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Evidence for the impact of quality improvement collaboratives: systematic review

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ABSTRACT

Objective To evaluate the effectiveness of quality improvement collaboratives in improving the quality of care.

Data sources Relevant studies through Medline, Embase, PsychINFO, CINAHL, and Cochrane databases.

Study selection Two reviewers independently extracted data on topics, participants, setting, study design, and outcomes.

Data synthesis Of 1104 articles identified, 72 were included in the study. Twelve reports representing nine studies (including two randomised controlled trials) used a controlled design to measure the effects of the quality improvement collaborative intervention on care processes or outcomes of care. Systematic review of these nine studies showed moderate positive results. Seven

studies (including one randomised controlled trial) reported an effect on some of the selected outcome measures. Two studies (including one randomised controlled trial) did not show any significant effect. **Conclusions** The evidence underlying quality improvement collaboratives is positive but limited and the effects cannot be predicted with great certainty. Considering that quality improvement collaboratives seem to play a key part in current strategies focused on accelerating improvement, but may have only modest effects on outcomes at best, further knowledge of the basic components effectiveness, cost effectiveness, and success factors is crucial to determine the value of quality improvement collaboratives.

INTRODUCTION

Healthcare organisations in many countries are setting up quality improvement collaboratives, in which teams from various healthcare departments or organisations join forces for several months to work in a structured way to improve their provision of care.

The earliest documented activities of such collaboratives include the Vermont Oxford Network, established in 1988, and the Breakthrough Series developed by the Institute of Healthcare Improvement in 1995. Present quality improvement collaboratives are mainly based on the Breakthrough Series.

Little is known about the effectiveness of collaboratives or specific components that enhance their effectiveness. We assessed the effectiveness of the quality improvement collaborative by systematically reviewing empirical studies.

METHODS

We searched several databases for the period January 1995 to June 2006 (see bmj.com for search terms). We also reviewed the reference lists of included papers.

We included studies in English, those with data on the effectiveness of processes of care or outcomes of care, those in a healthcare setting, and those that met the criteria for a quality improvement collaborative (see bmj.com).¹⁻⁵ To include studies we used the following definition and criteria. A quality improvement collaborative is an organised, multifaceted approach to quality improvement with five essential features: a subject exists with large variations in care or gaps between best and current practice; clinical experts and experts in quality improvement provide ideas and support for improvement; a critical mass of multi-professional teams from multiple sites are willing to improve and share care; a model for improvement focuses on setting clear and measurable targets, collecting data, and testing changes on a small scale to advance reinvention and learning by doing; and the collaborative process involves a series of structured activities in a given time frame to advance improvement, exchange ideas, and share experiences of the participating teams.

We assessed the methodological quality of the studies by evaluating the design, method of randomisation, characteristics of control sites, protection against bias, reliable outcome measures, and how sites and patients lost to follow-up had been handled in the analysis (see checklist at www.epoc.cochrane.org). We used a standardised extraction checklist to obtain data on topics, study design, setting, numbers of participants, characteristics of the collaborative strategy, and relevant results. Two researchers (LMTS and MEJLH) independently completed this checklist for each study. We categorised the studies in groups on the basis of their designs and characteristics of their collaborative strategy.

RESULTS

Overall, 1104 abstracts of studies published from January 1995 to June 2006 were identified. A total of

175 articles were reviewed and an additional 107 articles excluded. A review of the references of the remaining 68 studies led to the inclusion of four further studies, totalling 72 papers for inclusion in the study.

Sixty^{w1-w60} of the 72 papers (83%) used an uncontrolled study design: 50 (83%) were based on the Breakthrough Series. Of the 60 reports of uncontrolled studies 37 (62%) were based on self report measures of the teams or sites and 14 (23%) were case reports describing changes in a facility or team (details of the uncontrolled studies are available on request). The study designs of the uncontrolled reports relied mostly on post measurement, used before and after studies without being able to account for secular trends, made use of self report measures rather than reviews of medical records, included only anecdotal information, or selected samples from self selected sites. Conclusions on effectiveness could not be drawn from these reports owing to the lack of adequate reporting procedures on data collection, analysis, and objective evaluations.

Eleven reports (eight studies)^{w61-w71} used a “comparison group” design. One study^{w72} used an interrupted time series design (see bmj.com). The characteristics of the collaborative strategy used in these nine studies varied. Seven^{w61-w68 w72} were based on the Breakthrough Series; four combined the Breakthrough Series with elements of the chronic care model.^{w62 w64-w68} Two studies^{w69-w71} were based on the Vermont Oxford Network. Most studies had important flaws, such as possible differences in baseline measurement, limited data on characteristics of control sites, no specification of blinded assessment, and possible contamination (see bmj.com).

Randomised controlled trials

Two of the nine studies were randomised controlled trials, one of which was a trial of a quality improvement collaborative for children with asthma and based on the Breakthrough Series and chronic care model.^{w64} This trial did not show effects on any of the key processes or intermediate outcomes of care for the children. The other randomised controlled trial was a large trial of a quality improvement collaborative for neonatal intensive care and based on the Vermont Oxford Network.^{w71} This trial showed significant improvement in two specific processes of care but no significant improvement in patient outcomes (mortality and pneumothorax). Infants in the intervention hospitals (n=57) were more likely to receive a surfactant in the delivery room (54.7% v 18.2%) and were less likely to receive the first dose more than two hours after birth (9.4% v 24.9%) than infants in the control hospitals (see bmj.com).

Controlled before and after studies and interrupted time series studies

Five of the six controlled before and after studies based on the Breakthrough Series^{w61 w62 w65-w68 w72} showed significant improvements in the outcomes of care. Pierce-Bulger et al^{w72} showed a significant improvement in the

WHAT IS ALREADY KNOWN ON THIS TOPIC

The multi-institutional, quality improvement collaborative is widely accepted as a strategy in health care

Its widespread acceptance and use are not, however, based on a systematic assessment of effectiveness

WHAT THIS STUDY ADDS

Quality improvement collaboratives are complex and are applied in many different ways

The evidence underlying the strategy is positive but limited and the effects cannot be predicted with certainty

number of days between neonatal deaths during a seven year quality programme including a Breakthrough Series project in 1993. In Baier et al's study,^{w61} the prevalence of residents with pain in 21 nursing homes diminished significantly (7.2% *v* 11.2% of patients) after participation in a Breakthrough Series. Landon et al's study^{w63} of 9986 patients with HIV infection did not show any significant effect on virological outcomes or process measures.

All three controlled before and after studies combining the Breakthrough Series with the chronic care model^{w62 w65-w68} showed significant improvement of some of the selected process and outcome measures of care. Benedetti et al^{w62} compared participating providers with non-participating providers and reported significant improvements in, for example, rates of annual diabetes examinations for eyes and feet, and better outcomes for haemoglobin A_{1c} and blood pressure. Mangione-Smith et al^{w65} and Schonlau et al^{w66} showed significant improvements for specific items of patient self management and education in asthma. Mangione-Smith et al^{w65} also reported higher scores on quality of life measures for the intervention group in a survey carried out after measurement. The levels of asthma severity between the intervention group and control group, however, differed. In the same study Schonlau et al^{w66} showed significant improvement in satisfaction with communication. Asch et al^{w67} reported significant improvement in specific items on counselling and education in patients with chronic heart failure. The process measures with greater improvement were those with initially low performance rates, and the rates remained below 50% for most educational processes. Significant improvement in two of four measures for the appropriate use of drugs was less dramatic (angiotensin converting enzyme inhibitors, 93% *v* 87%; lipid lowering therapy, 66% *v* 64%).

The controlled before and after study based on the Vermont Oxford Network^{w69 w70} reported a significant decrease in the rate of infection at six intervention neonatal intensive care units (12.3% *v* 16.5%) and a decrease in the rate of supplemental oxygen at four neonatal intensive care units (34% *v* 38.7%). Although the effect among the units on both arms was heterogeneous, the intervention units improved at a significantly faster rate in a four year period than did the 66

comparison units. See bmj.com for a summary of effectiveness found in the nine controlled studies.

DISCUSSION

Worldwide, organisations are adopting the approach of the quality improvement collaborative in different settings. The evidence underlying the strategy is positive but limited and the effects cannot be predicted with certainty.

Twelve reports representing nine studies (two recent randomised controlled trials) used a controlled design to measure the effects of the quality improvement collaborative intervention on care processes or outcomes of care. The studies were based on different strategies. Seven studies evaluated the Breakthrough Series (four combined the Breakthrough Series with the chronic care model) and two studies were based on the Vermont Oxford Network. A systematic review of the studies produced moderate positive results. Seven studies (one randomised controlled trial) showed at least a positive effect of a specific selection of processes of care. Two studies (one randomised controlled trial) did not show any significant effect.

As a result of flaws in the methodological quality of the studies and the heterogeneity of the intervention itself, there is no certainty that the quality improvement collaborative was responsible for an effect. Six studies reported possible differences in baseline measurement. One of the controlled studies was a Breakthrough Series embedded in a seven year quality improvement programme. Four of the studies contained elements of the chronic care model in the intervention. Two of the controlled studies were based on the Vermont Oxford Network. This type of quality improvement collaborative differs from the Breakthrough Series in that it is long term: efforts are led and supported by ongoing data collection of member organisations and an ongoing infrastructure of communication and meetings that goes beyond a limited time frame of a quality improvement collaborative initiative. We were unable to disentangle the components of an intervention or to assess interactions between longitudinal activities for quality improvement or elements of the chronic care model and collaborative components.

Fifty three (88%) of the 60 uncontrolled reports highlighted specific improvements in care and organisational performance that resulted from participating in a collaborative. Several reports showed dramatic improvements of 30% to 80%. Almost all of the uncontrolled reports, however, had limitations, were methodologically weak, and were probably biased in favour of positive findings in successful teams.

The apparent inconsistency between the widespread belief in and use of quality improvement collaboratives and the available evidence heightens the importance of a deeper understanding of the relative strength of this intervention. The collaboratives are complex and applied in many different ways. Considering that such collaboratives seem to play a key part in current strategies focused on accelerating improvement, represent substantial

investments of time and funding, but may have only modest effects on outcomes at best, then further knowledge of the effectiveness of the basic components, cost effectiveness, variability within collaboratives, and success factors is crucial for determining their value. It is possible that a quality improvement collaborative works for some organisations but not for others because of inherent differences in the history and culture of organisations. The data collected in the included studies did not provide the information needed to understand and explain the findings. To understand how and why quality improvement collaboratives work it is necessary to look into the “black box” of the intervention and to study the determinants of success or failure. A detailed formative evaluation of the projects might provide additional insight into these problems.

This study has several limitations. Firstly, as in any systematic review we may have missed studies. We searched multiple databases, however, and checked our search using free text words (see bmj.com). Secondly, our search was limited to quality improvement collaboratives involving five features and to English language journals. This might have introduced bias if the effectiveness described in these studies differed systematically from those involving other features and appearing in other languages. Thirdly, the key components of some quality improvement collaboratives could have been

misclassified, although our abstraction process showed good inter-rater reliability.

Despite these limitations, this review shows that the evidence underlying quality improvement collaboratives is positive but still limited and that the effects cannot be predicted with certainty.

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A patient who changed my practice One's own medicine

The operation itself was uneventful. I went to theatre at 10 am and was home at 5 pm, having had a tonsillectomy. The day unit sister promised to telephone me on the following two mornings. When she did I proudly told her that I was fine.

As an ENT registrar, I would blithely tell tonsillectomy patients on the postoperative ward round that they should “eat and drink normally.” Gone are the days of taking only jelly and ice cream.

Early on the third postoperative day, I decided to follow my own advice. On went the toaster, and presently I took a bite out of a crisp slice of toast. Within seconds, the unmistakable taste of fresh blood filled my mouth. Peering into my throat in the bathroom mirror, I saw an active tonsil bleed. One hour later, and I was still bleeding. I considered what to do. My local hospital was also the unit where I worked. Suddenly, the calm and relative detachment of the day surgery unit was a distant memory—I was in danger of becoming a real patient on a real ward with real doctors and nurses, all of whom were my colleagues. I was scared.

I packed a bag with clean clothes from the wardrobe and folded them neatly. I selected some books, my laptop, and a DVD. I checked my email and looked at the on-call rota to see under whose care I would be admitted. In fact, I did everything possible to put off the inevitable. Finally, I telephoned two friends, one an ENT consultant and the other a GP. I left messages. They arrived some five

hours later (during which time I had managed to convince myself there was no need for my immediate admission) clutching silver nitrate cautery sticks and wooden tongue depressors. The surgeon and the GP both peered into my mouth. “You have a clot,” I was told.

The next day the pain started. Diclofenac and co-codamol were struggling to cope. I had been given a topical anaesthetic mouthwash in my bag of discharge drugs. I had ignored this as a homoeopathic remedy that would play no part on my analgesic ladder. It became my salvation.

So how has my practice changed? My guidance to patients now runs along the line of, “You will feel like you have two massive mouth ulcers. Eat and drink what you like, but avoid anything which could irritate a mouth ulcer.” Anything with citric acid, including most carbonated drinks, fresh fruit juices, and jams and preserves. I now look very sympathetically on those admitted with post-tonsillectomy pain, and perhaps tread a little lighter on the bipolar diathermy pedal. I strongly recommend two weeks off work.

I haven't had any more tonsillitis. I think I might just leave my deviated nasal septum where it is though.

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