type="radio"/> Nursing outpost n= _____	<input type="radio"/> Community Family Practice n= _____ <input type="radio"/> Walk-in clinic/after-hours clinic n= _____ that offers follow-up n= _____ <input type="radio"/> Hospital out-patient primary care clinic n= _____ <input type="radio"/> Nursing outpost n= _____	<input type="radio"/> Community Family Practice n= _____ <input type="radio"/> Walk-in clinic/after-hours clinic n= _____ that offers follow-up n= _____ <input type="radio"/> Hospital out-patient primary care clinic n= _____ <input type="radio"/> Nursing outpost n= _____

	<input type="radio"/> Nurse-led primary care clinic n= _____ <input type="radio"/> Other: n= _____	<input type="radio"/> Nurse-led primary care clinic n= _____ <input type="radio"/> Other: n= _____	<input type="radio"/> Nurse-led primary care clinic n= _____ <input type="radio"/> Other: n= _____
Type of practice setting	<input type="radio"/> Solo practitioners <input type="radio"/> Multidisciplinary teams	<input type="radio"/> Solo practitioners <input type="radio"/> Multidisciplinary teams	<input type="radio"/> Solo practitioners <input type="radio"/> Multidisciplinary teams
Duration of interventions	_____ months _____ years	_____ months _____ years	_____ months _____ years
Study design(s)			
Outcomes measured (processes, clinical outcomes, experiences/satisfaction, costs)			
Effect Sizes 0-33% studies show benefit 33-66% studies show benefit 67-100% studies show benefit			

Appendix E – Overall Trends and Interpretations Data Abstraction Form

Refworks ID: _____

Reviewer: _____

Purpose of review	
# Papers included	
Setting	<p># papers that cite primary care _____</p> <p>Other settings cited: specialist clinics, community, schools, pharmacies</p>
Type of program/intervention	<p>a) Programs</p> <p>_____ TQM</p> <p>_____ CQI</p> <p>_____ Awards/recognition</p> <p>_____ Chronic disease management</p> <p>_____ Collaboratives/Breakthrough series</p> <p>_____ Other (describe)</p> <p>b) Interventions</p> <p>_____ Financial</p> <p>_____ Computer/IT (prompts, reminders)</p> <p>_____ Educational</p> <p>_____ PDSA cycles/feedback cycles</p> <p>_____ Other (describe)</p>

Who targeted at	Physicians _____ Multidisciplinary teams _____ Organizations _____ Patients _____
Summary of results for each intervention identified above in primary care (what works where i.e. conclusions)	a) Overall summary of systematic review <ul style="list-style-type: none"> • Comments on effectiveness (e.g. weak, minimal, strong) b) Interventions in primary care (provide citation [number of author/year] of supporting paper) <ul style="list-style-type: none"> • Comments on effectiveness (e.g. weak, minimal, strong)
Research design of supporting evidence (e.g. RCT, before/after)	
Overall conclusions summary	

Appendix 1: List of primary care studies within the included systematic reviews

Included systematic review	# studies in primary care / total studies	Citations of primary care studies
Bravata DM, 2007 ⁸	3 / 171	Homer CJ, Forbes P, Horvitz L, et al. Impact of a quality improvement program on care and outcomes for children with asthma. <i>Arch Pediatr Adolesc Med</i> 2005 May;159(5):464-9.
		Mangione-Smith R, Schonlau M, Chan KS, et al. Measuring the effectiveness of a collaborative for quality improvement in pediatric asthma care: does implementing the chronic care model improve processes and outcomes of care? <i>Ambul Pediatr</i> 2005 Mar-Apr;5(2):75-82.
		Veninga CC, Denig P, Zwaagstra R, et al. Improving drug treatment in general practice. <i>J Clin Epidemiol</i> 2000 Jul;53(7):762.
Schouten LM, 2008 ²	6 / 9	Benedetti R, Flock B, Pedersen S, Ahern M. Improved clinical outcomes for fee-for-service physician practices participating in a diabetes care collaborative. <i>Jt Comm J Qual Saf</i> 2004;30(4):187-94.
		Homer CJ, Forbes P, Horvitz L, Peterson LE, Wypij D, Heinrich P. Impact of a quality improvement program on care and outcomes for children with asthma. <i>Arch Pediatr Adolesc Med</i> 2005;159(5):464-9.
		Mangione-Smith R, Schonlau M, Chan KS, Keeseey J, Rosen M, Louis TA et al. Measuring the effectiveness of a collaborative for quality improvement in pediatric asthma care: does implementing the chronic care model improve processes and outcomes of care? <i>Ambul Pediatr</i> 2005;5(2):75-82.
		Schonlau M, Mangione-Smith R, Chan KS, Keeseey J, Rosen M, Louis TA et al. Evaluation of a quality improvement collaborative in asthma care: does it improve processes and outcomes of care? <i>Ann Fam Med</i> 2005;3(3):200-8.
		Asch SM, Baker DW, Keeseey JW, Broder M, Schonlau M, Rosen M et al. Does the collaborative model improve care for chronic heart failure? <i>Med Care</i> 2005;43(7):667-75.
		Landon BE, Wilson IB, McInnes K, Landrum MB, Hirschhorn L, Marsden PV et al. Improving patient care. Effects of a quality improvement collaborative on the outcome of care of patients with HIV infection: the EQHIV study. <i>Ann Intern Med</i> 2004;140(11):887-96, 192.
		Kates N, 2007 ⁹
		Wells K, Sherbourne C, Schoenbaum M, et al. Impact of disseminating quality improvement programs for depression in managed primary care – a randomized, controlled trial. <i>JAMA</i> 2000;283(2):212-220.
		Alexopoulos GS, Katz IR, Bruce ML, et al. Remission in depressed geriatric primary care patients: a report from the PROSPECT study. <i>Am J Psychiatry</i> 2005;162(4):718-24.
		Neumeyer-Gromen A, Lampert T, Stark K, et al. Disease management programs for depression: a systematic review and meta-analysis of randomized controlled trials. <i>Med Care</i> 2004;42(12):1211-21.
Minkman M, 2007 ⁵	27 / 37	Sanchez E, Letona J, Gonzalez R et al. A descriptive study of the implementation of the EFQM excellence model and underlying tools in the Basque Health service. <i>Int J Qual Health Care</i> 2006;18:58–65.
		Arcelay A, Sanchez E, Hernandez L et al. Self-assessment of all the health centers of a public health service through the European Model of total quality management. <i>Int J Health Care Qual Assur Inc Leadersh Health Serv</i> 1999;12:54–58.
		Jackson S, Bircher R. Transforming a run down general practice into a leading edge primary care organization with the help of the EFQM excellence model. <i>Int J Health Care Qual Assur Inc Leadersh Health Serv</i> 2002;15:255–67.
		Gene-Badia J, Jodar-Sola G, Peguero-Rodriguez E et al. The EFQM excellence model is

Included systematic review	# studies in primary care / total studies	Citations of primary care studies
		useful for primary health care teams. <i>Fam Pract</i> 2001;18:407–9.
		Holland K, Fennell S. Clinical governance is “ACE”—using the EFQM excellence model to support baseline assessment. <i>Int J Health Care Qual Assur Inc Leadersh Health Serv</i> 2000;13:170–7.
		Freer J, Jackson S. Using the business excellence model to effectively manage change within clinical support services. <i>Health Manpow Manag</i> 1998;24:76–81.
		Wagner EH, Glasgow RE, Davis C et al. Quality improvement in chronic illness care: a collaborative approach. <i>Jt Comm J Qual Improv</i> 2001;27:63–80.
		Tsai AC, Morton SC, Mangione CM et al. A meta-analysis of interventions to improve care for chronic illnesses. <i>Am J Manag Care</i> 2005;11:478–88.
		Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness: the chronic care model, Part 2. <i>JAMA</i> 2002;288:1909–14.
		Piatt GA, Orchard TJ, Emerson S, Translating the Chronic Care Model into the community. Results from a randomized controlled trial of a multifaceted diabetes care intervention. <i>Diabetes Care</i> 2006;4:811–17.
		Bodenheimer T. Interventions to improve chronic illness care: evaluating their effectiveness. <i>Dis Manag</i> 2003;6:63–71.
		Benedetti R, Flock B, Pedersen S et al. Improved clinical outcomes for fee-for-service physician practices participating in a diabetes care collaborative. <i>Jt Comm J Qual Saf</i> 2004;30:187–94.
		Chumbler NR, Vogel WB, Garel M et al. Health services utilization of a care coordination/home-telehealth program for veterans with diabetes: a matched-cohort study. <i>J Ambul Care Manage</i> 2005;28:230–40.
		Mangione-Smith R, Schonlau M, Chan KS et al. Measuring the effectiveness of a collaborative for quality improvement in pediatric asthma care: does implementing the chronic care model improve processes and outcomes of care? <i>Ambul Pediatr</i> 2005;5:75–82.
		Schonlau M, Mangioni-Smith R, Chan KS et al. Evaluation of a quality improvement collaborative in asthma care: does it improve processes and outcomes of care? <i>Ann Fam Med</i> 2005;3:200–8.
		Feifer C, Ornstein SM, Nietert PJ et al. System supports for chronic illness care and their relationship to clinical outcomes. <i>Top Health Inf Manage</i> 2001;22:65–72.
		Bonomi AE, Wagner EH, Glasgow RE et al. Assessment of chronic illness care (ACIC): a practical tool to measure quality improvement. <i>Health Serv Res</i> 2002;37:791–820.
		Chin MH, Cook S, Drum ML et al. Improving diabetes care in Midwest community health centers with the health disparities collaborative. <i>Diabetes Care</i> 2004;27:2–8 (Erratum: Diabetes care 2004; 27:2099).
		Daniel DM, Norman J, Davis C et al. A state-level application of the chronic illness breakthrough series: results from two collaboratives on diabetes in Washington State. <i>Jt Comm J Qual Saf</i> 2004;30:69–79.
		Landis SE, Schwarz M, Curran DR. North Carolina Family Medicine Residency Programs’ Diabetes Learning Collaborative. <i>Fam Med</i> 2006;38:190–5.
		Sperl-Hillen J, O’Connor PJ, Carlson RR et al. Improving diabetes care in a large health care system: an enhanced primary care approach. <i>Jt Comm J Qual Improv</i> 2000;26:615–22.
		Sperl-Hillen JM, Solberg LI, Hroschikoski MC et al. Do all components of the chronic care model contribute equally to quality improvement? <i>Jt Comm J Qual Saf</i> 2004;30:303–9.
		Mohler PJ, Mohler NB. Improving chronic illness care: lessons learned in a private practice. <i>Fam Pract Manag</i> 2005;12:50–6.
		Siminerio LM, Piatt G, Zgibor JC. Implementing the chronic care model for improvements in diabetes care and education in a rural primary care practice. <i>Diabetes Educ</i> 2005;31:225–34.
		Stroebe RJ, Gloor B, Freytag S et al. Adapting the chronic care model to treat chronic

Included systematic review	# studies in primary care / total studies	Citations of primary care studies
		<p>illness at a free medical clinic. <i>J Health Care Poor Underserved</i> 2005;16:286–96.</p> <p>Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. <i>JAMA</i> 2002;288:1775–9.</p> <p>Wang A, Wolf M, Carlyle R et al. The North Carolina experience with the diabetes health disparities collaboratives. <i>Jt Comm J Qual Saf</i> 2004;30:396–404.</p> <p>Bodenheimer T. Interventions to improve chronic illness care: evaluating their effectiveness. <i>Dis Manag</i> 2003;6:63–71.</p>
Boonyasai, 2007 ⁶	13 / 39	<p>Margolis PA, Lannon CM, Stuart JM, Fried BJ, Keyes-Elstein L, Moore DEJ. Practice based education to improve delivery systems for prevention in primary care: randomised trial. <i>BMJ</i> 2004;328(7436):388.</p> <p>Rosenthal MS, Lannon CM, Stuart JM, Brown L, Miller WC, Margolis PA. A randomized trial of practice-based education to improve delivery systems for anticipatory guidance. <i>Arch Pediatr Adolesc Med</i> 2005;159(5):456-63.</p> <p>O'Connor PJ, Desai J, Solberg LI, et al. Randomized trial of quality improvement intervention to improve diabetes care in primary care settings. <i>Diabetes Care</i> 2005;28(8):1890-7.</p> <p>Solberg LI, Kottke TE, Brekke ML, et al. Failure of a continuous quality improvement intervention to increase the delivery of preventive services. <i>Eff Clin Pract</i> 2000;3(3):105-15.</p> <p>Landon BE, Wilson IB, McInnes K, et al. Effects of a quality improvement collaborative on the outcome of care of patients with HIV infection: the EQHIV study. <i>Ann Intern Med</i> 2004;140(11):887-96.</p> <p>McInnes DK, Landon BE, Wilson IB, et al. The impact of a quality improvement program on systems, processes, and structures in medical clinics. <i>Med Care</i> 2007;45(5):463-71.</p> <p>Landon BE, Hicks LS, O'Malley AJ, et al. Improving the management of chronic disease at community health centers. <i>NEJM</i> 2007;356(9):921-34.</p> <p>Mangione-Smith R, Schonlau M, Chan KS, et al. Measuring the effectiveness of a collaborative for quality improvement in pediatric asthma care. <i>AmbulPediatr</i> 2005;5(2):75-82.</p> <p>Boushon B, Provost L, Gagnon J, Carver P. Using a virtual breakthrough series collaborative to improve access in primary care. <i>Jt Comm J Qual Patient Saf</i> 2006;32(10):573-84.</p> <p>Chin MH, Cook S, Drum ML, et al. Improving diabetes care in midwest community health centers with the health disparities collaborative. <i>Diabetes Care</i> 2004;27(1):2-8.</p> <p>Wagner EH, Glasgow RE, Davis C, et al. Quality improvement in chronic illness care. <i>Jt Comm J Qual Improv</i> 2001;27(2):63-80.</p> <p>Weeks WB, Mills PD, Waldron J, Brown SH, Speroff T, Coulson LR. A model for improving the quality and timeliness of compensation and pension examinations in VA facilities. <i>J Health Care Manage</i> 2003;48(4):252-62.</p> <p>Young PC, Glade GB, Stoddard GJ, Norlin C. Evaluation of a learning collaborative to improve the delivery of preventive services by pediatric practices. <i>Pediatrics</i> 2006;117(5):1469-76.</p>
Ring N, 2007 ¹³	1 / 14	Homer C, Forbes P, Horvitz L, Peterson L, Wypij D, Heinrich P. Impact of a quality improvement programme on care and outcomes for children with asthma. <i>Arch Pediatr Adolesc Med</i> 2005;159:464-9.
Shojania KG, 2006 ¹	1 / 66	O'Connor PJ, Desai J, Solberg LI, et al. Randomized trial of quality-improvement intervention to improve diabetes care in primary care settings. <i>Diabetes Care</i> 2005;28:1890-1897.
Scott I, 2009 ¹⁰	5 / 65 55 (1 review paper)	Horbar JD, Carpenter JH, Buzas J, Soll RF, Suresh G, Bracken MB et al. Collaborative quality improvement to promote evidence based surfactant for preterm infants: a cluster randomised trial. <i>BMJ</i> 2004;329:1004–7.

Included systematic review	# studies in primary care / total studies	Citations of primary care studies
		<p>Holman WL, Allman RM, Sansom M, Kiefe CI, Peterson ED Anstrom KJ <i>et al.</i> Alabama CABG Study Group. Alabama coronary artery bypass grafting project: results of a statewide quality improvement initiative. <i>JAMA</i> 2001;285:3003–10.</p> <p>Landon BE, Wilson IB, McInnes K, Landrum MB, Hirschhorn L, Marsden PV <i>et al.</i> Effects of a quality improvement collaborative on the outcome of care of patients with HIV infection: the EQHIV study. <i>Ann Intern Med</i> 2004;140:887–96.</p> <p>Schouten LM, Hulscher ME, van Everdingen JJ, Huijsman R, Grol RP. Evidence for the impact of quality improvement collaboratives: systematic review. <i>BMJ</i> 2008;336:1491–4.</p> <p>ØVretveit J, Bate P, Cleary P, Cretin S, Gustafson D, McInnes K <i>et al.</i> Quality collaboratives: lessons from research. <i>Qual Saf Health Care</i> 2002;11:345–51.</p> <p>Shortell SM, Bennett CL, Byck GR. Assessing the impact of continuous quality improvement on clinical practice: what it will take to accelerate progress. <i>Milbank Q</i> 1998;76:593–624, 510.</p>
Tsai AC, 2005 ³	112 total-cannot determine # in PC	
Steuten LM, 2009 ¹¹	1 / 17	Steuten L, Vrijhoef B, Van Merode F, et al. Evaluation of regional disease management programme for patients with asthma or chronic obstructive pulmonary disease. <i>Int J Quality Health Care</i> 2006;18:429-36.
Windish DM, 2009 ⁷	2 / 18	<p>Landis S, Schwarz M, Curran D. North Carolina family medicine residency programs' diabetes learning collaborative. <i>Fam Med</i> 2006;38:190-5.</p> <p>Coleman M, Nasraty S, Ostapchuk M, Wheeler S, Looney S, Rhodes S. Introducing practice-based learning and improvement ACGME core competencies into a family medicine residency curriculum. <i>Jt Comm J Qual Saf</i> 2003;29:238-47.</p>
Weinmann S, 2007 ¹²	1 / 18	Brown JB, Shye D, McFarland BH, Nichols GA, Mullooly JP, Johnson RE. Controlled trials of CQI and academic detailing to implement a clinical practice guideline for depression. <i>Jt Comm J Qual Improv</i> 2000;26:39–54.

Appendix G: Summary of reviews of QI methods that do not meet criteria for full QI program

	Professional education	Organizational interventions / delivery system design	Financial interventions	CDM	Case management	Collaborative care or revision of professional role	Prompts/ Reminders, CDSS (IT)	Audit & feedback	Patient self-management / monitoring
Ouwens M, 2005 ¹⁶	Y			Y	Y	Y	Y	Y	Y
Akbari A, 2008 ¹⁷	Y	Y	Y					Y	
Van Voorhes BW, 2007 ¹⁸					Y	Y			
Wilson DL, 2007 ¹⁹	Y						Y	Y	
Smolders M, 2008 ¹⁴	Y							Y	
Smith SM, 2008 ²⁰	Y					Y	Y		Y
Steinman MA, 2006 ²¹	Y							Y	
Shaw B, 2005 ²²	Y						Y		
Randell R, 2007 ²³							Y		
Heneghan C, 2006 ²⁴								Y	Y
Durieux P, 2008 ²⁵							Y	Y	
Fahey T, 2006 ²⁶	Y	Y				Y	Y		Y
Garg AX, 2005 ²⁷							Y		
Ammenwerth E, 2008 ²⁸							Y		
Hakkeness S, 2008 ²⁹	Y		Y			Y	Y	Y	
Kastner M, 2008 ³⁰							Y		
Kawamoto K, 2005 ³¹							Y		
Sabatino SA, 2008 ³²			Y					Y	

	Professional education	Organizational interventions / delivery system design	Financial interventions	CDM	Case management	Collaborative care or revision of professional role	Prompts/ Reminders, CDSS (IT)	Audit & feedback	Patient self-management / monitoring
Saxena S, 2007 ³³				Y	Y	Y	Y		Y
Van Steenkiste B, 2008 ³⁴	Y	Y					Y		
Chaudhry B, 2006 ³⁵							Y		
Bayoumi, 2009 ³⁶							Y		
Schedlbauer, 2009 ³⁷							Y		
Jackson, 2006 ³⁸							Y		
Bryan C, 2008 ³⁹							Y		
Bywood PT, 2008 ⁴⁰							Y	Y	
Cheraghi-Sohi S, 2008 ⁴¹	Y							Y	
Yourman L, 2008 ⁴²							Y		
Ranji SR, 2008 ⁴³	Y						Y	Y	Y
Dorr D, 2007 ⁴⁴							Y		
Hayward GL, 2009 ⁴⁵							Y		
Adams SG, 2007 ⁴⁶		Y					Y		Y
Sintchenko V, 2007 ⁴⁷							Y		
Dennis SM, 2008 ⁴⁸		Y				Y	Y	Y	Y
Dexheimer JW, 2008 ⁴⁹							Y		
Christensen H, 2008 ⁵⁰	Y					Y	Y		
Verhoeven F, 2007 ⁵¹					Y				Y

	Professional education	Organizational interventions / delivery system design	Financial interventions	CDM	Case management	Collaborative care or revision of professional role	Prompts/ Reminders, CDSS (IT)	Audit & feedback	Patient self-management / monitoring
Baron RC, 2010 ⁵²							Y		
Ostini R, 2009 ⁵³	Y					Y	Y	Y	
Mollon B, 2009 ⁵⁴							Y		
Moeinedin F, 2009 ⁵⁵							Y		
Bravata DM, 2009 ⁵⁶	Y	Y							Y
Guldborg TL, 2009 ⁵⁷								Y	
Beach MC, 2006 ⁵⁸	Y					Y	Y		
Peek ME, 2007 ⁵⁹	Y				Y	Y	Y	Y	
Town R, 2005 ⁶⁰			Y					Y	
Pearson SA, 2009 ⁶¹							Y		
Shojania KG, 2009 ⁶²							Y		
Petersen LA, 2006 ⁶³			Y					Y	
Jamtvedt G, 2006 ⁶⁴								Y	
Rao JK, 2007 ⁶⁵	Y							Y	
Yen BM 2006 ⁶⁶	Y		Y				Y	Y	

Table 1: Description of included studies

Study	Purpose of review	# studies in primary care / total studies	Study	Countries of PC studies	Years covered by review	Type of practice	Design of PC studies	Duration of QI interventions in PC setting
Bravata DM, 2007 ⁸	Which QI strategies are effective for improving processes and outcomes of asthma care for specific patient populations (e.g., adults, children, low socio-economic status (SES), and racial groups, urban/rural)?	3 / 171	1	USA	2005	Team	RCT	Unknown
			2	Unknown	2005	Team	CBA	16 months
			3	The Netherlands	2000	Solo	CBA	Unknown
Schouten LM, 2008 ²	To evaluate the effectiveness of QI collaboratives in improving the quality of care	6 / 9	1-6	Unknown	2004-2005	Teams	1 RCT, 5 CBA	12 months (1 study 12-36 months)
Kates N, 2007 ⁹	Review RCT evaluating CDM models for depression in PC	4 / 17	1	Unknown	Unknown	Team	Not stated	Not stated
			2	USA	2000	Team	RCT	12 months
			3	Unknown	2005	Team	RCT	6 months
			4	Unknown	Unknown	Team	Review of RCTs	Not stated
Minkman M, 2007 ⁵	To review 3 Quality Management models and focus on the empirical evidence for improved performance by the interventions based on the these models	27 / 37	1-5		1999 - 2008	Unknown	4 non-controlled; 1 descriptive non-analytical	1-3 yrs; 1-8yrs; 3 unknown
			6		1998	Unknown	Non-controlled single case	Unknown
			7-27		2000-2006	Unknown	2 reviews; 1 RCT; 5 controlled trials; 7 non-controlled / multiple sites; 3 non-controlled / single site; 2 descriptive multiple projects; 1 descriptive single project	Unknown
Boonyasai, 2007 ⁶	Systematic review of the effectiveness of published QI curriculum to determine whether teaching methods influence effectiveness of curriculum	13 / 39	1-2	Unknown	2004, 2005	Team	Unknown	Unknown
			3-4	Unknown	2000, 2005	Team	Unknown	Unknown
			5-12	Unknown	2001-2007	Team	Unknown	Unknown
			13	Unknown	2006	Team	Unknown	Unknown
Ring N, 2007 ¹³	How best to encourage health professionals to promote, and patients with asthma to use asthma action plans	1 / 14	1		1	Not stated	RCT (grade 8 quality)	12 months
Shojania KG, 2006 ¹	To assess the impact on glycemic control of 11 distinct strategies for	1 / 66	1	USA	2005	Team	Clustered RCT	Unknown

Study	Purpose of review	# studies in primary care / total studies	Study	Countries of PC studies	Years covered by review	Type of practice	Design of PC studies	Duration of QI interventions in PC setting
	QI in adults with type 2 DM							
Scott I, 2009 ¹⁰	Review of published literature assessing the relative effectiveness of different QIS (Quality Improvement Strategies)	5 / 65	1-5	Unknown	2001-2008	Unknown	1 unknown; 1 uncontrolled; 4 controlled	Unknown
		55 (1 review paper)	6	Unknown	1998	Unknown	unknown	Unknown
Tsai AC, 2005 ³	To conduct systematic review and meta-analysis to answer: (1) To what extent do interventions that incorporate 1 or more elements of the CCM result in improved outcomes of interest for specific chronic illnesses? (2) Are some elements of the CCM more effective than others?	112 total- cannot determine # in PC	all	Unknown	1993-1998 (42 studies) 1999-2003 (70 studies)	Unknown	93 RCTs, others unknown	0-6 months (52 studies), 7-12 months (45 studies), >12 months (15 studies)
Steuten LM, 2009 ¹¹	Cost effectiveness of COPD programs - leading to how to identify cost effective programs	1 / 17	1	The Netherlands	2006	Unknown	CBA	12 months
Windish DM, 2009 ⁷	To determine whether QI curricula for physician trainees (residents) adhere to QI guidelines and meet standards for study quality in med education research	2 / 18	1-2	Unknown	2003, 2006	Teams	Unknown	6-12 months
Weinmann S, 2007 ¹²	To identify effects of psychiatric guidelines on provider performances and patient outcomes	1 / 18	1	USA	2000	Unknown (mix?)	Non-randomized controlled BA clinical trial	4 months

Table 2: Effectiveness of QI initiatives on outcomes

	Study	Initiatives in PC studies	Clinical care processes	Clinical care disease outcomes	Patient experience	Provider experience	Health care System costs	Overall summary of strength of effects	Conclusions
Bravata DM, 2007 ⁵⁶	1	QI theory based on 'Model for Improvement'	Yes	Yes			Yes	No effect on outcomes	Mixed results- improvement on several process outcomes and one patient outcome for asthma management after QI training interventions for clinicians in 2 of 3 studies. One study no effect
	2	Learning sessions for providers (similar to collaboratives)	Yes	Yes				Significant improvement in intervention group in some processes and 1 outcome	
	3	Self-learning audit program for providers	Yes					Improved process in intervention group	
Schouten LM, 2008 ²	1-6	Breakthrough Series (chronic care model)	Yes	Yes	Yes			75% showed benefit	"evidence of impact of quality improvement collaboratives is positive but limited" - most effective when breakthrough is combined with CCM 53/60 uncontrolled studies showed improvement in pt care + organizational performance resulting from participation in collab but all were weak in design + biased in favour of +ve findings "No way to understand the different components of an intervention or asses interactions between longitudinal activities or elements of the CCM" The effectiveness of collabortives in the primary care settings is limited and the reasons for any improvement cannot be isolated due to the complexity of the teams/environments + variety of interventions
Kates N, 2006 ⁹	1	Breakthrough series / Collaboratives	Yes	Yes				>50% Improved symptoms and medication adherence; >85% completion of	Very relevant to PC mental health care shows good evidence for use of

	Study	Initiatives in PC studies	Clinical care processes	Clinical care disease outcomes	Patient experience	Provider experience	Health care System costs	Overall summary of strength of effects	Conclusions
								structured assessments before treatment and follow-up assessments	-mental health care coordinators /case mangers -shared care with psych in PC setting -f/u + IT -self care model
	2	QI program for depression	Yes	Yes				No p values; Improvement in 1 process; Some improved outcomes better in control group	
	3	Re-engineering systems for primary care treatment of depression	Yes	Yes				Improved process and clinical outcomes over 10% more than control group (no p value)	
	4	Disease management programs with feedback loop	Yes	Yes	Yes			Significant enhancement in quality of care, adherence to meds; Significant effect on depression severity; Significant effect on pt satisfaction	
Minkman M, 2007 ⁵	1-5	Total quality management model (European Federation for Quality Management)	Yes		Yes	Yes		Scores improved on performance; Improvement on clinical outcomes, organizational efficiency, staff satisfaction; No data or p values given	Interventions based on CCM may improve process + outcome measures Supports CDM both models have possibilities for further development of practical + Evidence Based Tools for Improving integrated care
	6	Total quality management model – Balridge Quality Award	Yes					Upward trend in self assessment scores; No p value	
	7-27	Chronic care model (self-management support; delivery system design; decision support; clinical information systems)	Yes	Yes		Yes	Yes	67-100% of studies showed benefits	

	Study	Initiatives in PC studies	Clinical care processes	Clinical care disease outcomes	Patient experience	Provider experience	Health care System costs	Overall summary of strength of effects	Conclusions
Ring N, 2007 ¹³	1	Multifaceted QI intervention – supplemented educational interventions	Yes					No effect – not significant	Homer 2005 (grade B) showed no support for collaborative learning group
Shojania KG, 2006 ¹	1	Multifaceted QI intervention – IDEAL + IMPROVE Collaboratives		Yes				Can't separate the 1 PC CQI from the 2 hospital CQI (pooled effect size was not significant)	2 QI strategies were associated with statistical significant decrease in HgA1C values (1) team changes (26 trials), 16/26 = multidisciplinary teams 1) 1 professional added (e.g. diabetes nurse, pharmacist) 2) 2 or more professionals added 3) expanded and autonomous role for new professional 4) shared care fam doc and specialist (2) case management (26 trials) - CM=nurse or pharm - best with Cm that included independent medication changes Support for multidisciplinary team based case in DM
Scott I, 2009 ¹⁰	1-5	Multifaceted QI intervention – Breakthrough Series Collaborative	Yes	Yes			Yes	Reduction of wait times by 50%; 25% decrease in ICU costs; 50% decrease of hospitalizations for CHF patients; Mix of clinical care improvement	Overall review of all types of quality improvement activities in variety of setting showing evidence based effectiveness is limited resources best targeted at clinician/pt levels (not organizational) <u>most effective</u> at pt care level:
	6	Multi-faceted QI intervention – other collaboratives	?	?				Mix of effect results (none to positive); Predictive factors of	-clinical practice guidelines -small group, case based interactive CME

	Study	Initiatives in PC studies	Clinical care processes	Clinical care disease outcomes	Patient experience	Provider experience	Health care System costs	Overall summary of strength of effects	Conclusions
								<p>success = MD involvement, individual practitioner feedback & organizational cultures that supported quality reform</p>	<p>-pt use of reminders -CDM superior to usual care in some diseases <u>modest improvement</u> in primary care -pay-for-performances -specialty outreach programs -collaboratives <u>Least effective</u> -external accreditation -public scorecard -risk management</p>
Tsai AC, 2005 ³	all	QI learning collaborative for patient action plans for asthma	Yes	Yes			Yes	<p>Overall significant improvement in clinical outcomes, quality of life, and process of care</p> <p>Delivery system design- significantly improves clinical outcome and process of care; not quality of life Self-management support- significantly improves clinical outcomes and process of care- not quality of life Decision support- significantly improves process of care; not quality of life or clinical outcomes Clinical information systems- no improvement on any outcomes Community resources- no improved clinical</p>	<p>Interventions that contain at least 1 CCM element improve clinical outcomes and processes of care— and to a lesser extent, quality of life—for patients with chronic illnesses.</p>

	Study	Initiatives in PC studies	Clinical care processes	Clinical care disease outcomes	Patient experience	Provider experience	Health care System costs	Overall summary of strength of effects	Conclusions
								outcomes (process of care and quality of life not measured) Health care organization- no improvement any outcome	
Steuten LM, 2009 ¹¹	1	CQI	Yes	Yes	Yes		Yes	Increase in knowledge, QoL, med compliance, self-management, and access of care; Decrease in health care utilization (but costs for drugs increased); No p values	* >3 chronic care components (DMP CCM) are likely more cost effective most cost effective is to avoid 1st hospital admission - COPD only ?Programs based on multidisciplinary guidelines will deliver more value for \$ than current COPD care programs
Boonyasai RT, 2007 ⁶	1-2	Multi-site quality improvement collaborations (breakthrough)	Yes	Yes				Process outcomes: 9/27 beneficial; 15/27 mixed benefit; 3/27 no benefit Patient outcomes: 5/18 beneficial; 4/18 mixed; 9/18 no benefit	Useful to support teaching QI to clinicians: -residency programs -practice settings
	3-4	CQI programmes	Yes	Yes				Process: increase in both grps, p=NS; Outcome: increase in both grps, p=NS; Preventive care: vaccine - greater increase in Int grp (p=0.003), smoking cessation – greater incr Int grp (p=0.006), other outcome #'s not available	
	5-12	CCM defined as any of: system change, self-management support, decision	Yes	Yes				Process: 2/8 beneficial, 4/8 mixed, 2/8 no benefit; Outcomes:	

	Study	Initiatives in PC studies	Clinical care processes	Clinical care disease outcomes	Patient experience	Provider experience	Health care System costs	Overall summary of strength of effects	Conclusions
		support, clinical information systems (including potentially of performance data), community resources, health care organization						1/6 change, 4/6 mixed, 1/6 no change	
	13	Disease management program with feedback loop	Yes					Mixed benefit for processes	
Windish DM, 2009 ⁷	2	Single PDSA cycle (both studies)	Yes			Yes		Both studies showed benefit	Support for QI curriculum in residency training OI learning in multidisciplinary teams
Weinmann S, 2007 ¹²	1	CQI (included guideline & patient guide dissemination, roll-out meetings, system support, consultation hotline, sponsor grp mechanism)	Yes	Yes	Yes	Yes		No difference in depression scores; No exposure-related change in clinician attitude, knowledge or practice (self-reported); Moderate increase in days of antidepressant use per episode	Psychiatry guidelines only - insufficient evidence to draw conclusions no connection to pt + phys factors influencing guideline implementation included nicotine dependence as psychiatric disorder not useful outside of psychiatry guideline implementation - very little relevance to CDM or CQI

Table 3: Summary of benefits of different QI interventions

Strategy	Study Designs Used	Outcomes improved	Outcomes not improved	Sources
Learning collaboratives/breakthrough series	CBA, RCT, “controlled studies” and not stated	Process, clinical outcome (majority) Unstated outcomes (mixed)	Process (minority) Unstated outcomes (mixed)	Bravata #2, Schouten #1-6. Kates #1, Ring #1, Scott #1-5
PDSA cycles, self-audit programs	CBA and not stated	Process, provider experience (majority)		Bravata #3, Windish #2
CCM/disease management	Review of RCTs, RCT, CBA, systematic reviews, descriptive-described as (3 studies: 1 – “Description of characteristics, implemented interventions and main results”; 2 – “Description of characteristics, implemented interventions and some results. Interviews with team leaders”; 3 – “Report of evidence found on model and models components”), or not stated	Process, clinical outcome, patient experience, provider experience, health care utilization (majority)	Costs (minority-med costs increased)	Kates #4, Tsai all, Steuten #1, Minkman #7-27
CCM elements combined with QI (e.g. tests of small changes with feedback)	RCT	Clinical outcomes, patient experience (1 study)	Processes, clinical outcomes, health care utilization (1 study)	Bravata#1, Kates #3
Total Quality Management (European Federation for Quality Management, Baldrige Quality Award)	Non-controlled, descriptive (single cases) described as “key performance indicators”; “Baldrige self-assessment scores on 28 items, 4-year measurements” (x2); “Measurement of multiple indicators on EFQM performance criteria. Survey on worker satisfaction”; “Measurement of EFQM self-assessment scores. No statistical testing” (x3)	Processes, clinical outcomes, patient experience, provider experience (majority-but mostly based on self-assessment)		Minkman #1-6
Continuous Quality Improvement	Cluster RCT, review of RCTs and “single site studies”, not stated	Clinical outcomes (minority) Unstated outcomes (majority in “single site studies”)	Clinical outcomes, provider knowledge or self-reported practice (majority); Unstated outcomes (majority in RCTs)	Shojania #1, Weinmann #1 Scott #6
Multi-faceted QI with learning collaboratives or breakthrough series	Controlled trial, “uncontrolled studies”, or not stated	Processes, clinical outcomes, health care utilization (majority)	Some no effect-cannot determine which outcomes	Scott #1-6, Boonyasai #3-12
Multi-faceted QI with supplemented educational interventions	Cluster RCT, Not stated	Processes, clinical outcomes (majority)	1 clinical outcome improved in control group	Boonyasai #1-2, Kates #2

“ ” indicates the wording of how study design was reported in the article

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