Applying the RE-AIM framework to evaluate two implementation strategies used to introduce a tool for lifestyle intervention in Swedish primary health care

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SUMMARY

The aim of this study was to evaluate 2 implementation strategies for the introduction of a lifestyle intervention tool in primary health care (PHC), applying the RE-AIM framework to assess outcome. A computer-based tool for lifestyle intervention was introduced in PHC. A theory-based, explicit, implementation strategy was used at 3 centers, and an implicit strategy with a minimum of implementation efforts at 3 others. After 9 months a questionnaire was sent to staff members (n=159) and data from a test database and county council registers were collected. The RE-AIM framework was applied to evaluate outcome in terms of reach, effectiveness, adoption and implementation. The response rate for the questionnaire was 73%. Significant differences in outcome were found between the strategies regarding reach, effectiveness, and adoption, in favor of the explicit implementation strategy. Regarding the dimension implementation, no differences were found according to the implementation strategy. A theory-based implementation strategy including a testing period before using a new tool in daily practice seemed to be more successful than a strategy in which the tool was introduced and immediately used for patients.

Key words: Implementation, Primary health care, RE-AIM

INTRODUCTION

There is increasing interest in how to obtain the best available quality in health care delivery. Research regarding transference of knowledge into practice has expanded considerably in recent years. Different traditions can be identified, generally on the basis of EM Rogers' theories about innovation diffusion (Rogers, 2003). Estabrooks *et al* (2008) identified 4 main domains of "the knowledge utilization" field in a bibliometric analysis: diffusion of innovations; knowledge utilization; technology transfer; and evidence-based medicine (EBM). EBM emerged in the early 1990s and has had a great influence on research on implementation (Evidence-Based Medicine Working Group., 1992). Implementation science, which has developed in the wake of EBM, has been defined by Eccles *et al*. (2006) as "the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services and care."

A current debate in implementation science is the use of theories to form strategies for implementation of change in clinical practice (Eccles *et al.*, 2005). Eccles *et al.* (2005) argue that clinical practice is a form of human behavior, and thus could be described in terms of general human behavioral theories. The use of theory, on the other hand, is rejected by Oxman *et al*. (2005), who say that there is no need for theory in implementation research, and Bhattacharyya *et al*. (2006), who argue that there is no scientific evidence proving that a theory-based implementation strategy is more effective than one that is built on common sense. There is, however, evidence that behavior change interventions based on theory are more effective than those not based on theory (van Achterberg *et al*., 2010)

Thus, there is a need for research exploring whether theory-based strategies can contribute to more effective implementation than less theory-bound approaches (Bhattacharyya *et al.*, 2006). It is also important to evaluate whether outcome is a result of the implementation

process or the intervention implemented (Farris *et al.,* 2007). One model that has been shown to be helpful in the evaluation process is the RE-AIM framework (Glasgow *et al.,* 1999). This model was developed to evaluate interventions, but has also been applied to plan and conduct research studies, and to evaluate implementation outcome (Farris *et al.,* 2007; Glasgow *et al.,* 1999; Bakken and Ruland, 2009; Jillcott *et al.,* 2007; Li *et al., 2008)*. The RE-AIM framework offers a structure focusing on five dimensions in the evaluation process: reach, efficacy, adoption, implementation, and maintenance.

Implementation studies performed previously in Swedish primary health care (PHC) settings did not evaluate implementation strategy, but have focused on other factors affecting implementation, such as adopter characteristics and context (Lövgren *et al.,* 2001; Toth-Pal *et al.,* 2008. The aim of the present study was to evaluate two implementation strategies for the introduction of a new tool for lifestyle intervention in PHC, applying the RE-AIM framework to assess outcome in terms of reach, effectiveness, adoption, and implementation.

METHODS

The RE-AIM Framework

The RE-AIM framework can be used for the evaluation of public health interventions but also to fill the research-practice gap evaluating the translatability of the interventions (www.re-aim.org, 2010). Outcome is evaluated in 5 dimensions: reach, efficacy, adoption, implementation, and maintenance, and can be adapted for use in a specific study (Farris *et al.,* 2007). Applied in the translation field, the term effectiveness is often used instead of efficacy.

A detailed description of the RE-AIM dimensions and their application in this study is presented in Table 1. Reach measured the proportion of staff members who chose to use the innovation as a new working tool. Effectiveness measured the effect on staff members' attitudes and performance, which was assessed at the individual and setting levels. The

dimension adoption was not relevant according to its original definition, because the PHC centers that were offered the new tool were selected beforehand. Instead the dimension adoption was used to assess adoption at the setting level, by measuring the proportion of patients who performed the test. Implementation measured fidelity to the original ideas of the innovation. The dimension maintenance was not considered in the study. The concept of implementation in this article is used in two ways: primarily to describe the whole process of introducing and putting the innovation into practice but also as one of the dimensions of the RE-AIM framework.

The Innovation

The innovation that was implemented was a computer-based tool for screening and brief intervention regarding alcohol use and physical activity, developed for use in PHC. The tool consists of a touch-screen computer and a printer, placed in a so-called IT kiosk and staff are encouraged to refer their patients to the computer. Patients who perform the test receive a printed test result and tailored advice (Carlfjord *et al.*, 2009*)*.

Implementation Strategies

Two implementation strategies were used to introduce the computer-based tool for lifestyle intervention in PHC: explicit and implicit implementation strategies. The explicit implementation strategy was based on Rogers' theories about the innovation-decision process, including knowledge, persuasion, decision, and implementation (Rogers, 2003). Attributes of the innovation, such as trialability and observability were also taken into account (Rogers, 2003). The strategy began with an information session with a change agent from the research team visiting the center (knowledge). This was followed by a testing period for 1 month, during which all staff members were encouraged to perform the test themselves, and give their opinions about it (persuasion, trialability, observability). After the testing period, the change agent visited the center again; there was a discussion about how the test could be used

in daily work, and a mutual agreement to incorporate it or not, as a working method, was made (decision). After that second meeting the lifestyle test was made available to patients and referral to the test was encouraged (implementation).

The implicit implementation strategy included an information session at the center by a change agent from the research team. The computer-based lifestyle test was introduced, and staff members got instructions about the opportunity to refer their patients to the test. No further dialogue was encouraged. The computer with the lifestyle test was installed and patient testing could start immediately.

In the rest of this article, the centers where explicit implementation strategy was used are called explicit centers, and centers where implicit implementation strategy was used are called implicit centers.

Setting and Study Participants

Swedish health care is publicly funded with hospital care and PHC provided by the county councils. Each county council has the responsibility to provide health care and preventive services to the population. Six PHC centers, with general practitioners (GPs), nurses, and other staff members, two in each of three different county councils in the south east of Sweden, were recruited to the study. All the centers volunteered to participate. Through randomization, one center within each county council was selected to each one of the two implementation strategies. Before the introduction of the computer-based tool there was no difference between explicit centers and implicit centers regarding the perception of how lifestyle issues were prioritized at the center.

Data Collection

When computers had been in operation for 9 months, a questionnaire was sent by e-mail to staff members at the participating centers. The questionnaire was developed for the present

study and the questions were thoroughly examined and discussed by a group of experts in the research team until consensus was reached. The questionnaire was tested by staff at a PHC center with experience of the computer-based lifestyle test, not participating in the study, and their comments were taken into account for the final version (Streiner *et al.*, 2007). Apart from background factors such as gender and profession, the questionnaire included 7 statements about the computer-based tool answered on a 4-degree Likert scale with the response alternatives agree, partly agree, partly disagree, disagree, and some questions concerning referral to the computer and opinions about lifestyle issues. Questions were formulated with the aim of covering and evaluating the 3 RE-AIM dimensions: reach, effectiveness, and implementation. The questionnaires were distributed to all clinical staff members at the participating centers who meet patients in their daily practice, and thus could be expected to refer patients to the lifestyle test. Using the Web-based tool Publech® Survey 5.6, 159 questionnaires were distributed, 77 to explicit centers, 82 to implicit centers. Questionnaires were answered anonymously.

Number of performed tests at each center and number of patients stating they had been referred to the computer were obtained from the computer database. The number of patients aged 18 years and older who had visited the center was obtained from county council registers. These data were used to evaluate the RE-AIM dimension adoption and were also collected after 9 months of operation.

Data Analysis

Data were analyzed with the aim of comparing explicit centers with implicit centers. Data concerning adoption were analyzed as the proportion of visiting patients who performed the test and proportion of visiting patients who performed the test after referral; these are presented in terms of risk ratio. Analysis of differences between groups according to ordinal data was performed using the Mann-Whitney test, and differences according to categorical

nonparametric data were analyzed using the χ^2 test. Statistical significance was set at $P \leq 0.05$. Statistical analyses were performed using the computer-based analysis program Statistical Package for the Social Sciences (SPSS) version 16.0, and the open access statistical program OpenEpi version 2.3.

RESULTS

The number of responding individuals was 52 from the explicit centers and 64 from the implicit centers, yielding response rates of 68% and 78%, respectively. Women had higher response rates than men (75% vs 63%). The response rate for nurses was 78%, GPs 54%, and other staff groups 83%. Response rates according to gender or profession did not differ significantly between the two strategies.

Most of the respondents (84%) were women, 81% at the explicit centers and 86% at the implicit centers. Age ranged from 26 to 70 years; the mean age was 49 years at the explicit centers and 50 years at the implicit centers. At explicit centers, 81% of the respondents had been working in their profession for at least 10 years; at implicit centers 77% had at least 10 years experience. According to profession, 19% of responders were GPs (23% at explicit centers, 16% at implicit centers), 51% were nurses (50% at explicit centers, 52% at implicit centers), and 30% represented other staff groups (27% at explicit centers, 33% at implicit centers).

Reach

The dimension reach was measured using one question about frequency of referral to the test. The response alternatives were daily, once a week, once a month, or never. At the explicit centers, 17% answered never, compared with 47% at implicit centers. Thus, the proportion of staff members referring to the test at least once a month was 83% at explicit centers and 53% at implicit centers. The difference was significant ($p = 0.001$). Weekly or

daily referral was reported by 29% of staff at explicit centers, and 16% of staff at implicit centers ($p = 0.085$). The main reason for not referring patients to the test was forgetting. The representativeness among those referring was also evaluated. At explicit centers, 83% reported referring patients to the test (GPs 83%, nurses 77%, other staff members 93%). At implicit centers 53% of staff reported referring to the test (GPs 50%, nurses 48%, other staff members 63%).

Effectiveness

Seven statements/questions concerned the dimension effectiveness (Table 2). Significant differences between the two strategies were found in 4 of the 7 items assessed, all in favor of the explicit implementation strategy. A fifth item reached the *p*-value 0.063. All these 5 items were assessed on the individual level; the 2 items on the setting level were the two that showed no difference between strategies.

Adoption

Data concerning the dimension adoption are presented in Table 3, and show a significantly higher proportion of patients performing the test and being referred to the test at explicit centers than at implicit centers.

Implementation

Eight of the questions/statements assessed the dimension implementation. Responses to these questions are presented in Table 4. Regarding implementation there were no significant differences between the two implementation strategies.

DISCUSSION

The main finding from this study was that 3 of the 4 assessed RE-AIM dimensions used to evaluate outcome seemed to be associated with the implementation strategy used. The RE-AIM dimensions that were affected by the implementation strategy used were reach,

effectiveness. and adoption. The dimension implementation did not show any differences according to implementation strategy. The adapted RE-AIM framework was found to be applicable for evaluating the implementation of a new tool for lifestyle intervention in PHC. A strength in the study was the high response rates regarding the questionnaire, and the representativeness of the responders, even though the number of participating units selected for the study was limited.

Regarding the dimension reach, a higher proportion of staff members at the explicit centers reported using the new working tool. It is likely that the 1-month testing period facilitated reach in terms of acceptance at the individual level. When the computer-based tool was introduced at the different PHC centers, there was a decision to accept it on organizational level. However, to be used in the setting, each staff member had to make their own decision to accept the innovation. A possible explanation for our findings can be found in Frambach and Schillewaert's (2002) model demonstrating how different factors influence the individual's attitude to an innovation that is already accepted by the organization. Organizational factors (eg, management support and training), personal characteristics (eg, values, experience, and innovativeness), and social influence from peers or networks form the individual's attitude to the innovation, and lead to an individual decision to accept (adopt) or reject (Frambach and Schillewaert, 2002).

Items regarding effectiveness assessed on the setting level, like the overall attitudes among staff, and discussions about lifestyle issues or about the test, did not differ between the 2 strategies. Effectiveness on the individual level, however, seemed to be influenced by the strategy used. A high proportion of staff members at the explicit centers, who had been encouraged to perform the test themselves, had read the advice provided by the computer and stated that they agreed with the advice. They also brought up lifestyle issues more often than they did before. This can probably be explained in terms of learning, because the change

involved in introducing and starting to use a new tool might have been facilitated by testing the computer, and reading and reflecting on the advice provided by the computer.

Research use in terms of learning on the individual and organizational levels has been studied by The Research Unit for Research Utilization (RURU) group (Nutley *et al.,* 2007). Individual learning has been shown to be most effective when learners can interact with one another and where processing experiences through reflection is encouraged. Organizational learning is facilitated by cultural values such as belief in human potential, openness, trust, and tolerance of mistakes (Nutley *et al.,* 2007). It seems likely that the explicit strategy used in the present study influenced individual learning, but had limited effect on learning at the organizational level. It should be noted that, also at explicit centers, two-thirds of the staff group reported a low rate of using the new tool, referring patients to the computer-based test less than once a week.

The dimension effectiveness in the RE-AIM framework suggests that not only positive effects of an intervention but also unexpected negative effects should be evaluated (Lövgren *et al*., 2001). Such unexpected negative effects on participants were found in a study of a physical activity intervention among students conducted by Zabinski *et al*. (2001) who found increasing concerns about slimming in women. In our study, one negative consequence of the availability of a computer-based lifestyle test could be staff neglecting to talk about lifestyle with their patients, believing that providing the computer-based test is sufficient. This was assessed, but no such consequences were found regarding either of the two strategies. Other negative effects from using the new tool were not studied, which could be considered a limitation.

Adoption regarding the proportion of patients performing the test and the proportion being referred differed between the explicit and implicit centers, which is somewhat surprising

because only referral was expected to be influenced by the explicit implementation strategy. One possible explanation could be that individual staff members at the explicit centers discussed lifestyle issues with their patients to a higher degree and, even if they did not refer their patients to the test, patients themselves became curious and performed the test spontaneously. Data concerning referral to the test in this study was patient-reported, leaving unanswered the question about how many patients were referred to the test but did not do it. This is a weakness, but it probably affects the centers for the different strategies equally, and should not influence the results regarding the implementation strategy used.

The implementation dimension, concerning the extent to which the innovation has been used as intended, showed no differences according to the implementation strategy used. It would appear that those using the test used it in a similar way and this did not depend on how it was introduced. A study of guideline implementation among nurses showed that the adaptation of guidelines to local circumstances was crucial for a successful implementation (Alanen *et al.*, 2009). This was not the case in our study, as staff members chose to adopt or reject the tool, but once they had decided to adopt it they used it in the intended way.

The RE-AIM dimension maintenance was not considered in this study, because change at organizational level tends to be a slow process, and the long-term evaluation will not be conducted until the tool has been in operation for 2 years.

One of the features of the explicit implementation strategy (the discussion/decision session) was expected to produce a higher level of staff involvement in the decision process. However, staff at these centers did not express a higher degree of perceived involvement. Involvement is an important issue in change and innovation. Poole and van de Ven (2004) argue that "successful planned change requires a commitment grounded in an engaging vision and deep emotional involvement with the program." It seems that offering a discussion/decision session

is not sufficient to achieve this deep emotional involvement. In addition to the decision session, the major difference between the two implementation strategies was the 1-month testing period, which did not generate any additional costs. Thus, implementation outcome improved despite limited financial input, an important factor because benefits and costs of the implementation and the benefits and costs as a result of changes in provider behavior have to be considered at the introduction of new tools or guidelines in health care (Grimshaw *et al.*, 2004).

Implementation strategy was the only factor influencing implementation outcome that was evaluated in the present study. Other important factors have also been shown to affect the implementation process. The Promoting Action on Research Implementation in Health Services (PARIHS) model describes implementation success as a function of the nature and type of evidence, the qualities of the context, and the way the process is facilitated (Kitson *et al.*, 2008). The implementation strategies used in our study represented 2 ways of facilitating the process. The evidence (in our case the lifestyle intervention tool) was the same in all centers, although context might have differed between the PHC centers. Greenhalgh *et al.* (2005) also highlight the importance of the characteristics of the potential adopters, another factor that was not considered in the present study.

Whether implementation strategies should be based on theory or not has been discussed by several researchers (Eccles *et al*., 2005, Oxman *et al*., 2005, Bhattacharyya *et al.*, 2006). The theory-based strategy used in our study seemed to have a positive impact on the implementation. If this was a result solely of the strategy being based on theory, or if other factors, beyond the scope of this study, influenced outcome remains unsolved. The aim with this study, however, was to evaluate how outcome was influenced by the implementation strategy used, applying the RE-AIM framework.

CONCLUSION

In this study we compared an explicit theory-based implementation strategy with an implicit strategy. Our conclusion is that, regarding the dimensions reach, adoption, and effectiveness, the theory-based implementation strategy, including a testing period and allowing staff to try the innovation before using it in their daily practice, seemed to be more successful than a strategy in which the innovation was introduced and immediately used for patients.

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Table 1: The RE-AIM[a] Framework and its Application in the Present Study

Dimension	Original RE-AIM Definition	Application on Implementation of Innovations in PHC	Definition in this Study	Outcome Variable
Reach	The absolute number, proportion, and representativeness of individuals who are willing to participate in a given initiative	Absolute number, proportion and representativeness of staff members who have participated, ie, used the innovation in their practice	Proportion and representativeness of staff members who report having referred patients to the computer at least once a month	Proportion of staff members referring patients at least once a month
Effectiveness	The effect of an intervention on important outcomes, including potential negative effects, quality of life, and economic outcomes	The effect of the introduction of the innovation on staff members' attitudes and performance	The effect of the introduction of the computer-based test on staff members' attitudes and performance regarding lifestyle issues at the PHC center	Frequency of discussing lifestyle with patients now versus before. Perceptions about referring to the test. Reliance on effects of the test. Agreeing with advice provided. Perceptions of lifestyle issue importance at the center. Acceptance in staff group
Adoption	The absolute number, proportion, and representativeness of settings and intervention agents who are willing to initiate a program	The extent to which the innovation has been accepted at center level	The extent to which the computer has been used at center level, measured by proportion of visiting patients who perform the test or have been referred to the computer	Proportion of patients performing the test and being referred to the test
Implementation	At the setting level, implementation refers to the intervention agents' fidelity to the various elements of an intervention's protocol	Fidelity to the original ideas linked to the innovation. Is it used as intended?	Fidelity to the original ideas linked to the computer-based test. Are patients being referred, is the result discussed with patients, is the test discussed among staff members?	Test discussed in staff group. Test results discussed with patients. Proportion of patients referred and reasons for not referring. Feelings of being a part in the implementation process
Maintenance	The extent to which a program or policy becomes institutionalized or part of the routine	The extent to which the innovation has been institutionalized and is still in use after a specified time period	Not relevant in this study	Not relevant in this study

[a]RE-AIM, reach, effectiveness: adoption, implementation, and maintenance.

Table 2: Responses to Questions Concerning Effectiveness: Comparison Between the Two Strategies

Statement/Question	Implementation Strategy		*p*
	Explicit	Implicit	
Using the computer-based lifestyle test is well supported amongst staff			0.203[a]
Agree	9	7	
Partly agree	26	27	
Partly disagree	12	20	
Disagree	5	7	
Total (*n*)	52 (52)	61 (64)	
It is my opinion that this health care center prioritizes discussion lifestyle issues with patients			0.226[a]
Agree	20	15	
Partly agree	21	29	
Partly disagree	10	15	
Disagree	1	0	
Total (*n*)	52 (52)	59 (64)	
It feels good/would feel good to refer patients to the computer-based lifestyle test			0.063[a]
Agree	16	10	
Partly agree	30	40	
Partly disagree	5	7	
Disagree	1	4	
Total (*n*)	52 (52)	61 (64)	
It is my judgment that it is possible to influence patients' lifestyles with the aid of the computer-based lifestyle test			0.045[a]
Agree	10	4	
Partly agree	30	36	
Partly disagree	11	18	
Disagree	1	3	
Total (*n*)	52 (52)	61 (64)	
Have you read the advice provided by the computer-based lifestyle test?			0.013[b]
Yes, I did read the advice	48	44	
No, I did not read the advice	4	15	
Total (*n*)	52 (52)	59 (64)	
I feel I can stand for the advice provided by the computer-based lifestyle test[c]			0.011[a]
Agree	16	4	
Partly agree	30	38	
Partly disagree	2	2	
Disagree	0	0	
Total (*n*)	48 (48)	44 (44)	
How often have you brought up lifestyle questions with patients since the computer-based lifestyle test was introduced, compared with before its introduction?			0.012[a]
Much more often now	8	1	
Somewhat more often now	10	6	
Just as often	31	52	
Somewhat more often previously	3	2	
Much more often previously	0	0	
Total (*n*)	52 (52)	61 (64)	

[a]Mann-Whitney test.
[b]χ^2 test.
[c]Only respondents who did read the advice.

Table 3: Number of Tests and Number of Referred Patients Versus Number of Patients Aged 18 Years and Older Visiting the Center: Comparison Between the Two Strategies in Terms of Risk Ratio

	Implementation Strategy	
	Explicit	Implicit
Visiting patients age ≥18 y	14235	13872
Tests, total number	660	346
Tests, referred patients	365	143
Tests (RR)	1	0.54 (CI=0.48–0.60)
Referred (RR)	1	0.40 (CI=0.34–0.48)

Table 4: Responses to the Questions Concerning Implementation: Comparison Between the Two Strategies

Statement/Question	Implementation Strategy		*p*
	Explicit	Implicit	
Staff often discuss the computer-based test			0.408[a]
Agree	3	3	
Partly agree	17	17	
Partly disagree	24	28	
Disagree	8	13	
Total (*n*)	52(52)	61(64)	
I have felt being involved in the process with introducing the computer-based lifestyle test at the center			0.452[a]
Agree	10	8	
Partly agree	22	21	
Partly disagree	6	21	
Disagree	14	11	
Total (*n*)	52(52)	61(64)	
How do you use the results from the computer-based lifestyle test in meetings with your patients?[c]			0.727[b]
I do not use the results	20	16	
I discuss the results if the patient bring it up	19	14	
I ask for the results and try to start a discussion	4	3	
Total (*n*)	43(43)	33(34)	
When do you discuss the results from the computer-based lifestyle test with patients?[d]			0.113[b]
During the appointment when I refer the patient to the test	13	4	
At the next appointment	17	9	
Other time	3	4	
Total (*n*)	23(23)	17(17)	
Of the patients you have referred to the computer-based lifestyle test, approximately what percentage have you discussed the results with?[d]			0.944[b]
10 % or less	16	12	
More than 10 %	7	5	
Total (*n*)	23(23)	17(17)	
Why have you not used the results of the computer-based lifestyle test at appointments with your patients?[e]			0.737[b]
It has not been relevant	7	6	
I forget	2	1	
No time	4	1	
Other	7	6	
Total (*n*)	20(20)	14(16)	
Since beginning to use the computer-based lifestyle test, approximately what percentage of your patients have you referred to the test?[c]			0.323[b]
10 % or less	31	27	
More than 10 %	12	6	
Total (*n*)	43(43)	33(34)	
Why have you not referred patients to the computer-based lifestyle test?[f]			[g]
It is not my job	1	3	
It does not fit into my routines	2	3	
I forget	2	10	
Lack of time	0	0	
Other	0	1	
Total (*n*)	5(9)	17(30)	

[a]Mann-Whitney test.

[b]χ^2 test.

[c]Only respondents who state they do refer to the test.

[d]Only respondents who state they have discussed the results.

[e]Only respondents who state they do not discuss the results.

[f]Only respondents who state they never refer to the test.

[g]No statistical test could be performed because of the low number of respondents.