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Short report

A large-scale longitudinal study indicating the importance of perceived effectiveness, organizational and management support for innovative culture

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ABSTRACT

Teams participating in QI collaboratives reportedly enhance innovative culture in long-term care, but we currently lack empirical evidence of the ability of such teams to enhance (determinants of) innovative culture over time. The objectives of our study are therefore to explore innovative cultures in QI teams over time and identify its determinants. The study included QI teams participating between 2006 and 2011 in a national Dutch quality program (Care for Better), using an adapted version of the Breakthrough Method. Each QI team member received a questionnaire by mail within one week after the second (2–3 months post-implementation of the collaborative = *T*0) and final conference (12 months post-implementation = *T*1). A total of 859 (out of 1161) respondents filled in the questionnaire at *T*0 and 541 at *T*1 (47% response). A total of 307 team members filled in the questionnaire at both *T*0 and *T*1. We measured innovative culture, respondent characteristics (age, gender, education), perceived team effectiveness, organizational support, and management support. Two-tailed paired *t*-tests showed that innovative culture was slightly but significantly lower at *T*1 compared to *T*0 (12 months and 2–3 months after the start of the collaborative, respectively). Univariate analyses revealed that perceived effectiveness, organizational and management support were significantly related to innovative culture at *T*1 (all at $p \leq 0.001$). Multilevel analyses showed that perceived effectiveness, organizational support, and management support predicted innovative culture. Our QI teams were not able to improve innovative culture over time, but their innovative culture scores were higher than non-participant professionals. QI interventions require organizational and management support to enhance innovative culture in long-term care settings.

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Introduction

Innovative cultures reportedly enhance the creation and implementation of new ideas and working methods in organizations (Caldwell & O'Reilly, 2003). Team involvement in quality improvement (QI) activities increases professionals' commitment to implementing change and developing new ideas, which is expected to enhance an innovative culture (Nieboer & Strating, 2012; Strating & Nieboer, 2010). Group norms that influence attitudes and behaviors by representing what 'is' or 'ought to be' in a particular situation, may be more or less conducive to creativity, risk-taking, and error toleration, thus facilitating or inhibiting innovation by generating social approval through working together effectively and acting quickly (Curry, Spatz, Cherlin, et al, 2010). Innovative cultures reflect attitudes and behaviors of teams as well as the organization and are known to provide a link between effective organizational practice and high-quality healthcare (Mickan & Rodger, 2000; St. John Burch & Anderson, 2003).

Teams in QI collaboratives are increasingly used to improve healthcare and are expected to enhance innovative culture (Cramm, Strating, & Nieboer, 2012; Nieboer & Strating, 2012). One instrument used widely by such collaboratives is the "breakthrough method" developed by the Institute of Healthcare Improvement (Institute for Healthcare Improvement, 2003). In breakthrough projects QI teams from different organizations join forces to improve a certain aspect of care within a specified timeframe. The teams develop and implement improvement actions targeted to their own organizations and client groups. Best practices or evidence-based interventions are the usual starting points; QI teams learn about them at national conferences organized for this purpose. They are then expected to act as 'learning laboratories'

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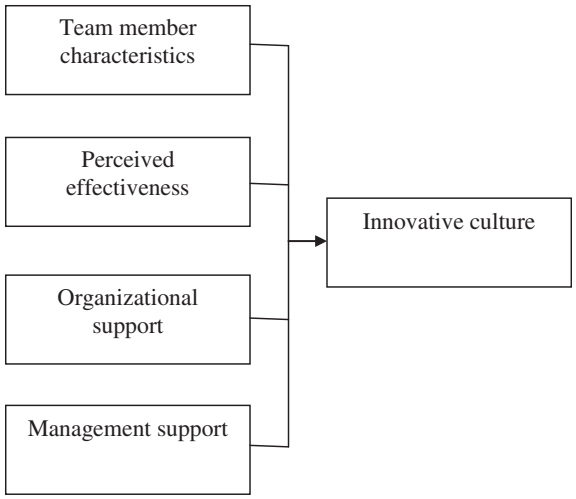

Fig. 1. Conceptual model.

(Senge & Scharmer, 2001) to enhance innovative culture by stimulating and implementing innovations and quality improvement methods (Strating, Broer, Bal, et al., 2011; Strating, Nieboer, Zuiderent-Jerak, et al., 2011; Zuiderent-Jerak, Strating, Nieboer, et al, 2009).

We currently lack empirical evidence on (i) QI teams' ability to enhance innovative culture and (ii) the determinants of innovative culture. Studies have demonstrated that perceived organizational and management support is associated with QI teams' success in enhancing innovative culture (Amabile & Conti, 1999; Kaplan, Brady, Dritz, & et al, 2010). Evidence from Amabile, Schatzel, Moneta, et al (2004) suggests that having support from the organization (e.g., time, resources, training, skills) and management (e.g., attentiveness, coaching, giving useful feedback, being open to criticism) influences employees' creative freedom and encourages intrinsic motivation to be creative, both of which are conducive to innovative culture. Support includes providing clarity of goals and establishing an environment that promotes innovation (e.g., giving time to develop new ideas, allowing teams to try new methods, promoting innovative solutions to problems) (Amabile & Conti, 1999; Amabile et al., 2004).

In addition to organizational and management support, QI team members' perception of new working methods as being effective may benefit an innovative culture. Shortell, Marsteller, Lin, et al (2004) found that the greater the *perceived* effectiveness, the greater the number and depth of changes made to improve quality of care, which indicates an enhanced innovative culture.

The objectives of our study are to explore innovative culture over time and identify the determinants of innovative culture, leading to two main research questions: Are QI teams able to improve innovative culture over the course of the improvement project? What are the predictive roles of team member characteristics, perceived effectiveness, and support (organization and management) on innovative culture? Our results will improve insight into the factors that enhance innovative culture (see Fig. 1 for our conceptual model).

Methods

Setting and design

The longitudinal study included QI teams participating between 2006 and 2011 in a national Dutch quality program (Care for Better). Each QI team was part of one of 12 QI collaboratives which focused on improving one specific quality topic varying from malnutrition to process redesign (see appendix) **[INSERT LINK TO ONLINE FILES]** (Broer, Nieboer, & Bal, 2010; Strating, Broer, et al., 2011; Strating, Nieboer, et al., 2011; Strating, Zuiderent-Jerak, Nieboer, et al, 2008). Participating long-term care organizations were nursing homes, residential care homes, home care providers, and care providers for the mentally or physically disabled. As this study included staff members only and not patients, we did not need approval from an ethics committee.

The Care for Better QI program followed an adapted version of the Breakthrough method. QI teams were invited by the knowledge institutes to attend four national conferences (called learning sessions; IHI, 2003) offering workshops and sessions in which questions could be asked of other teams or experts. During these learning sessions QI teams were brought together from each QI collaborative and the knowledge institutes to exchange ideas. Between the learning sessions the QI teams developed and executed the interventions in their own organizations (called action periods IHI, 2003) under the guidance of process counselors and using the Plan-Do-Study-Act cycle, which consists of a series of actions: planning and carrying out small-scale actions, measuring whether the actions led to the expected outcomes, and adjusting the actions if the outcomes were not achieved.

Data collection and measures

Project leaders from the 306 QI teams selected 1161 team members to fill in a questionnaire. Each selected QI team member received the questionnaire by mail within one week after the second conference (2–3 months post-implementation of the collaborative = *T*0) and final conference (12 months post-implementation = *T*1) (see flowchart) (Fig.2) **[INSERT LINK TO ONLINE FILES]**. A total of 859 (out of 1161) respondents filled in the questionnaire at *T*0 (response rate 74%) representing 259 teams (out of 306; response rate 85%) and 12 QI collaboratives (out of 12; 100% response). At *T*1 541 (out of 1161; 47% response) filled in the questionnaire representing 214 teams (out of 306; response rate 70%) and 12 QI collaboratives (out of 12; 100% response). A total of 307 team members filled in the questionnaire at both *T*0 and *T*1 (representing 158 QI teams and 12 QI collaboratives).

Age, gender and education level were assessed at *T*0. Educational level was assessed on an ordinal scale ranging from 0 to 7, with higher scores indicating a higher educational level.

Innovative culture was assessed at *T*0 and *T*1 using 15 items of the Group Innovation Inventory (GII) (Nieboer & Strating, 2012). This instrument consists of four dimensions underlying the GII. Two dimensions are 'group functioning' and 'speed of action', which are related to the team level. These two dimensions concern the extent to which group norms support cooperation and exchange of information among members of improvement teams, as well as the presence of a shared sense of the need to accomplish things quickly. Two other dimensions 'risk taking' and 'tolerance of mistakes' are related to the organizational level (see appendix). Innovative culture, therefore, reflects attitudes and behaviors of the team as well as the organization. Respondents were asked to answer statements on a 5-point scale ranging from 'strongly disagree' to 'strongly agree'. Higher scores indicated a more innovative culture. Missing values were replaced by mean subscale scores if at least two-thirds of the items were filled in. Cronbach's alpha of the scale was 0.77 at *T*0 and 0.81 at *T*1 indicating reliability.

Four questions with 5-point response scales assessed perceived team effectiveness during their project at *T*1 (Lemieux-Charles & McGuire, 2006; Lemieux-Charles, Murray, Baker, et al, 2002) by asking about the extent to which each QI team member (1) believed

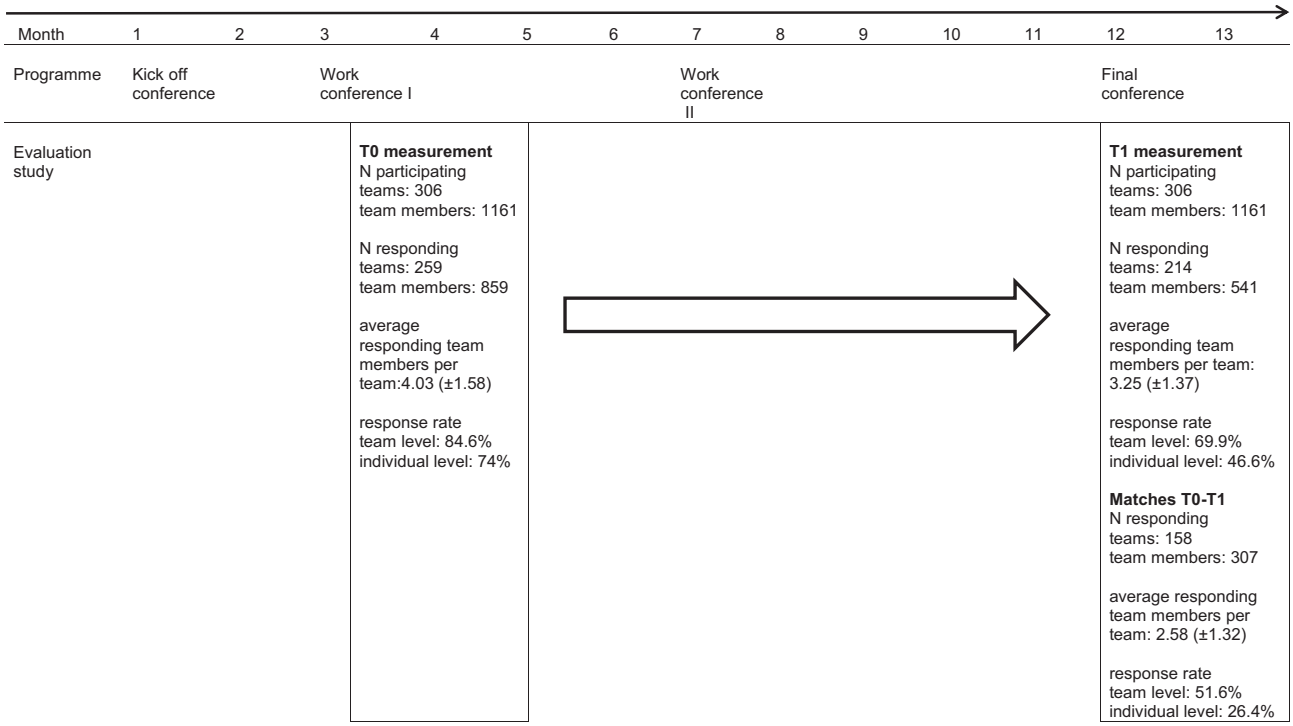

Fig. 2. Flow chart of data collection.

that the team's overall performance met expectations, (2) was satisfied with the team member experience, (3) felt positively about the experience, and (4) would be willing to work in a similar team in the future. A higher score indicated a higher level of perceived effectiveness. Cronbach's alpha of the scale indicated reliability at 0.87.

Seven items drawn from existing questionnaires (Strating et al., 2008) were used to assess organizational support during the project at *T*1 by inquiring about the availability of time and means to participate in the QI team. Responses ranged from 'strongly disagree' to 'strongly agree' on a 7-point scale; higher scores represented higher levels of organizational support (see appendix). Cronbach's alpha was 0.89, indicating good reliability.

Management support during the project was assessed at *T*1 with 9 questions on a 7-point response scale (see appendix); higher scores represented higher levels of support (RAND, 1999). Cronbach's alpha indicated excellent reliability at 0.91.

Statistical analysis

We used two-tailed paired *t*-tests to investigate an improvement in innovative culture over time. We also tested to see if innovative culture at *T*0 and *T*1 was significantly higher than a test value of 3.1 (s.d.: 0.6) found in a comparable sample of long-term care health professionals who were not in a QI collaborative (Nieboer & Strating, 2012). We examined Spearman or Pearson correlations among respondents who filled in the questionnaire at both *T*0 and *T*1 to assess the relationships between team member characteristics (age, gender and educational level), perceived effectiveness, support (organizational and management), and innovative culture.

We fitted a hierarchical random-effects model (SPSS ver. 17, mixed models option; SPSS, Inc., Chicago, IL) to account for the hierarchical structure of the study design. The structure comprised 307 QI team members (level 1), nested in 158 QI teams (level 2), nested in 26 organizations (level 3), nested in 12 QI collaboratives (level 4). We tested for the influence of QI collaboratives (level 4) on innovative culture and found that it did not contribute to explained variance in innovative culture (−2 loglikelihood 690.811 vs. 689.437: $p = 0.24$). Next, we tested for the influence of organizational level (level 3) on innovative culture. These results indicated that the organizational level does not affect innovative culture (−2 loglikelihood 690.811 vs 689.255: $p = 0.21$). In addition we tested for influence of QI team level (level 2) on innovative culture. These results indicated that team level does affect innovative culture (−2 loglikelihood 690.811 vs 637.689: $p \leq 0.001$). We thus employed a two-level model to investigate the predictive role of team member characteristics, perceived effectiveness, and support on enhancement of innovative culture. The multilevel model used in the hierarchical analyses comprised of QI team members (level 1) nested in QI teams (level 2). All independent variables were standardized. Analyses included QI team members who filled in questionnaires at both *T*0 and *T*1 only ($n = 307$). Listwise deletion of missing cases led to the inclusion of 280 respondents for the multilevel regression analyses. We first estimated an empty model (0) that reflected variation in the intercept. To assess the extent to which variance should be ascribed to the team rather than the individual, teams served as level-2 units (model 1). In model 2, we introduced age, gender, educational level, perceived effectiveness, organizational support and management support (model 2). Results were considered statistically significant if two-sided *p* values were ≤ 0.05.

Results

Respondents, whose mean age was 42 ± 10.0 (range 19–70) for the most part were female (78.4%), had been working for more than three years in the organization (78.6%) and worked more than 29 h per week (64.0%). QI teams consisted of medical assistants (4.7%), nurses (27.9%), social workers (6.3%), medical specialists (12.2%), paramedical professionals (5.1%), quality staff (9.3%) and lower to

middle managers (34.4%). About 45.2% had completed tertiary education; 14.9% had a university degree.

QI team members reported a mean organizational support of 4.6 ± 1.0 (range: 1–7) and management support of 2.8 ± 1.0 (range: 1–7). Mean perceived effectiveness was 4.1 ± 0.8 (range 1–7).

Two-tailed paired *t*-tests showed that innovative culture was slightly but significantly lower at *T*1 (3.6 ± 0.4 (range 2.0–4.8) vs. 3.7 ± 0.4 (range 2.3–4.9) at *T*0; $p \leq 0.05$; $n = 286$). Innovative culture varied between the QI collaboratives at *T*0 (3.7 ± 0.4 (range 3.5–3.8) Fgroup 2.6; $p \leq 0.01$), but not at *T*1 (3.6 ± 0.4 (range 3.5–3.7) Fgroup 1.6; $p = 0.07$). Innovative culture varied for the QI teams at baseline (3.7 ± 0.4 (range 2.7–4.4) Fgroup 2.0; $p \leq 0.001$) and at follow-up (3.6 ± 0.4 (range 2.0–4.8) Fgroup 2.2; $p \leq 0.001$). There were no differences in innovative culture between participants who responded on both *T*0 and *T*1 ($n = 307$) compared to participants who only filled in the questionnaire at *T*0 ($n = 859$) ($t = -0.572$; $p = 0.567$).

The mean scores of innovative culture of 3.7 at *T*0 (3.7; $p \leq 0.001$) and 3.6 at *T*1 (3.6; $p \leq 0.001$) were substantially higher than Nieboer and Strating's (2012) test group of 3.1 ± 0.6 (range 1.5–4.6) of managers and professionals in 37 Dutch long-term care organizations not participating in QI teams.

Correlations of independent variables and innovative culture at *T*1 are displayed in Table 1. Results from the univariate analyses showed that innovative culture at *T*0, and perceived effectiveness, organizational support and management support at *T*1 were significantly related to innovative culture at *T*1 (all at $p \leq 0.001$). No significant relationship was found between age, gender, educational level and innovative culture at *T*1.

Table 2 displays the results of the multilevel regression analysis. Model 0 is the null model including the dependent variable only, without the multilevel structure. Model 1 is the empty model (random effects), which includes the dependent variable with the multilevel structure, but without explanatory variables. Model 2 shows that perceived effectiveness, organizational and management support had a positive effect on innovative culture. Looking at explained individual level variance, 7.7% of the total variance (individual plus team level variance) and 88.8% of the variance at the individual level could be explained. Looking at explained team level variance, 28.4% of the total variance (individual plus team level variance) and 88.9% of the variance at the team level could be explained.

Discussion

While there are some studies in the long-term care setting indicating that organizational culture in general is important for organizational performance (van Beek & Gerritsen, 2010; Flesner, 2009), a recent systematic review on the effectiveness of strategies to change organizational culture showed that evidence on the effectiveness of such strategies is lacking (Parmelli et al., 2011). This study contributes to the debate on the effects of interventions such as QI collaborates on innovative culture and how difficult it is to improve innovative culture over time. Innovation is required to meet the challenges facing healthcare organizations (Mulgan & Albury, 2003), especially in long-term care settings. Demands for higher quality healthcare in an environment of limited resources and capacity present special problems in achieving desired outcomes (Nieboer, Koolman, & Stolk, 2010). Innovative culture is known to provide a link between effective organizational practice and high-quality healthcare (Curry et al., 2010). Without innovation, pressures to contain costs can only be met by forcing heavily burdened staff to take on more work (Tesluk, Farr, & Klein, 1997).

QI teams are increasingly used to improve the effectiveness and quality of healthcare and are expected to enhance the organization's innovative culture. There is, however, a lack of evidence for the ability of QI teams to enhance innovative culture over time and the determinants of innovative culture in QI teams. The first aim of the study was thus to investigate whether QI teams improved innovative culture over time. While we expected an improvement during the QI project, results showed that innovative culture slightly but significantly decreased. The difference found, however, is very small and may not be 'clinically' relevant. Furthermore, it is likely that we missed improvements in innovative culture during the early stages of the QI collaborative as our first measurement took place approximately 2–3 months after the start-up meeting or that the time interval of 9 months between *T*0 and *T*1 is simply too small to detect improvement in organizational culture. Another explanation could be that respondents may have had high expectations of joining the Dutch quality program (Care for Better), leading to relatively higher scores in the beginning of the project. The mean scores of innovative culture of 3.7 (*T*0) and 3.6 (*T*1) on a scale of 1–5 were, however, positive compared to a test group, whose mean score was 3.1 (Nieboer & Strating, 2012). So although the QI teams were not able to improve innovative culture over time, their innovative culture scores were substantially higher (at least a standard deviation) than teams not participating in a QI collaborative. This result also suggests that innovative organizations are more likely to join QI collaboratives than less innovative organizations. Involvement of teams in QI activities may have increased

Table 1
Univariate analyses on innovative culture.

	Innovative culture (at *T*1)
Innovative culture (at *T*0)	0.59***
Educational level (0–7) (at *T*0)	0.01
Age (at *T*0)	0.01
Gender (female) (at *T*0)	−0.01
Perceived effectiveness (at *T*1)	0.42***
Organizational support (at *T*1)	0.49***
Management support (at *T*1)	0.34***

Notes: ***$p \leq 0.001$; **$p \leq 0.01$; *$p \leq 0.05$ (two-tailed). At *T*1 respondents were asked how they perceived, effectiveness, organizational and management support during the entire project, not just at the moment they received the questionnaire. Correlational analyses included respondents who filled in the questionnaire at both *T*0 and *T*1 only ($n = 307$).

Table 2
Multilevel analyses on innovative culture ($n = 280$).

Model	0		1		2	
	β	se	β	se	β	se
Constant	3.64	0.02	3.64	0.02	3.62	0.02
Innovative culture (at *T*0)					0.13***	0.02
Educational level (0–7) (at *T*0)					0.02	0.02
Age (at *T*0)					0.00	0.02
Gender (female) (at *T*0)					−0.01	0.02
Perceived effectiveness (at *T*1)					0.07**	0.02
Organizational support (at *T*1)					0.04*	0.02
Management support (at *T*1)					0.13***	0.02
−2 loglikelihood	690.811		637.689		211.817	

Note. ***$p \leq 0.001$; **$p \leq 0.01$; *$p \leq 0.05$ (two-tailed). Multilevel analyses included respondents who filled in questionnaires at both *T*0 and *T*1 only ($n = 307$). Listwise deletion of missing cases resulted in 280 cases for the multilevel regression analyses. Model 0 is the null model including the dependent variable only, without the multilevel structure. Model 1 is the empty model (random effects), which includes the dependent variable with the multilevel structure, but without explanatory variables. In model 2 the explanatory variables enter the equation. At *T*1 respondents were asked how they perceived, effectiveness, organizational and management support during the entire project, not just at the moment they received the questionnaire.

professionals' commitment to implementing change and developing new ideas – thereby initially enhancing innovative culture – but that is not enough. Sustaining and enhancing innovative culture in healthcare settings by creating 'learning laboratories' demands more than simply initiating QI projects. The small decrease in innovative culture could then be explained by team members' new insights in the difficulties of organizational change.

The second aim of our study was to investigate the predictive roles of team member characteristics (educational level, age, gender), perceived effectiveness, and support (organizational and management) on the enhancement of innovative culture in the long-term care setting. Results showed that organizational and management support are critical to innovative culture. Without such support enhancing an innovative culture in long-term care settings is highly unlikely. Organizational support means, for example, providing time, personnel, resources, skills and training. Examples of management support are paying attention to team activities, coaching, and providing useful feedback (Lemieux-Charles et al., 2002). Such support reportedly also helps institutionalize and sustain new ideas and working methods on both the team and organizational levels (Slaghuis, Strating, Bal, & Nieboer, 2011). Furthermore, our study revealed that perceived effectiveness is also important to innovative culture. Managers should carefully consider healthcare professional's perceived effectiveness during implementation to ensure their commitment to project success.

Our study comes with limitations. First, the somewhat low number of respondents who filled in the questionnaire at both *T*0 and *T*1 ($n = 307$) may translate to selection bias. No differences in innovative culture between participants who responded on both *T*0 and *T*1, however, were found compared to participants who filled in the questionnaire at *T*0 only, suggesting non-selective drop-outs of respondents regarding innovative culture. Second, we investigated innovative culture in Dutch long-term care settings only. Future research is needed to investigate innovative culture in other healthcare settings and QI programs. Third, we did not investigate the relationship between objective measures or organizational characteristics (e.g. size, resources, ownership) and innovative culture over time. There is large variation in innovative culture between organizations in long-term care, as reported by Nieboer and Strating (2012).

Organizational characteristics such as environmental dynamism, transformational leadership, commitment to quality, and an exploratory and exploitative innovation strategy appeared to play a role in these differences. Differences in innovative culture between QI collaboratives and QI teams may in part be connected to these organizational differences. Finally, we did not relate innovative culture to objective outcome measures. Earlier we did report on the extent to which some of these QI collaboratives reached their goals (Strating, Broer, et al., 2011; Strating, Nieboer, et al., 2011), but it was not possible to relate these findings to innovative culture because data were often incomplete. Furthermore, goals varied widely between QI collaboratives both in content and level of ambition making it problematic to compare across collaboratives.

The study increased our understanding of the determinants of innovative cultures in the long-term care setting. The QI teams in our study were not able to further enhance innovative culture over time, but their innovative culture scores were positive compared to a control group. Our large-scale longitudinal study indicated the importance of perceived effectiveness and organizational and management support for innovative culture. These are important lessons for healthcare organizations aiming to improve innovative culture. QI interventions or programs should always be accompanied by organizational and management support to enhance innovative culture in long-term care settings.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.socscimed.2013.01.017.

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