

Explaining variation in perceived team effectiveness: results from eleven quality improvement collaboratives

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Aims and objectives. Explore effectiveness of 11 collaboratives focusing on 11 different topics, as perceived by local improvement teams and to explore associations with collaborative-, organisational- and team-level factors.

Background. Evidence underlying the effectiveness of quality improvement collaboratives is inconclusive and few studies investigated determinants of implementation success. Moreover, most evaluation studies on quality improvement collaboratives are based on one specific topic or quality problem, making it hard to compare across collaboratives addressing different topics.

Design. A multiple-case cross-sectional study.

Methods. Quality improvement teams in 11 *quality improvement collaboratives* focusing on 11 different topics. Team members received a postal questionnaire at the end of each collaborative. Of the 283 improvement teams, 151 project leaders and 362 team members returned the questionnaire.

Results. Analysis of variance revealed that teams varied widely on perceived effectiveness. Especially, members in the Prevention of Malnutrition and Prevention of Medication Errors collaboratives perceived a higher effectiveness than other groups. Multilevel regression analyses showed that educational level of professionals, innovation attributes, organisational support, innovative culture and commitment to change were all significant predictors of perceived effectiveness. In total, 27.9% of the individual-level variance, 57.6% of the team-level variance and 80% of the collaborative-level variance could be explained.

Conclusion. The innovation's attributes, organisational support, an innovative team culture and professionals' commitment to change are instrumental to perceived effectiveness. The results support the notion that a layered approach is necessary to achieve improvements in quality of care and provides further insight in the determinants of success of quality improvement collaboratives.

Relevance to clinical practice. Understanding which factors enhance the impact of quality improvement initiatives can help professionals to achieve breakthrough improvement in care delivery to patients on a wide variety of quality problems.

Key words: effectiveness, innovative culture, long-term care, nurses, nursing, patient safety, quality improvement collaborative

Accepted for publication: 1 November 2011

Introduction

Quality improvement collaboratives (QICs) are increasingly being used to improve quality of care. The Breakthrough method developed by the Institute for Healthcare Improvement (2003) has been one of the major instruments put to use in such collaboratives. In Breakthrough QICs, teams from

different organisations join forces to improve care on a certain topic within a set time-frame, steered and supported by a faculty team. These teams will develop and implement improvement actions geared to their own organisations and client groups. Best practices or evidence-based interventions are the usual starting points and teams will learn about these at national conferences organised to this purpose. QICs are

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expected to enhance quality and efficiency of care by acting as a 'learning laboratory' stimulating and implementing innovations.

The evidence underlying the effectiveness of QICs is inconclusive (Leatherman 2002, Ovretveit 2002, Cretin *et al.* 2004, Schouten *et al.* 2008) and few studies investigated determinants of success (Mills & Weeks 2004, Neily *et al.* 2005, Dücker *et al.* 2009). Moreover, most evaluation studies on QICs are based on one specific topic, making it hard to compare across collaboratives addressing different topics. The objective of our study is to explore effectiveness of 11 collaboratives focusing on 11 different topics, as perceived by local improvement teams and to explore associations with collaborative-, organisational- and team-level factors. The results contribute to a better insight into the mechanisms underlying QICs and factors that enhance success.

To understand the operating mechanism of QICs, the 'chain of action' framework developed by Cretin *et al.* (2004) is used, which suggests a layered approach is needed to improve quality. The proposed chain of action begins with participating teams and their environment, the latter comprising the organisational context and the broader context of the collaborative itself. To explain perceived effectiveness, we examine collaborative-level factors, the organisational context of the team and team-level factors.

At the collaborative level, several conditions should be in place for teams to be effective. First, we hypothesise that if new working methods are perceived by professionals as relatively beneficial, compatible with norms and values, easy to learn and implement, allow for experimentation and have observable results, the implementation process is expected to be more successful (Rogers 1995). Second, it is expected that stimulating participants' improvement efforts requires (1) a challenging and achievable collaborative target, (2) appropriate measures and usable monitoring tools that help teams make stepwise changes guided by measured results and keep them focused on the collaborative target (Øvretveit 2002, Øvretveit & Gustafson 2002, Øvretveit *et al.* 2002, Dücker *et al.* 2009) and (3) program management support (Benn *et al.* 2009, Dücker *et al.* 2009, Nembhard 2009).

According to the 'chain of action' framework, commitment to quality improvement, organisational support and organisational culture are considered important organisational-level conditions (Cretin *et al.* 2004, Lin *et al.* 2005). The more organisations involve their teams with quality improvement activities, the more the professionals will be committed to implementing changes and the more positive their perceptions of effectiveness will be. Also, organisational support in terms of leadership and active involvement of top manage-

ment motivates professionals to achieve improvement (Gustafson *et al.* 2003, Mills & Weeks 2004, Dücker *et al.* 2009, Kaplan *et al.* 2010). Culture conveys the norms, values, beliefs and behaviours of an organisation, reflecting 'how we do things around here'. The competing values framework distinguishes four types of culture: group (teamwork and participation), developmental (risk-taking, innovation and change), hierarchical (rules, regulations and bureaucracy) and rational (efficiency, goal attainment and achievement) (Zammuto *et al.* 2000, Shortell *et al.* 2004). Some studies suggest that organisations are most effective when a group culture is dominant (Lin *et al.* 2005). Shortell *et al.* (2004), however, suggest that each of the four types of cultures may contribute to effective quality improvement. Our hypothesis therefore is that the relative balance among the four culture types is associated with perceived effectiveness.

On the team level, or workgroup level as it is called in the 'chain of action' framework, compositional characteristics such as team size, educational level and presence of management have been found to play a role (Fried *et al.* 2000, Shortell *et al.* 2004). But also commitment to change and innovative culture are expected to be key determinants (Lin *et al.* 2005, Lemmens *et al.* 2009). Professionals who (1) are committed to change, (2) value the outcomes associated with successful implementation of changes in care processes and (3) believe that effort and implementation will lead to the targeted outcomes are key to successful improvement of quality of care. Innovative culture, conceptualised as social expectations of team members, may be more or less conducive to creativity and can facilitate implementation by generating social approval when working together effectively and acting quickly (Caldwell & O'Reilly 2003). To conclude, we expect that differences in perceived effectiveness can be explained by the aforementioned collaborative-, organisational- and team-level characteristics.

Methods

Setting and design

This multiple-case cross-sectional study included quality improvement teams participating between 2006–2009 in 11 QICs which were part of a national Dutch program called 'Care for Better'. Each collaborative focused on one specific quality topic. These were: pressure ulcers, ill-nutrition, prevention of sexual abuse, medication safety, fall prevention, problem behaviour, client autonomy and control, social participation, recovery-oriented care, somatic comorbidity of psychiatric clients and outreach care (Table 1 and Strating *et al.* 2008, 2011). Organisations from the following sectors

Table 1 Overview of Care for Better collaboratives

Collaborative	Target	Team level			Individual level		
		No. of participating teams in QIC	No. of teams with survey	Response teams to survey (%)	No. of participating team members in QIC	No. of team members responding to survey	Response team members to survey (%)
Prevention of pressure ulcers	Lowering the prevalence of pressure ulcers by 50%	25	15	60.0	100	34	34.0
Prevention of malnutrition	Lowering the prevalence of malnutrition by 40%	38	31	81.6	152	77	50.7
Prevention of sexual abuse	Score 8 at a scale of 1–10 at each measure	19	13	68.4	76	38	50.0
Reducing medication errors	Lowering the prevalence of medication errors by 30%	48	28	58.3	144	71	49.3
Reducing problem behaviour	Lowering the prevalence of problem behaviour	26	17	65.4	104	41	39.4
Prevention of fall incidents	Lowering the prevalence of fall incidents by 30%	24	20	83.3	96	62	64.6
Improving autonomy and control	Substantial improvement in autonomy and quality of life of clients	45	24	53.3	135	56	41.5
Social psychiatric care	Decrease in problems increase in social functioning	25	14	56.0	100	30	30.0
Improving recovery-oriented care	Increase in quality of life increase in recovery-oriented services	25	18	72.0	100	50	50.0
Enhancing social participation	Decrease in loneliness	26	21	80.8	104	57	54.8
Screening somatic co-morbidity	Attaining normal BMI attaining normal systolic pressure	18	14	77.8	72	32	44.4
Total		319	215	67.4	1183	548	46.3

participated: nursing homes, residential care homes, home care, care for people with a mental handicap and care for people with a physical disability.

Program management was in the hands of the long-term care knowledge institute Vilans and it was commissioned by ZonMw, the main funding agency of health research in the Netherlands. As a research team, we were asked to describe the processes and effects of the collaboratives for clients and participating teams and to describe which interventions were actually carried out.

Set up of the quality improvement collaboratives

Each collaborative was led by a faculty team consisting of a program leader and other experts on the selected quality improvement topic. The improvement teams from the participating organisations were invited to attend four national conferences offering workshops and sessions where questions could be posed to other teams or to experts. The improvement teams developed and executed their interventions under the guidance of process counsellors. They used the Plan-Do-Study-Act cycle: carrying out small scale actions, measuring if the actions led to the expected outcomes and, if not, adjusting the actions.

Data collection and measures

As part of a larger evaluation study, team members received a postal questionnaire within one week after the last collaborative conference. Teams typically comprised five members, one of which was team leader. In total, 548 team members (about 46%, on average 2.6 per team) returned a questionnaire (see for response per collaborative Table 1). These 548 respondents represented 215 teams of the 319 participating teams (about 67% at the team level).

The questionnaire mostly consisted of existing validated measurements instruments that have been used before in quality improvement projects (Appendix). Most instruments were validated in health care and extensively tested in previous studies. Internal consistency of each scale based on our study results is represented by Cronbach's alpha and is included in Table 2. Scores on all items of a scale were summed and divided by the number of items and higher scores indicate a higher degree of the underlying concept.

Dependent variable

Perceived team effectiveness was assessed by four questions, using a five-point response scale (Lemieux-Charles *et al.* 2002, Lemieux-Charles & McGuire 2006). These questions

Table 2 Overview of theoretical constructs and instruments per variable

	No. of items	Potential range	Actual range	Cronbach's alpha
Perceived effectiveness	4	1-5	1.25-5.0	0.82
Innovation's attributes	10	1-5	2.6-5.0	0.68
Program management expertise	5	1-7	2.5-7.0	0.86
Advisor support	4	1-7	1.5-7.0	0.84
Achievability	4	1-7	1.75-7.0	0.77
Challenging targets	1	1-7	1.0-7.0	
Measurability	4	1-7	1.0-7.0	0.86
Quality improvement commitment	8	1-5	2.27-5.0	0.85
Organisational support	13	1-7	1-7	0.90
Cultural balance	20	0-1	0-0.82	
Innovative culture	15	1-5	1.93-3.62	0.81
Commitment to change	18	1-245	44-245	

assessed the extent to which each team member: (1) believed the team's overall performance met expectations, (2) was satisfied with his/her experience as a team member, (3) felt positive about their experience and (4) would be willing to work in a similar team in the future. A higher score indicates a higher level of perceived effectiveness.

Independent variables at the collaborative level

- Innovation attributes were assessed with 10 items on the innovation's relative benefit, compatibility, complexity and observability (Vos *et al.* 2008). Items were rated by each team member on a scale of 1 (totally disagree)-5 (totally agree) and summed to form one score.
- Program management expertise on breakthrough methodology and the collaborative topic, provision of information and advice was rated by project leaders with five items on a scale of 1-7 (Dückers *et al.* 2008). An example statement: 'program management had sufficient expertise on the improvement methods'.
- Advisor's support was assessed by four items. Project leaders rated the extent to which their advisor gave advice that was good and specific to the team's needs and problems (Dückers *et al.* 2008). Four items were rated on a scale of 1-7. An example statement: 'Our advisor was sufficiently responsive in the design of our action plan, implementation of improvement actions and measurements'.
- Achievability was assessed by four statements. Example statements are: 'collaborative targets are achievable' and 'program management made clear how to achieve collaborative targets' (Dückers *et al.* 2008). Rating was on a

seven-point scale ranging from 'strongly disagree' to 'strongly agree'. Higher scores indicated that team leaders perceived a higher degree of achievability of the collaborative's targets.

- Challenging targets was assessed by project leaders who rated whether 'Program management set high expectations with regard to performance and improvement possibilities' (Dückers *et al.* 2008). Team leaders rated this statement on a seven-point scale ranging from 'strongly disagree' to 'strongly agree'.
- Measurability was assessed by four statements. Example statements are: 'measuring indicators helps to monitor progress' and 'there were clear agreements on measuring central indicators' (Dückers *et al.* 2008). Rating was on a seven-point scale ranging from 'strongly disagree' to 'strongly agree'. Higher scores indicated perception of a higher degree of measurability.

Independent variables at the organisational level

- Quality improvement commitment was assessed in the project leaders' survey with eight items formulated by the European foundation for quality management (Shortell *et al.* 1995). Rating was on a five-point scale ranging from 'strongly disagree' to 'strongly agree'. Example statements were 'Realising improvements is rewarded in this organisation' and 'Our board of directors is actively involved in quality improvement'.
- Organisational support was assessed by 13 items of existing questionnaires (RAND 1999) on availability of time and means and on the degree of encouragement from top management. Rating was on a seven-point scale ranging from 'strongly disagree' to 'strongly agree'. An example statement: 'Senior management encouraged staff to improve their performance'.
- Organisational culture was assessed in line with the competing values framework (Shortell *et al.* 1995, Zammuto *et al.* 2000). Team members distributed 100 points across four sets of organisational statements (representing the culture types) according to descriptions that best fit their organisation. The Blau Index of heterogeneity (Blau 1977) was calculated to assess the level of balance between the four culture types. A score of 1 indicates that points were apportioned in a 25/25/25/25 pattern and indicates an optimal balance.

Independent variables at the team level

- Team composition characteristics were based on individual socio-demographic characteristics. Education level was assessed by a 0–7 point ordinal scale, higher scores indicating a higher educational level. A variable indicating

whether a manager was part of the team was computed. Project leaders were asked whether any changes (dropouts or new team members) occurred.

- Innovative culture of the team was assessed by 15 items of the Group Innovation Inventory (Caldwell & O'Reilly 2003, Strating & Nieboer 2010, Nieboer & Strating 2011). Respondents were asked to answer statements on a five-point scale ranging from 'strongly disagree' to 'strongly agree'. Higher scores indicated a more innovative culture. An example statement: 'The attitude around here is that when you are trying new things, mistakes are a normal part of the job'.
- Commitment to change was assessed by 28 items with a seven-point rating scale based on the expectancy measurement for motivation developed by Vroom (1995). Three subscales were computed: expectancy (perceived probability that effort will lead to good performance), instrumentality (perceived probability that good performance will lead to desired outcomes) and valence (value that an individual personally places on these outcomes). A composite measure was calculated as the product of valence, instrumentality and expectancy. Example items are 'how important do you find making changes that improve processes of care?', 'success in implementing changes in care will help improve quality of care' and 'exerting effort will help implement changes in care for clients'.

Analysis

Owing to missing data on one or more of the variables, a sample of 513 was used for the analyses. We examined Spearman or Pearson correlations. Because of the hierarchical structure of the data (individuals are nested within teams and within collaboratives), a normal regression design would lead to estimation errors. We thus employed multi-level techniques (mixed models option SPSS 17; SPSS Inc., Chicago, IL, USA). We first estimated an empty model (0), which reflected variation in the intercept. To assess the extent to which variance should be ascribed to the team or collaborative rather than individual level, collaboratives served as level-3 and teams as level-2 units (model 1). In the models thereafter, we entered the independent variables as fixed effects in separate steps. As individual socio-demographic and team composition characteristics are expected to influence perceived effectiveness as well as other independent variables, these were included first. Following the theoretical model, collaborative-, organisation- and team-level variables were entered in the separate steps. Results were considered statistically significant when two-sided *p*-values were ≤ 0.05 . Deviance tests or likelihood ratio tests compared the relative

fit of the different models. The difference in deviance of two nested models has a chi-square distribution with degrees of freedom equal to the number of extra parameters in the larger model.

Results

Sample characteristics

Respondents had a mean age of 44 and were mostly female (72.9%). About 53% had completed tertiary education, 15% had a university degree. About 85% had been working for more than three years in the organisation and 66.7% worked more than 29 hours per week. Teams consisted of medical assistants (6.1%), nurses (25.8%), social workers (7.8%), medical specialists (7.3%), paramedical professionals (9.2%), quality staff (10.9%) and lower and middle managers (32.9%).

Descriptive statistics

Table 3 provides descriptive statistics (mean, standard deviation or percentages) of all variables. Mean scores on the collaborative-level variables were moderate with mean score varying between 4.01 and 5.34 on a seven-point scale. With respect to organisational factors, commitment to quality improvement had a mean of 3.81 on a five-point scale, indicating a relatively high rate of professional involvement in quality improvement and team member training. The mean score on organisational support was relatively low (4.05 on a seven-point scale). With respect to cultural balance, a mean of 0.67 on a 0–1 range indicated that most respondents perceived a moderate balance between the four types of culture in their organisation. At the team level, innovative culture was moderate with a mean of 3.62 (on five-point scale) and commitment to change was relatively low with a mean of 123.52 compared with the theoretical range of 1–245.

Perceived effectiveness varied between the 11 collaboratives (Table 4). High average scores were found especially in the Prevention of Malnutrition and Prevention of Medication Errors collaboratives. Reducing Problem Behaviour and Social Psychiatric Care scored relatively low on perceived effectiveness.

Associations between independent and dependent variables

Frontline professionals and respondents with a higher educational level scored lower on perceived effectiveness

Table 3 Descriptive statistics and correlation with perceived effectiveness ($n_{\text{teams}} = 215$) ($n_{\text{individual}} = 513$)

Demographic characteristics	<i>n</i>	% or mean (SD)	Correlation
<i>Gender</i>			
0 male	139	27.1%	0.02
1 female	374	72.9%	
<i>Position</i>			
0 manager/quality staff	222	43.3%	−0.09*
1 frontline professionals	219	42.7%	
Age	513	44.20 (9.69)	0.02
Educational level	513	5.47 (1.23)	−0.12*
<i>Team composition characteristics</i>			
Stable team			
0 no	154	71.6%	−0.14
1 yes	61	28.4%	
Manager in the team			
0 no	94	43.7%	0.17*
1 yes	121	56.3%	
% females in the team	215	73.0 (33.7)	0.09
Mean educational level of the team	215	5.54 (0.90)	−0.13
% tertiary education of the team	215	70.2 (34.2)	−0.13
<i>Collaborative-level variables</i>			
Innovation's attributes	513	4.01 (0.45)	0.44**
Program management expertise	215	5.34 (0.96)	0.15**
Advisor support	215	4.95 (1.42)	0.11*
Achievability	215	5.01 (0.95)	0.17**
Challenging targets	215	4.24 (1.32)	0.02
Measurability	215	4.98 (1.17)	0.13**
<i>Organisation-level variables</i>			
Quality improvement commitment	215	3.81 (0.60)	0.08
Organisational support	513	4.05 (1.10)	0.42**
Cultural balance	513	0.67 (0.09)	−0.07
<i>Team-level variables</i>			
Innovative culture	513	3.62 (0.41)	0.48**
Commitment to change	513	123.52 (39.13)	0.35**

Two-tailed *p*-values.

(Table 3). Teams with a manager in the team scored higher. Of the collaborative-level variables, all but challenging targets were significantly positively associated with perceived effectiveness. Of the organisational-level variables, only organisational support had a significant correlation. Both team-level variables were significantly correlated with perceived effectiveness, innovative culture having the highest correlation coefficient of 0.48.

Table 5 shows the results of the multilevel regression analysis. The first empty model served as a baseline with just intercepts. Model 1 shows that about 33% of the variance

Table 4 Descriptive statistics on perceived effectiveness for each collaborative

	<i>n</i>	Mean	SD
Prevention of medication errors	67	4.19	0.65
Prevention of malnutrition	72	4.16	0.67
Improving recovery-oriented care	48	4.01	0.71
Prevention of fall incidents	59	3.98	0.62
Improving autonomy and control	52	3.97	0.59
Prevention of pressure ulcers	31	3.95	0.59
Enhancing social participation	30	3.89	0.65
Screening of somatic comorbidity	52	3.78	0.71
Prevention of sexual abuse	36	3.81	0.79
Reducing problem behaviour	36	3.65	0.64
Social psychiatric care	30	3.43	0.89
Total	513	3.94	0.70

Analysis of variance $F = 4.51$ and $p = 0.000$.

could be attributed to differences between teams and 5% to differences between collaboratives. Model 2 shows that respondent's educational level, innovation's attributes,

organisational support, innovative team culture and commitment to change have positive effects on perceived effectiveness. In total, 27.9% individual-level variance, 57.6% team-level variance and 80% collaborative-level variance could be explained.

Discussion

The evidence underlying the effectiveness of QICs is inconclusive (Leatherman 2002, Ovreteit 2002, Cretin *et al.* 2004, Schouten *et al.* 2008) and few studies investigated determinants of implementation success (Mills & Weeks 2004, Neily *et al.* 2005, Dückers *et al.* 2009). Moreover, most evaluation studies are based on one specific topic, making it hard to compare across collaboratives addressing different topics. The objective of our study was to explore effectiveness of 11 collaboratives focusing on 11 different topics, as perceived by local improvement teams and to explore associations with collaborative-, organisational- and

Table 5 Hierarchical linear multilevel analyses on perceived effectiveness ($n = 513$)

Model	0		1		2		3		4		5	
	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Constant	0.01	0.05	-0.06	0.09	0.33	0.36	0.64 [§]	0.34	0.58 [§]	0.33	0.93**	0.31
Gender					0.07	0.11	0.00	0.10	0.05	0.10	0.00	0.09
Age					0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
Educational level					-0.07 [§]	0.09	-0.10**	0.04	-0.09**	0.04	-0.11**	0.03
Position					-0.13	0.09	-0.09	0.09	-0.05	0.08	-0.09	0.08
Stable team					0.12	0.13	0.16	0.12	0.02	0.12	-0.05	0.11
<i>Collaborative-level variables</i>												
Innovation's attributes							0.34**	0.05	0.29**	0.05	0.24**	0.04
Program management expertise							0.12	0.11	0.03	0.11	-0.04	0.10
Advisor support							-0.07	0.09	0.02	0.09	0.05	0.08
Achievability							0.14	0.09	0.12	0.08	0.14 [§]	0.07
Challenging targets							0.06	0.06	0.02	0.06	0.00	0.06
Measurability							-0.01	0.07	-0.04	0.07	-0.06	0.06
<i>Organisation-level variables</i>												
Quality improvement commitment											-0.04	0.06
Organisational support											0.18**	0.05
Cultural balance											-0.06	0.04
<i>Team-level variables</i>												
Innovative culture											0.24**	0.05
Commitment to change											0.16**	0.04
-2 log likelihood	1264.51		1214.68		1042.63		922.37		954.21		922.04	
Variance individual level	0.97	0.06	0.61	0.05	0.55	0.05	0.51	0.05	0.48	0.05	0.44	0.05
Variance team level			0.33	0.07	0.36	0.08	0.22	0.06	0.19	0.05	0.14	0.05
Variance collaborative level			0.05	0.04	0.03	0.03	0.03	0.03	0.01	0.02	0.01	0.02
Explained individual level											27.9%	
Explained variance team level											57.6%	
Explained variance collaborative level											80.0%	

* $p < 0.05$ ** $p < 0.01$ [§] $0.05 > p < 0.10$, all two-sided tests.

¹((variance individual-level model 1 - variance individual-level final model)/variance individual-level model 1)*100 = 0.61 - 0.44/0.61*100 = 27.9%.

team-level factors. The results partly supported the theoretically proposed associations. As suggested by several authors, the nature of topic or quality problem addressed is critically important to a collaborative's effectiveness (Øvretveit & Gustafson 2002, Wilson *et al.* 2003). Respondents in the Prevention of Malnutrition and Prevention of Medication Errors collaboratives perceived effectiveness as considerably higher than respondents in other collaboratives, those in Reducing Problem Behaviour and Social Psychiatric Care perceived effectiveness as considerably lower.

In preparing and organising a QIC program, managers should carefully consider the type of quality problem or topic addressed and researchers investigating effectiveness of QICs should also take this into account. At the collaborative level, the innovation's attributes are key in explaining implementation success. The more the new working methods were perceived by professionals as – having relative benefit, being compatible with norms and values, not difficult to learn and implement and leading to observable results – the more the implementation process was perceived as successful. In contrast with previous studies (Øvretveit 2002, Øvretveit & Gustafson 2002, Øvretveit *et al.* 2002, Benn *et al.* 2009, Dücker *et al.* 2009, Nembhard 2009), the other collaborative-level factors – program management expertise, advisor support, achievability, challenging targets and measurability – were not significant predictors. Although most of these variables showed significant associations with perceived effectiveness in the univariate analyses, the associations disappeared in the multivariate analyses owing to the strong effect of the innovation's attributes.

At the organisational level, the findings suggest that for teams to perceive a higher impact of their improvement efforts, organisational support is crucial. In line with previous studies (Gustafson *et al.* 2003, Mills & Weeks 2004, Dücker *et al.* 2009), organisational support – conceptualised as making time, finances, means and instruments available and having a manager who shows interest, coaches and encourages professionals – is important to achieve improvement. In contrast with previous studies (Meterko *et al.* 2004, Shortell *et al.* 2004, Lin *et al.* 2005, Hann *et al.* 2007), the other organisational-level variables, quality improvement commitment and organisational culture, were not identified as determinants of perceived effectiveness.

Commitment to change and innovative culture are both significant predictors of perceived effectiveness on the team level. Professionals who attach importance to the outcomes of quality improvement and believe they can achieve them are associated with higher perceived effectiveness. Innovative culture, however, was the stronger predictor. Teams with high social expectations – trying new ways

of doing things, taking risks, tolerating mistakes – facilitate implementation.

Limitations

The cross-sectional design hampered our ability to draw causal inferences. Our results establish a significant association, which is an important step that prompts further studies to identify directionality. Second, the overall moderate response on the evaluation survey and the rather low number of respondents per team (2.6) may have led to some selection bias. During the collaborative program, many team members held other jobs or left the organisation. Given the dynamics in the field with new (compulsory) policies, reorganisations or mergers, not many respondents were available for this study. Third, we used self-reported instruments to assess organisational- and team-level factors and perceived effectiveness. Professionals' perceptions of effectiveness may have been influenced by expectations and positive feelings of working together. Although such a measure can introduce bias, the considerable variation between teams and collaboratives left room for explanation by organisational- and team-level factors.

Unfortunately, no single measure for objective effectiveness could be computed across all 11 collaboratives owing to the diversity in topic, content and outcome indicators. Neglecting the content of the indicator and gathering the different indicators together would lead to misleading results. We thus used the perceived effectiveness of team members as an indicator of the collaboratives' overall impact. Other accomplishments and effects not measured by outcome indicators may well be perceived, especially in the context of service delivery. Team members, for example, may have noticed how patients benefited or how professionals learned new working practices and routines. Distinguishing a subjective part as a conceptualisation of effectiveness allows us to compare the effectiveness of collaboratives that address different types of problems. For future research, it would be interesting to investigate to what extent perceived effectiveness is related to changes in objective outcome indicators and what different determinants of success may play a role. Although these general limitations may have somewhat influenced the reported results, they allowed us to compare a wide range of QICs, a major strength of the study.

Conclusion

The results support the notion that a layered approach is necessary to achieve improvements in quality of care and

provide further insight in the determinants of success of QICs. By evaluating 11 different QICs, our study provides insight in how collaborative-, organisational- and team-level factors may play a role in perceived effectiveness of different collaboratives. The innovation's attributes, organisational support, an innovative team culture and professionals' commitment to change are instrumental to perceived effectiveness.

Relevance to clinical practice

Understanding which factors enhance the impact of quality improvement initiatives can help professionals to achieve breakthrough improvement in care delivery to patients on a wide variety of quality problems.

Acknowledgement

The authors thank the participating improvement teams and questionnaire respondents.

Contributions

Study design: MMHS, APN; data collection and analysis: MMHS, APN and manuscript preparation: MMHS, APN.

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Conflict of interest

The author(s) declare that they have no conflict of interests.

Ethical approval

As the quality improvement initiatives were part of daily practice and were initiated and implemented by health care organisations and not by the evaluation research team, no ethics approval was required in the current ethical regime in The Netherlands.

Funding

The Care for Better program and evaluation study are funded by the Netherlands Organization for Health Research and Development (ZonMw grantnr 5942 and 60-60900-96-005). The evaluation study researchers are independent of the funding organisation.

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Appendix

Measurement instruments

Perceived effectiveness

Lemieux-Charles L, Murray M, Baker GR, *et al.* (2002) The effects of quality improvement practices on team effectiveness: a mediational model. *Journal of Organizational Behavior* 23, 533–553.

	Strongly disagree			Strongly agree	
I am satisfied with my experience as a team member	1	2	3	4	5
I feel positive about my experience in the team	1	2	3	4	5
I am willing to work in a similar team in the future	1	2	3	4	5
I believe the team's overall performance met (my) expectations	1	2	3	4	5

Innovation attributes

Vos L, Dückers M, Wagner C (2008) Evaluation Better Faster pillar 3: results of an improvement programme for hospitals [in Dutch].

The new improvement and working methods of Care for Better	Strongly disagree					Strongly agree				
Are applicable to our division	1	2	3	4	5	6	7	8	9	10
Match with our needs	1	2	3	4	5	6	7	8	9	10
Are transferred in an appropriate manner	1	2	3	4	5	6	7	8	9	10
Are clear	1	2	3	4	5	6	7	8	9	10
Are relevant to our division	1	2	3	4	5	6	7	8	9	10
Are difficult to learn	1	2	3	4	5	6	7	8	9	10
Are difficult to implement	1	2	3	4	5	6	7	8	9	10
Have a favourable balance between costs and benefits	1	2	3	4	5	6	7	8	9	10
We perceive risks on the project	1	2	3	4	5	6	7	8	9	10
Will lead to observable results	1	2	3	4	5	6	7	8	9	10

Program management expertise

Dücker ML, Wagner C, Groenewegen PP (2008) Developing and testing an instrument to measure the presence of conditions for successful implementation of quality improvement collaboratives. *BMC Health Serv Res* 8, 172.

Program management	Strongly disagree							Strongly agree						
Explained the improvement methods well	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Provided clarity on the purpose and approach of the project	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Gave a sufficiently tailored instruction	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Had sufficient expertise on the quality improvement topic	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Had sufficient expertise on the improvement methods	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Advisor support

Dücker ML, Wagner C, Groenewegen PP (2008) Developing and testing an instrument to measure the presence of conditions for successful implementation of quality improvement collaboratives. *BMC Health Serv Res* 8, 172.

Our advisor	Strongly disagree							Strongly agree						
Had regular telephone contact	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Was sufficiently responsive in the design of our action plan, implementation of improvement actions and measurements	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Was sufficiently responsive to our questions and problems we ran in to	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stimulated us to report the results and progress monthly	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Achievability

Dücker ML, Wagner C, Groenewegen PP (2008) Developing and testing an instrument to measure the presence of conditions for successful implementation of quality improvement collaboratives. *BMC Health Serv Res* 8, 172.

	Strongly disagree							Strongly agree						
Collaborative targets are achievable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Program management made clear how to achieve collaborative targets	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Program management offered a standardised set of indicators to monitor progress and compare results	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Program management offered good practices and evidence on achievable results	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Challenging targets

Dückers ML, Wagner C, Groenewegen PP (2008) Developing and testing an instrument to measure the presence of conditions for successful implementation of quality improvement collaboratives. *BMC Health Serv Res* 8, 172.

	Strongly disagree				Strongly agree		
	1	2	3	4	5	6	7
Program management set high expectations with regard to performance and improvement possibilities	1	2	3	4	5	6	7

Measurability

Dückers ML, Wagner C, Groenewegen PP (2008) Developing and testing an instrument to measure the presence of conditions for successful implementation of quality improvement collaboratives. *BMC Health Serv Res* 8, 172.

	Strongly disagree				Strongly agree		
	1	2	3	4	5	6	7
Progress is measured continuously	1	2	3	4	5	6	7
Timely and accurate progress information was available at all times	1	2	3	4	5	6	7
Measuring indicators helps to monitor progress	1	2	3	4	5	6	7
There were clear agreements on measuring central indicators	1	2	3	4	5	6	7

Quality improvement commitment

Shortell SM, O'Brien JL, Carman JM, *et al.* (1995) Assessing the impact of continuous quality improvement/total quality management: concept versus implementation. *Health Serv Res* 30, 377–401.

	Strongly disagree		Strongly agree		
	1	2	3	4	5
<i>Agree</i>					
Staff is involved in developing plans for improving quality	1	2	3	4	5
Staff is given the opportunity to improve quality	1	2	3	4	5
Staff has the authority to correct problems in their area when quality standards are not being met	1	2	3	4	5
Staff is supported when they take necessary risks to improve quality	1	2	3	4	5
The organisation has an effective system for employees to make suggestions to management on how to improve quality	1	2	3	4	5
Staff is given education and training in how to identify and act on quality improvement opportunities	1	2	3	4	5
Staff is given the needed education and training to improve job skills and performance	1	2	3	4	5
Staff is rewarded and recognised (e.g., financially and/or otherwise) for improving quality	1	2	3	4	5

Organisational support

RAND (2010) *Improving Chronic Illness Care Evaluation. Healthcare Organization Survey for Breakthrough Series (BTS) Team members.*

	Strongly disagree				Strongly agree		
	1	2	3	4	5	6	7
Senior management pays attention to the activities of the improvement team	1	2	3	4	5	6	7
Senior management acted as coach to our improvement team	1	2	3	4	5	6	7
Senior management encouraged staff to improve their performance	1	2	3	4	5	6	7
Senior management provides good feedback on the work of our improvement team	1	2	3	4	5	6	7
Senior management was open for criticism	1	2	3	4	5	6	7
Senior management gave us time to reflect up on our work	1	2	3	4	5	6	7
Senior management gave us time to try new working methods	1	2	3	4	5	6	7

	Strongly disagree				Strongly agree			
I am satisfied about the way senior management supported our team	1	2	3	4	5	6	7	
Our team had enough time to implement the changes	1	2	3	4	5	6	7	
Our team had enough manpower to execute the project	1	2	3	4	5	6	7	
Our team had enough resources to make the project successful	1	2	3	4	5	6	7	
Our team members had the skills necessary to make the project successful	1	2	3	4	5	6	7	

Organisational culture

Zammuto RF, Gifford G, Goodman EA (2000) Managerial ideologies, organisation culture and the outcomes of innovation: a competing values perspective. In *The Handbook of Organizational Culture and Climate* (Ashkanasy NM, Wilderom C & Peterson MF eds). Sage Publications, Inc., Thousand Oaks, CA.

Shortell SM, O'Brien JL, Carman JM, *et al.* (1995) Assessing the impact of continuous quality improvement/total quality management: concept versus implementation. *Health Serv Res* 30, 377–401.

Instructions

These questions relate to the type of organisation that your institution is most like. Each of these items contains four descriptions of healthcare organisations. Please distribute 100 points among the four descriptions depending on how similar the description is to your organisation. None of these descriptions is any better than the others; they are just different. For each question, please use all 100 points. *For example: In question 1, if Organization A seems very similar to mine, B seems somewhat similar, and C and D do not seem similar at all, I might give 70 points to A and the remaining 30 points to B.* Please note that these questions pertain to the overall organisation of which you are a part, not to your individual team or unit.

Organisation character (please distribute 100 points)

- _____ Organisation A is a very *personal* place. It is a lot like an extended family. People seem to share a lot of themselves.
- _____ Organisation B is a very *dynamic and entrepreneurial* place. People are willing to stick their necks out and take risks.
- _____ Organisation C is a very formalized and structured place. Bureaucratic procedures generally govern what people do.
- _____ Organisation D is very *production oriented*. A major concern is with getting the job done. People aren't very personally involved.

Total = 100 points

Organisation's managers (please distribute 100 points)

- _____ Managers in organisation A are *warm and caring*. They seek to develop employees' full potential and act as their mentors or guides.
- _____ Managers in organisation B are *risk-takers*. They encourage employees to take risks and be innovative.
- _____ Managers in organisation C are *rule-enforcers*. They expect employees to follow established rules, policies, and procedures.
- _____ Managers in organisation D are *coordinators and coaches*. They help employees meet the organisation's goals and objectives.

Total = 100 points

Organisation cohesion (please distribute 100 points)

- _____ The glue that holds organisation A together is *loyalty and tradition*. Commitment to this organisation runs high.
- _____ The glue that holds organisation B together is *commitment to innovation and development*. There is an emphasis on being first.
- _____ The glue that holds organisation C together is *formal rules and policies*. Maintaining a smooth running operation is important here.
- _____ The glue that holds organisation D together is the emphasis on *tasks and goal accomplishment*. A production orientation is commonly shared.

Total = 100 points

Organisation emphases (please distribute 100 points)

- _____ organisation A emphasizes *human resources*. High cohesion and morale in the organisation are important.
- _____ organisation B emphasizes *growth and acquiring new resources*. Readiness to meet new challenges is important.

- 15. _____ organisation C emphasizes *permanence and stability*. Efficient, smooth operations are important.
- 16. _____ organisation D emphasizes *competitive actions and achievement*. Measurable goals are important.

Total = 100 points

Organisation rewards (please distribute 100 points)

- 17. _____ organisation A distributes its rewards *fairly equally* among its members. It's important that everyone from top to bottom be treated as equally as possible.
- 18. _____ organisation B distributes its rewards based on *individual initiative*. Those with innovative ideas and actions are most rewarded.
- 19. _____ organisation C distributes its rewards based on *rank*. The higher you are, the more you get.
- 20. _____ organisation D distributes its rewards based on the *achievement of objectives*. Individuals who provide leadership and contribute to attaining the organisation's goals are rewarded.

Total = 100 points

Innovative culture

Caldwell DF, O'Reilly CA (2003) The determinants of team-based innovation in organisations. The role of social influence. *Small Group Research* 34, 497–517.

Strating MMH, Nieboer AP (2010) Norms for creativity and implementation in healthcare teams: testing the group innovation inventory. *International Journal for Quality in Health Care* 6, 1–8.

	Strongly disagree					Strongly agree				
Risk taking is encouraged around here	1	2	3	4	5	1	2	3	4	5
Management provides rewards and recognition for innovation and trying new things	1	2	3	4	5	1	2	3	4	5
Mistakes are a normal part of trying something new	1	2	3	4	5	1	2	3	4	5
People have great freedom to act to make necessary changes around here	1	2	3	4	5	1	2	3	4	5
The attitude around here is that when you are trying new things, mistakes are a normal part of the job	1	2	3	4	5	1	2	3	4	5
In our group, there is a great deal of openness in sharing information	1	2	3	4	5	1	2	3	4	5
People in our group encourage each other to try new things	1	2	3	4	5	1	2	3	4	5
Decisions in our group are made quickly	1	2	3	4	5	1	2	3	4	5
Management encourages people to try new things.	1	2	3	4	5	1	2	3	4	5
Members of our group listen carefully to the views of others	1	2	3	4	5	1	2	3	4	5
In our group we expect others to take initiative and get things done even if a person is not formally responsible	1	2	3	4	5	1	2	3	4	5
Our group is flexible and adapts quickly to new opportunities.	1	2	3	4	5	1	2	3	4	5
In our group we try to reach a consensus about important decisions	1	2	3	4	5	1	2	3	4	5
Once a decision is made, we implement it quickly	1	2	3	4	5	1	2	3	4	5
Our group has sufficient autonomy to implement new ideas without clearance from above.	1	2	3	4	5	1	2	3	4	5
People in this organisation are willing to try new things	1	2	3	4	5	1	2	3	4	5
It may go wrong when trying to grant wishes of individual clients	1	2	3	4	5	1	2	3	4	5
In this organisation we are always looking for other ways to organise our work in order to provide better care	1	2	3	4	5	1	2	3	4	5

Commitment to change

Vroom VH (1995) *Work and Motivation*. Jossey-Bass, Co., San Francisco, CA.

Exerting effort (e.g., time and resources) will	Strongly disagree							Strongly agree						
Help you implement changes in care	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Success in implementing changes in care	Strongly disagree							Strongly agree						
Help you improve quality of care for patients	1	2	3	4	5	6	7	1	2	3	4	5	6	7

Exerting effort (e.g., time and resources) will	Strongly disagree	Strongly agree
Help you improve patient satisfaction with their care	1	2 3 4 5 6 7
Help you improve productivity/efficiency	1	2 3 4 5 6 7
Help improve patient clinical outcomes	1	2 3 4 5 6 7
Help you involve patients with their own care	1	2 3 4 5 6 7
Help improve continuity of care	1	2 3 4 5 6 7
Allow you opportunities to use your skills and abilities better	1	2 3 4 5 6 7
Help you get recognition (i.e., praise, promotion, etc.) from your superiors	1	2 3 4 5 6 7
Help you feel that you have accomplished something worthwhile	1	2 3 4 5 6 7
Exerting effort (e.g., time and resources) will	Strongly disagree	Strongly agree
Help you to adopt the PDSA improvement process	1	2 3 4 5 6 7
Success in adopting the PDSA improvement process will	Strongly disagree	Strongly agree
Enable your team to <i>make changes</i> that improve the processes of care	1	2 3 4 5 6 7
Enable process changes to be spread to other parts of the organisation	1	2 3 4 5 6 7
Enable the team to gain support for process changes	1	2 3 4 5 6 7
Enable your team to adapt the collaborative improvement methods to their needs	1	2 3 4 5 6 7
How important are the following to you?	Strongly disagree	Strongly agree
Improving quality of care for patients	1	2 3 4 5
Improving patient satisfaction with their care	1	2 3 4 5
Improving productivity/efficiency	1	2 3 4 5
Improving patient clinical outcomes	1	2 3 4 5
Involving patients with their own care	1	2 3 4 5
Improving continuity of care	1	2 3 4 5
Having opportunities to use your skills and abilities better	1	2 3 4 5
Getting recognition (i.e., praise, promotion, etc.) from your superiors	1	2 3 4 5
Feeling that you have accomplished something worthwhile	1	2 3 4 5
Making changes that improve the processes of care	1	2 3 4 5
Spreading process changes to other parts of the organisation	1	2 3 4 5
Gaining support for process changes	1	2 3 4 5
Adapting collaborative improvement methods to your team's needs	1	2 3 4 5

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