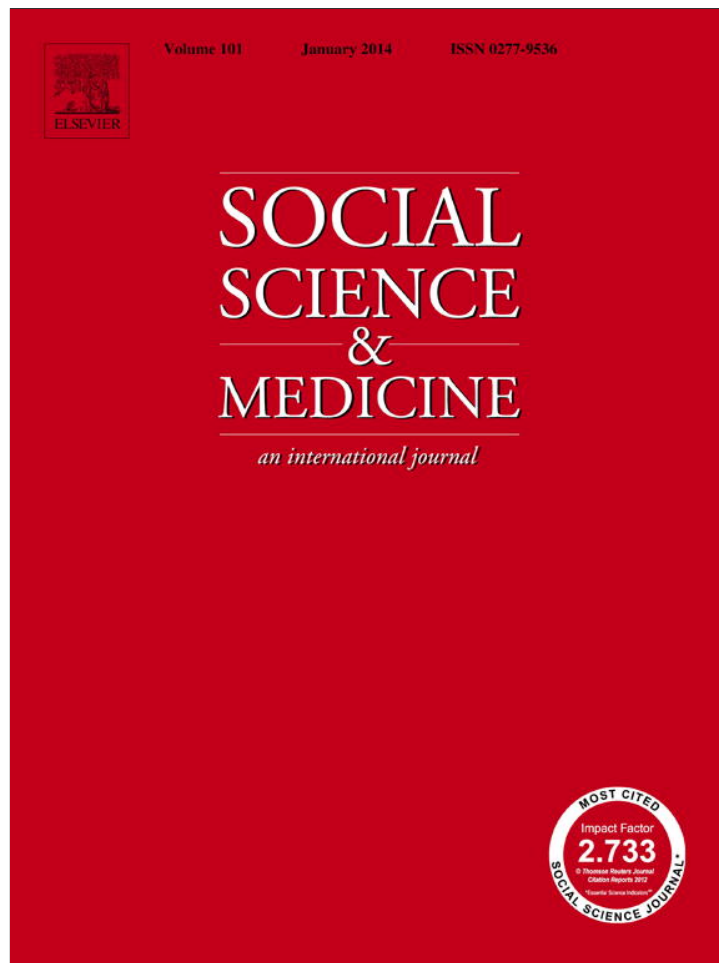


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Short and long term improvements in quality of chronic care delivery predict program sustainability[☆]



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ABSTRACT

Empirical evidence on sustainability of programs that improve the quality of care delivery over time is lacking. Therefore, this study aims to identify the predictive role of short and long term improvements in quality of chronic care delivery on program sustainability.

In this longitudinal study, professionals [2010 (T0): $n = 218$, 55% response rate; 2011 (T1): $n = 300$, 68% response rate; 2012 (T2): $n = 265$, 63% response rate] from 22 Dutch disease-management programs completed surveys assessing quality of care and program sustainability. Our study findings indicated that quality of chronic care delivery improved significantly in the first 2 years after implementation of the disease-management programs. At T1, overall quality, self-management support, delivery system design, and integration of chronic care components, as well as health care delivery and clinical information systems and decision support, had improved. At T2, overall quality again improved significantly, as did community linkages, delivery system design, clinical information systems, decision support and integration of chronic care components, and self-management support. Multilevel regression analysis revealed that quality of chronic care delivery at T0 ($p < 0.001$) and quality changes in the first ($p < 0.001$) and second ($p < 0.01$) years predicted program sustainability. In conclusion this study showed that disease-management programs based on the chronic care model improved the quality of chronic care delivery over time and that short and long term changes in the quality of chronic care delivery predicted the sustainability of the projects.

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Introduction

Rapid aging of populations and greater longevity result in the increased prevalence of chronic diseases (Wagner et al., 2001), which lead to deficiencies in the organization and quality of care delivery. Care for chronically ill patients is characterized by under-diagnosis, under-treatment, and failure to use primary and secondary preventive measures (Roland, Dusheiko, Gravelle, & Parker, 2005). Evidence strongly suggests that multicomponent interventions, such as disease-management programs based on the chronic care model, are required to change the processes and outcomes of chronic care delivery (Cramm, Rutten-Van Mölken, & Nieboer, 2012; Nolte & McKee, 2008; Wagner, Austin, & Von Korff, 1996a, 1996b). The chronic care model aims to transform the system

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of chronic disease care delivery from acute and reactive to proactive, planned, and population based (Coleman et al., 2009; Norris, Glasgow, Engelgau, O'Connor, & McCulloch, 2003; Tsai, Morton, Mangione, & Keeler, 2005; Wagner et al., 1996a, 1996b, 2001). This multidimensional framework was developed as a foundation for the redesign of care practices, and seeks to improve the quality of chronic care delivery through enhanced productive interactions between informed, activated patients and proactive care teams (Bowen et al., 2010). Wagner et al. (2001) designed the chronic care model based on evidence from a review of interventions to improve quality of chronic care delivery (Wagner et al., 1996a, 1996b). The evaluations and findings from a Cochrane Collaboration review confirmed that interventions based on the chronic care model led to improved quality of chronic care and patient outcomes (Renders et al., 2001). Accumulated evidence in more recently conducted meta-analyses support the notion that the chronic care model is an effective integrated framework to guide practice redesign to improve patient care and health outcomes of chronically ill patients (Coleman et al., 2009; Tsai et al., 2005).

The rapid growth in the number of individuals with chronic conditions and the failure of health care systems and organizations

to meet the needs of these individuals have made disease management a priority in health care policymaking in many countries. In Germany, for example, disease-management programs were implemented nationwide starting in 2002. Results of a four-year follow-up study show that quality of chronic care delivery and patient satisfaction with care delivery improved. Furthermore, their study showed a reduction of hospitalization rates, length of hospital stay, patient mortality and medication use (Stock, Starke, Altenhofen, & Hansen, 2011). Key policy reforms that enabled disease management in the Netherlands are: 1) the Health Insurance Act (2006), which created a mandatory insurance system introducing the possibility of selective contracting with collectives to target care delivery to those with chronic conditions; 2) the Social Support Act (2007), which introduced provisions to enable chronically ill and/or disabled people to live independently and participate in society; 3) the Act for Allowances for the Chronically Ill and Handicapped Persons (2009), which entitled chronically ill and disabled persons to receive a fixed allowance to compensate for excessive health care expenses; and 4) the amendment of the 1993 Individual Health Care Professions Act, which facilitated the use of nurses in the care of chronically ill and elderly people (Nolte & Hinrichs, 2012). Furthermore, in 2008 the government tried to create a nationwide push to improve the quality of care for chronically ill patients through a programmatic approach to chronic illness care (Ministry of Health Welfare and Sport). This approach included the use of nationally developed, evidence-based care standards and quality indicators, the promotion of multidisciplinary care teams, and a focus on self-management and the promotion of performance-based financing through bundled payments (Nolte & Hinrichs, 2012).

Care practices that are implementing new working methods, such as disease-management programs based on the chronic care model, are challenged to successfully sustain these new working methods over time (Buchanan et al., 2005). As in the Netherlands, many other government agencies throughout the world have recognized the need to promote sustainability of quality improvement programs (McHugh & Barlow, 2010). Quality improvements in care delivery that are not sustained are a waste of resources. Furthermore, the implementation of unsustainable programs is expected to cause frustration and increase resistance among professionals to subsequent quality improvement initiatives.

Disease-management interventions

Disease-management programs in the Netherlands are based on the chronic care model as developed by Wagner et al. (2001). This model provides an organized multidisciplinary approach to the delivery of care for patients with chronic diseases in the primary care setting. In the Netherlands, primary care organizations redesigned their existing practices and began to develop and implement new interventions consistent with the chronic care model, which was specifically designed to improve the quality of chronic care delivery over time as clinicians and other program staff more fully incorporated the model's principles into their activities (Cramm & Nieboer, 2012a, 2012b, 2012c; Cramm et al., 2013; Lemmens et al., 2011; Walters, Adams, Nieboer, & Bal, 2012). As self-care is critical for the optimal management of chronic diseases (Cramm & Nieboer, 2012d), all programs included interventions to enhance self-management by educating patients in abilities related to lifestyle, regulatory skills, and proactive coping. In addition, the implementation of appropriate care standards, guidelines, and protocols were essential parts of the disease-management programs. They were integrated through timely reminders, feedback, and other methods that increased their visibility at the time of clinical decision making. The implementation of these guidelines

was supported by information and communication technology tools, such as integrated information systems. Furthermore, many forms of organizational change were applied in the disease-management programs, including new collaborations among care providers, changes in task allocation, efforts to increase the effectiveness of information transfer and appointment scheduling, case management, the use of new types of health professionals, the redefinition of professionals' roles and redistribution of their tasks, planned interaction among professionals, and regular follow-up meetings. Implementation of interventions based on the chronic care model led to improved quality of chronic care and patients' experiences with chronic illness care delivery (Cramm & Nieboer, 2013).

Buchanan et al. (2005) explained that sustainability is achieved when new ways of working become the norm. This concerns a dynamic process in which health care professionals are expected to adapt the new working methods as routine methods (Slaghuis, Strating, Bal, & Nieboer, 2011). Implementation of new working methods, however, does not automatically result in changed behaviors of professionals and sustainability of the new working method. Research indeed showed that many quality improvement programs fail to become part of the habits and routines of professionals as they often fall back to old work habits (Wiltsey Stirman et al., 2012). The implementation of care standards or protocols regarding the new working method within disease-management programs, for example, does not automatically lead to professionals changing their old working methods and making the disease-management approach their routine method. Self-management support for example may be limited to distribution of information only rather than supporting patient empowerment and problem solving by trained professionals (e.g. through motivational interviewing) (Bonomi, Wagner, Glasgow, & Von Korff, 2002).

Also, even if care practices have their disease-management systems in place (such as new clinical information systems that facilitate professionals from various disciplines to communicate and share information on chronically ill patients more easily with each other, or having an appointment system to schedule acute care visits, follow-up visits and preventive visits), professionals may not always use them. When evidence-based guidelines are not part of routine practice of professionals, the new working methods within the disease-management approach may simply be added on top of existing ones rather than becoming integrated in their routine practices (Buchanan et al., 2005), which makes them vulnerable to diminish in the long run (Yin, 1981). Moreover, unsustainable working methods may occur due to lack of resources or competing demands (Bowman, Sobo, Asch, & Gifford, 2008). For example, consultation between primary care professionals and medical specialists in acute care delivery on more severe patients (e.g. patients with heart failure, stroke or co-morbidity/multi-morbidity) may not always take place due to time and financial constraints. Furthermore, not all patients may be able or want to set goals for themselves and use interventions to become (better) self-managers and to be proactively in charge of their chronic condition. Failure to achieve desired outcomes of the disease-management approach, such as enhancing self-management abilities of patients, may result in negative appraisals regarding this approach (Aarons & Palinkas, 2007), and stimulate discontinuation of the new working method and preference for old working habits.

This is all the more important because it has often been suggested that effectiveness of projects predicts sustainability (Aarons & Palinkas, 2007; Alexander & Hearld, 2009; Greenhalgh et al., 2004; Makai, Cramm, van Grotel, & Nieboer, 2012). Therefore, we expect that success of newly implemented programs, such as disease-management programs, in improving quality of care delivery over time will positively affect sustainability of these programs. If

professionals are able to improve quality of chronic care delivery as a result of the disease-management approach, this will also positively influence their views on this approach, making them more motivated to change their old ways and adapt the new working method as their routine method (Aarons & Palinkas, 2007). While some consider sustainability is reached when new ways of working and improved outcomes such as improved quality of care delivery become the norm (Buchanan et al., 2005), we clearly separated the two and are interested in the predictive nature of the ability to improve the quality of care delivery on the sustainability of the new working method. Empirical evidence on the sustainability of programs that improve the quality of care delivery is, however, lacking. A systematic review showed that the follow-up time for quality improvement interventions was less than 1 year (Alexander & Herald, 2009). In addition, Greenhalgh et al. (2004) concluded that studies focusing on the sustainability of complex innovations in care delivery, such as disease-management programs based on the chronic care model, are almost entirely absent. Therefore, this study aims to identify the predictive role of short and long term improvements in quality of chronic care delivery on disease-management program sustainability.

Methods

Sample

This longitudinal study included professionals working in disease-management programs within the context of a national program examining the management of chronic diseases in the Netherlands. The requirements of the national program were experience with the delivery of chronic care and the ability to implement all systems required for such delivery, which resulted in the inclusion of 22 of 38 disease-management programs. These 22 programs were implemented in various Dutch regions and consisted of a variety of collaborations, such as those between general practitioners (GPs) and hospitals, among primary care collaborators (including physiotherapists and dieticians), and between those providing care in primary and community settings. They targeted several patient populations: those with cardiovascular diseases ($n=9$), chronic obstructive pulmonary disease ($n=4$), diabetes ($n=3$), heart failure ($n=1$), stroke ($n=1$), depression ($n=1$), psychotic disorders ($n=1$), comorbidity ($n=1$) and eating disorders ($n=1$) (Lemmens et al., 2011).

Participants

In 2010, most disease-management programs had finished implementing interventions and training professionals, and had started to enroll patients. At this time (T0), we sent a questionnaire to all 393 professionals (nurses, medical doctors, practice nurses, GPs, dieticians, physical therapists, etc) participating in the 22 disease-management programs. A total of 218 respondents completed the questionnaire (55% response rate). One year later (in 2011; T1), we sent a questionnaire to 433 professionals participating in the disease-management programs at that time. A total of 300 respondents completed the questionnaire (68% response rate). Two years later (in 2012; T2), we sent a questionnaire to 421 participating professionals, which was completed by 265 respondents (63% response rate). A total of 106 respondents (still representing the 22 disease-management programs) completed the questionnaires at all measurement points (T0, T1, and T2).

Questionnaires were distributed to potential respondents through a contact person at each participating organization (through internal mailboxes or personal delivery at team meetings) or by direct mailing. A few weeks later, the same procedure was

used to send a reminder to non-respondents. No incentive in the form of money or gifts was offered.

Ethics

This study was approved by the ethics committee of the Erasmus University Medical Center, Rotterdam (September 2009).

Measures

In addition to collecting demographic data, the questionnaire incorporated the Assessment of Chronic Illness Care short version (ACIC-S) to assess the quality of chronic care delivery (Cramm & Nieboer, 2012a; Cramm, Strating, Tsiachristas, & Nieboer, 2011; Cramm et al., 2013). The ACIC-S is one of the first comprehensive tools developed for the assessment of chronic care organization across disease populations, in contrast to traditional disease-specific tools such as glycated hemoglobin levels, productivity measures (e.g., number of patients seen), or process indicators (e.g., percentage of diabetic patients receiving foot exams). The ACIC-S consists of 21 items covering the six areas of the chronic care model: health care organization, community linkages, self-management support, delivery system design, decision support, and clinical information systems ($n=3$ each). Additional items integrate the six components, such as by linking patients' self-management goals to information systems ($n=3$). Responses to ACIC-S items (e.g., "evidence-based guidelines are available and supported by provider education") fall within four descriptive levels of implementation ranging from "little or none" to "fully implemented intervention." Within each of the four levels, respondents are asked to choose the degree to which that description applies. The result is a 0–11 scale, with categories defined as 0–2 (little or no support for chronic illness care), 3–5 (basic or intermediate support), 6–8 (advanced support), and 9–11 (optimal or comprehensive integrated care for chronic illness). Subscale scores for the areas of the chronic care model are derived by calculating the average score for all items in that subsection (Bonomi et al., 2002; Cramm et al., 2011). Mean subscale scores were calculated if at least two of three items were available. Total scores were calculated by determining the average of subsection scores (when at least four of seven subsections were available). Bonomi et al. (2002) have shown that the seven subscale scores are responsive to health care quality improvement efforts. In the present study, Cronbach's alpha of the ACIC-S was 0.90 at baseline (T0), 0.89 at T1 (1 year later), and 0.94 at T2 (2 years later), indicating reliability.

At T2 (2012), the sustainability of new practices was assessed with eight items from the routinization instrument (Short Version) as developed by Slaghuis et al. (2011). Slaghuis et al. (2011) showed that the psychometric properties of the measurement instrument are good and warrant application of the instrument in the evaluation of improvement projects, such as disease-management programs aiming to improve quality of chronic care. These eight items concern the two subscales routinization I and II, which are most applicable to assess if professionals changed their old working habits and integrated the new working method in their routine practices. Due to lack of relevance we did not include the other subscales (e.g. institutionalization of team reflection). The eight items from the subscales routinization I and II used in this study are 'the new practice is regarded as the standard way to work', 'the new work practice is easy to describe', 'all colleagues involved in the new work practice are knowledgeable about it', 'the work practice has replaced the old routine once and for all', 'performing the new routine always goes swimmingly well', 'we are accustomed to the work practice', 'we automatically work according to the new work practice', and 'we have adjusted our old habits to the new work

practice.' Responses are structured by a five-point scale (ranging from '1: I don't agree at all' to '5: I agree very much'), with higher scores indicating greater sustainability. The sustainability score was derived by calculating the mean of scores for all eight items. In the present study, Cronbach's alpha of the sustainability instrument was 0.91, indicating reliability.

Statistical analyses

All statistical analyses were conducted with Statistical Package for the Social Sciences (SPSS) software (ver. 20.0; SPSS Inc., Chicago, IL, USA). We used two-tailed, paired *t*-tests to investigate improvement in chronic illness care delivery over time. First-year changes in the quality of chronic care delivery, as measured by ACIC-S scores included respondents who completed questionnaires at measurement points T0 and T1 only (*n* = 154). Second-year changes in the quality of chronic care delivery included respondents who completed questionnaires at measurement points T1 and T2 only (*n* = 170).

After analyzing univariate associations, we fitted a hierarchical, random-effects model to account for the hierarchical structure of the study design: professionals (level 1) nested in 22 disease-management programs (level 2). We then employed this two-level model to investigate the predictive role of (changes in) the quality of chronic care delivery in the sustainability of the disease-management programs. Multilevel analyses included only respondents who completed questionnaires at all measurement points (T0, T1, and T2; *n* = 106); listwise deletion of missing cases resulted in the inclusion of 99 cases. Results were considered statistically significant if two-sided *p* values were ≤0.05.

Results

At T2 (2012), most (67%) respondents were women. The mean age of responding professionals was 48.1 ± 9.1 years, ranging from 24 to 64 years. About 92% of these professionals had been working in their current organization for more than 3 years, and 69% worked more than 29 h per week. Disease-management teams consisted primarily of GPs (37%), practice nurses (33%), and paramedical staff (10%).

The average baseline (T0) ACIC-S scores for all disease-management programs ranged from 5.93 (integration of care components) to 7.36 (delivery system design), indicating basic to intermediate/advanced support for chronic illness care. One year later (T1), average ACIC-S scores were considerably higher; they ranged from

6.52 (integration of care components) to 8.10 (delivery system design), indicating advanced support for chronic illness care. Two years after implementing changes in care practice (T2), average ACIC-S scores for the disease-management programs had increased further; they ranged from 7.02 (integration of care components) to 8.67 (delivery system design), indicating a higher degree of advanced support for chronic illness care than at T1.

Overall ACIC-S scores documented significant improvement in chronic care delivery in the first year after the implementation of these disease-management programs (paired *t*-test, *p* < 0.001; Table 1). Specifically, the most significant improvements were made in self-management support, delivery system design, and the integration of chronic care components (all *p* < 0.001). The organization of the health care delivery system and clinical information systems also showed significant improvement (both *p* < 0.01), as did decision support (*p* < 0.05). The only component of the chronic care model that did not show significant improvement in the first year after program implementation was community linkages.

Table 2 displays the changes in the quality of chronic care delivery in the second year after program implementation, as measured by ACIC-S scores. These scores also showed significant improvement in chronic care delivery compared with scores obtained at baseline and after the first year of implementation (paired *t*-test, *p* < 0.001; Table 2). However, the areas in which improvements were made differed somewhat from those most affected in the first year. The most significant improvements were made in delivery system design, clinical information systems, and community linkages (all *p* < 0.001), the latter of which showed no improvement in the first year. Decision support and the integration of chronic care components showed continued improvement (both *p* < 0.01), as did self-management support (*p* < 0.05). The only component of the chronic care model that did not improve significantly between the first and second year after implementation was the organization of the health care delivery system, although this aspect had been improved within the first year of disease-management program implementation.

Univariate analyses showed that quality of care delivery at T0 (*p* < 0.05), T1 (*p* < 0.001) and T2 (*p* < 0.001) were significantly associated with sustainability (Table 3).

The results of multilevel analyses are displayed in Table 4. These analyses showed that the quality of chronic care delivery at baseline (*p* < 0.001), and changes in the quality of care delivery within the first (*p* < 0.001) and second (*p* < 0.01) years all predicted the sustainability of disease-management programs at T2. In contrast, the demographic characteristics of participating professionals, such

Table 1
First-year changes in the quality of chronic care delivery, as measured by Assessment of Chronic Illness Care short version (ACIC-S) scores.

	Baseline (T0 ^a) assessment		Follow-up (T1 ^b) assessment		Change in score (T1 – T0)		<i>p</i> ^e	<i>n</i>
	<i>M</i> ^c	<i>SD</i> ^d	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Organization of the health care delivery system	7.11	(1.20)	7.51	(1.68)	0.40	(1.98)	<0.01	149
Community linkages	6.51	(1.78)	6.72	(1.76)	0.19	(1.89)	0.214	148
Self-management support	6.10	(2.19)	6.71	(2.00)	0.61	(2.27)	<0.001	151
Decision support	6.73	(1.76)	7.03	(1.70)	0.30	(1.52)	<0.05	150
Delivery system design	7.36	(1.57)	8.10	(1.70)	0.74	(1.65)	<0.001	151
Clinical information systems	6.16	(1.93)	6.57	(1.72)	0.41	(1.73)	<0.01	143
Integration of chronic care components	5.93	(1.93)	6.52	(1.72)	0.59	(1.92)	<0.001	145
Overall ACIC-S score ^f	6.56	(1.50)	7.05	(1.38)	0.49	(1.27)	<0.001	154

^a T0, 2010.

^b T1, 2011.

^c *M*, mean.

^d *SD*, standard deviation.

^e Paired *t*-test, T0 vs. T1.

^f ACIC-S scores indicate: 0–2 (little or no support for chronic illness care), 3–5 (basic or intermediate support), 6–8 (advanced support), and 9–11 (optimal or comprehensive integrated care for chronic illness). These analyses included respondents who completed questionnaires at measurement points T0 and T1 only (*n* = 154).

Table 2
Second-year changes in the quality of chronic care delivery, as measured by Assessment of Chronic Illness Care short version (ACIC-S) scores.

	Follow-up (T1) ^a assessment		Follow-up (T2) ^b assessment		Change in score (T2 – T1)		p ^c	n
	M ^c	SD ^d	M	SD	M	SD		
Organization of the health care delivery system	7.57	(1.74)	7.72	(1.84)	0.15	(1.84)	0.301	159
Community linkages	6.84	(1.80)	7.54	(1.69)	0.70	(1.82)	<0.001	161
Self-management support	6.88	(1.86)	7.19	(1.86)	0.31	(1.79)	<0.05	168
Decision support	7.18	(1.68)	7.50	(1.51)	0.32	(1.51)	<0.01	168
Delivery system design	8.27	(1.54)	8.67	(1.38)	0.41	(1.52)	<0.001	167
Clinical information systems	6.81	(1.65)	7.34	(1.64)	0.53	(1.61)	<0.001	164
Integration of chronic care components	6.68	(1.75)	7.02	(1.59)	0.34	(1.66)	<0.01	166
Overall ACIC-S score ^f	7.16	(1.36)	7.55	(1.29)	0.39	(1.09)	<0.001	170

^a T1, 2011.
^b T2, 2012.
^c M, mean.
^d SD, standard deviation.
^e Paired *t*-test, T1 vs. T2.
^f ACIC-S scores indicate: 0–2 (little or no support for chronic illness care), 3–5 (basic or intermediate support), 6–8 (advanced support), and 9–11 (optimal or comprehensive integrated care for chronic illness). These analyses included respondents who completed questionnaires at measurement points T1 and T2 only (n = 170).

as age, gender, and educational level, had no predictive effect on program sustainability.

Discussion

Several (systematic) reviews on the sustainability of quality improvement programs have documented the fragmented and underdeveloped nature of the sustainability literature due to limited funding for monitoring programs after initial implementation (Buchanan et al., 2005; Greenhalgh et al., 2004; Wiltsey Stirman et al., 2012). There is a general lack of empirical evidence on sustainability of programs that improve the quality of care delivery over time (Bowman et al., 2008; Wiltsey Stirman et al., 2012). Therefore, this study aimed to identify the predictive role of short and long term improvements in quality of chronic care delivery on the sustainability of programs. Our study demonstrated that effectively improving the quality of care delivery during both the first and second year after program implementation predicted the sustainability of these programs. These findings are interesting, especially in light of the persistence of major problems in the sustainability of quality improvement in other programs with the same aim (Berwick, 2005; Institute of Medicine, 2006; Leatherman & Sutherland, 2004; McGlynn et al., 2003; Schoen, Davis, How, & Schoenbaum, 2006; Seddon, Marshall, Campbell, & Roland, 2001; Van Roosmalen, Braspenning, De Smet, & Grol, 2007). Various reasons have been identified for these problems, such as organizational structures that block the improvement of care delivery and resistance to change old working methods among professionals (Grimshaw et al., 2004; Grol & Grimshaw, 2003; Grol, Wensing, & Eccles, 2005; Institute of Medicine, 2006; Rosenberg, 2003).

Table 3
Associations with sustainability, as assessed by univariate analyses.

	Sustainability	
	r	n
Age	–0.03	252
Gender	0.02	254
Educational level (university)	–0.02	251
Quality of care delivery at T0 ^a	0.21*	118
Quality of care delivery at T1 ^b	0.40***	170
Quality of care delivery at T2 ^c	0.35***	253

***p ≤ 0.001, *p ≤ 0.05 (two-tailed).
^a T0, 2010.
^b T1, 2011.
^c T2, 2012.

Effectively improving the quality of care delivery had been identified to primarily depend on system changes (Berwick, 2003; Shojania & Grimshaw, 2005). This may also explain the long-term success of disease-management programs based on the chronic care model to improve quality of care delivery which involves system changes in care delivery compared to quality improvement programs not incorporating such system changes. Changing systems of care delivery alone is not enough, however. It does not automatically result in changing old working methods of professionals and successfully sustain the new working method (Wiltsey Stirman et al., 2012). We expected that successfully improving quality of care delivery by newly implemented disease-management programs would positively affect sustainability of these programs. This research confirmed our expectations and clearly showed that short and long term improvements in quality of chronic care delivery predicted program sustainability. This study showed that increased organizational support and system implementation leads to changes in behavior of professionals. The ability of professionals to effectively improve quality of chronic care delivery as a result of the disease-management approach is expected to have positively influenced professionals' views on this approach making them more motivated to change their old ways and making the new working method part of their daily routine practice. Unsuccessfully improving quality of care delivery may have resulted in preference for old working habits,

Table 4
Predictors of sustainability, as assessed by multilevel regression analyses (random intercepts model, n = 99).

	B	SE	β	SE ^a
Constant	1.40	0.53	3.51	0.07
Age	–0.00	0.01	–0.00	0.06
Gender	–0.08	0.14	–0.08	0.07
Educational level (university)	0.24	0.14	0.11	0.07
Quality of care delivery (ACIC-S ^b T0 ^c)	0.28***	0.05	0.50***	0.08
First-year changes in quality of care delivery (ACIC-S T1 ^d – T0)	0.28***	0.06	0.43***	0.09
Second-year changes in quality of care delivery (ACIC-S T2 ^e – T1)	0.20**	0.07	0.27***	0.08

***p ≤ 0.001, **p ≤ 0.01 (two-tailed). Multilevel analyses included only respondents who completed questionnaires at all measurement points (T0, T1, and T2; n = 106); listwise deletion of missing cases resulted in the inclusion of 99 cases.

^a SE, standard error.
^b ACIC-S, Assessment of Chronic Illness Care short version.
^c T0, baseline (2010).
^d T1, follow up (2011).
^e T2, follow up (2012).

with the danger of discontinuation of the new working method within the disease-management approach by professionals.

The study has several limitations. First and most importantly, we included only professionals' perceived quality improvements and sustainability, and did not examine objective improvements. But research showed that the Assessment of Chronic Illness Care short version (ACIC) is a valid and sensitive instrument to trace changes in quality of chronic care delivery. Second, because we did not include a control group, we were unable to determine whether improvements in the quality of care delivery were caused by the disease-management programs or other factors. While this study did not include objective outcome measures or a control group other robust findings show that interventions based on the chronic care model led to significant improvements in process outcome measures (e.g., number of prescribed medications, number tested for hemoglobin A1c level) and clinical outcomes (e.g., number with hemoglobin A1c level > 7%). These findings are based on a meta-analysis of 112 studies conducted by Tsai et al. (2005), which included randomized and non-randomized controlled trials only. Third, because this study concerned disease-management programs based on the chronic care model, our findings apply only to similar programs and not, for example, to commercialized disease-management programs not incorporating system changes in care delivery. Commercial disease-management programs are contracted and paid by health insurance companies and provide care to chronically ill patients without any involvement of regular primary and hospital care. They mostly provide chronic disease assessment and educational services by telephone, usually for a single condition.

Conclusion

This study showed that short and long term improvements in the quality of chronic care delivery predicted the sustainability of the disease-management programs. Within the context of a growing older population and increasing pressure on health care budgets, improving the quality of chronic care delivery and the effectiveness of quality improvement initiatives to sustain such programs and not waste investments becomes increasingly important. Implementation of disease-management programs based on the chronic care model is an important method to improve the quality of chronic care organization and delivery in primary care practices. Increasing organizational support and system implementation is expected to change behavior of professionals enhancing their ability to improve quality of care delivery. Furthermore, the ability of professionals to effectively change the quality of care delivery over time predicts program sustainability.

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