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Intervention

Computerized lifestyle intervention in routine primary health care: Evaluation of usage on provider and responder levels

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ABSTRACT

Objective: The aim of this study was to evaluate the use of a computerized concept for lifestyle intervention in routine primary health care (PHC).
Methods: Nine PHC units were equipped with computers providing a lifestyle test and tailored printed advice regarding alcohol consumption and physical activity. Patients were referred by staff, and performed the test anonymously. Data were collected over a period of 1 year.
Results: During the study period 3065 tests were completed, representing 5.7% of the individuals visiting the PHC units during the period. There were great differences between the units in the number of tests performed and in the proportion of patients referred. One-fifth of the respondents scored for hazardous alcohol consumption, and one-fourth reported low levels of physical activity. The majority of respondents found the test easy to perform, and a majority of those referred to the test found referral positive.
Conclusion: The computerized test can be used for screening and intervention regarding lifestyle behaviours in PHC. Responders are positive to the test and to referral.
Practice implications: A more widespread implementation of computerized lifestyle tests could be a beneficial complement to face-to-face interventions in PHC.

1. Introduction

Lifestyle behaviours such as alcohol consumption, smoking, diet and physical activity have been shown to have a great impact on health [1–3]. Individuals can make important contributions to their own health by adopting some health-related behaviours and avoiding others [4–6]. In many countries, lifestyle-related diseases are the leading causes of death [7–9]. There is increasing awareness among health care authorities that unhealthy lifestyle behaviours need to be addressed in routine health care. However, most health care systems focus on the management of acute illness and chronic health conditions. Health care providers face substantial barriers to providing preventive services aimed at achieving health-related behaviour change, as they often lack the time, knowledge, and skills [10–11].

The use of computer technology has been suggested as a way to overcome many of the barriers to integrating health behaviour change interventions into routine health care. Computer-based screening and advice, office-based or web-based, for various health-related behaviours has been developed during recent decades and there is a growing body of evidence supporting its effectiveness [12–15]. In a study by Kypri et al. [16], computerized alcohol interventions performed as well as practitioner-delivered brief interventions. Moreover, computerized interventions concerning alcohol or physical activity have been favourably evaluated in terms of feasibility, provider acceptability and patient willingness to participate in various settings, including emergency departments, primary care, and schools [17–22].

Research has demonstrated that computer-assisted health behaviour advice may have several advantages compared to conventional face-to-face counselling. The use of computers decrease the effect of social desirability and increase the amount of information disclosed [23–24]. Findings suggest that patients prefer to reveal information of a personal and potentially embarrassing nature to a computer rather than a person [25–27]. The use of computer-based screening and advice can improve the effectiveness of behavioural counselling through improved consistency of counselling and closer matching of intervention to patient characteristics and recommended guidelines. The number of staff needed to deliver counselling and the associated costs for

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personnel training can be reduced when advice is delivered by a computer [28].

Despite expanding documentation on the effectiveness and feasibility of delivering computer-based lifestyle interventions in health care, there is a paucity of research that evaluates implementation of such interventions in primary health care (PHC). The aim of this study was to evaluate the use of a computerized concept for lifestyle testing and tailored advice implemented in routine PHC, in terms of provider usage, responder characteristics and responder attitudes to the concept. To the best of our knowledge, this is the first attempt to evaluate a computerized lifestyle intervention concept in a routine PHC setting.

2. Methods

2.1. Setting

The study was conducted in Östergötland, Sweden, a county with approximately 420,000 inhabitants, considered representative of the Swedish population in terms of age distribution, employment rates and economy. Nine of the 42 PHC units in the county were invited by the regional director for PHC, to participate in the study. These specific nine PHC units had shown motivation and interest in health promotion, and were geographically spread across the county. All accepted to participate in the study, which started in autumn 2006.

The units varied in the number of general practitioners (GPs), nurses and other staff members employed and were situated in different, urban and rural, areas. The size of the PHC units, measured by number of listed patients aged 18 years or more, ranged from 4200 to 16,500 (average 9500). The study was carried out as a development project in routine PHC, in cooperation with the health care authorities in Östergötland County. In Sweden, health care is publicly funded, i.e. residents are insured by the state and health care services are funded through a taxation scheme of county councils.

2.2. The computerized concept

The computer-based lifestyle intervention concept was developed by the Lifestyle Intervention Research group at Linköping University, based on previous experiences from student health care and emergency department settings, as reported in Karlsson and Bendtsen [17], Bendtsen et al. [18] and Karlsson et al. [29].

The lifestyle test included questions on the following topics: age; blood pressure measurement; alcohol consumption; physical activity; motivation to change; attitudes to performing the test. If a patient reported they had been referred to the test, they were also asked about which staff category made the referral and about their attitude to being referred.

The questions on alcohol consumption were beverage-specific and evaluated weekly consumption on a day-by-day basis and frequency of heavy episodic drinking (HED), i.e. intake of a large volume of alcohol on any one occasion. If the respondent reported no alcohol consumption during the last 3 months, the subsequent alcohol questions were omitted. Alcohol consumption was measured by number of standard drinks (12 g alcohol) per week and frequency of HED, and was classified into three risk levels: low risk, increased risk and hazardous consumption. Hazardous consumption was defined for a woman as 10 or more standard drinks per week and/or 4 standard drinks per occasion (HED) once a week or more frequently, and for a man 15 or more standard drinks per week and/or 5 standard drinks per occasion (HED) once a week or more frequently. Those levels were based on recommendations from the Swedish National Institute of Public Health (SNIP) [30]. The intermediate risk level – increased risk – was defined for a woman as 7–9 standard drinks per week and/or 4 standard drinks per occasion (HED) 1–3 times per month, and for a man 10–14 or more standard drinks per week and/or 5 standard drinks per occasion (HED) 1–3 times per month. Those increased risk levels are not mentioned by SNIP, but were constructed by the research team to serve as a wake-up call in the test. The questions concerning motivation to change alcohol consumption were influenced by the Stages of Change model and had the three choices: "I have no intention to change", "I have considered change" and "I am determined to change". The respondents who had no intention to change were categorized as pre-contemplators, those considering change as contemplators, and those who had made a decision to change their habits as being in preparation phase [31].

Physical activity questions were based on recommendations from the Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine in 1995 [32]. The questions measured number of days per week with moderate-intensity aerobic (endurance) physical activity for a minimum of 30 min (rendered 1 point/day), and number of days per week with vigorous-intensity aerobic physical activity (rendered 2 points/day). To be considered physically active, 5 points had to be obtained. Respondents that reached 3–4 points were considered insufficiently active and those with less than 3 points inactive. Motivation to change physical activity was measured by one question about intention to increase physical activity within the coming 6 months period, answered with yes or no.

Respondents who completed the test received a printed sheet with information about their risk levels and tailored written advice, based on their answers.

2.3. Implementation activities

Managers and health coordinators at the nine PHC units were invited to an information session with the research team. All staff members were then invited to an information session at their own PHC unit, where the test was demonstrated and they were educated about how it should be used. Since it was not deemed realistic to expect all patients visiting the health care centre to be referred to the test the staff were told to decide which patients should be the target group for the test, simply in order to avoid forgetting to use the test. Thus, at each unit staff were allowed to determine selection criteria concerning which patient groups should be included in the testing routine, as well as the staff categories that should refer patients to the test. Hence, the patient groups and the referring staff categories varied between the units. All were told to refer patients who had their blood pressure tested. Four units added one group (aged 20–30 or "not severe mental disorders"), one unit added two more groups (aged 20–30 and aged 45–65), and one unit selected five groups in addition to "blood pressure" (blood lipid testing, aged 20–30, "not severe mental disorders", smokers, "patients on sick leave >28 days"). All units selected nurses to refer to the test, all but one selected also GPs, and five units added other staff categories as well. An agreement stating which patient groups and staff categories for referral were chosen was signed by the manager, and at least one person at each unit was appointed as a contact person between the PHC unit and the research team.

The nine PHC units were provided with computers, monitors and printers integrated in an IT kiosk specially designed for the project. PHC units with less than 11,000 listed patients aged 18 or older received one computer kit, larger units (three of the nine included) received two computer kits. The computers were equipped with the lifestyle test and the IT kiosks were placed in waiting rooms, corridors or in a separate room, depending on local conditions.

After an initial period of learning how to use the test, the computers were connected to the local health care computer network in Östergötland County, which made it possible to store data centrally, and give regular feedback to the participating units. From April 2007 each PHC unit was provided with weekly statistical feedback from the test, including the number of tests performed, proportion of respondents who stated they had been referred to the test by a staff member, and by which staff category, and proportion of respondents with hazardous alcohol consumption and/or low physical activity. Members from the research team visited each participating unit at least four times during the implementation period, to verify that the computers were operational and to participate in staff meetings. Reminder posters were distributed to all units to help staff remember to refer their patients to the test.

The objective was that staff members should actively refer the patients to the test. However, the patients were also free to spontaneously initiate tests. GPs, nurses or other staff members invited patients to perform the test after the normal consultation. Patients below 18 years of age, not able to understand Swedish, or too ill were excluded from referral. Staff members were asked to report in the medical records when a patient had been advised to perform the test. The test was performed anonymously, and the respondents themselves decided whether to discuss the test results with any member of the PHC staff. It was assumed that the majority of the respondents would not ask for additional help to change their health-related behaviours, but to take responsibility for their own health. However, if a patient asked for extended counselling the PHC unit had agreed to provide some consultation.

2.4. Data collection and analysis

The data were analysed after 1 year of data collection from April 2007 to March 2008. Data concerning the number of listed patients at each unit and the number of individuals who visited the PHC during the period were collected from county council files. All other data were obtained from the test results. Statistical analyses were performed using the computer-based analysis program SPSS (Statistical Package for the Social Sciences) version 15.0. Analyses were performed using the chi-squared test or the Kruskal–Wallis test. Correlations were analysed using Pearson's correlation coefficient. Statistical significance was defined as a p-value ≤ 0.05.

3. Results

During the 1-year study period, 5202 tests were initiated, of which 3065 tests (59%) were completed. Among the completed tests, 38 respondents stated that they had consumed >100 standard drinks per week. These were regarded outliers and were not included in the data analysis. No outliers in terms of physical activity were found. The remaining 3027 tests were included in the further analyses.

3.1. Usage on a provider level

Table 1 shows the number of tests performed, either by patients who were referred by staff or spontaneously without referral. The decrease in July occurred during the most common vacation period in Sweden. The average proportion of tests in relation to the total number of individuals who attended the PHC units during the study period was 5.7%.

The characteristics of the nine PHC units in terms of the size of the units, selected referral groups, number of tests and referrals, are shown in Table 2. There were considerable differences not only in the number of tests performed, but also in the proportion of respondents who were actively referred by the staff to perform the test. Forty-four percent (range 11–87% per unit) of the completed tests were

Table 1
Number of respondents who performed the test month by month during the 1-year study period (starting April 2007), referred or spontaneously, at the nine participating PHC units.

	April	May	June	July	August	September	October	November	December	January	February	March	Total
Number of tests performed	276	345	244	128	207	287	345	320	224	233	234	184	3027
Referred[a]	116	151	101	24	71	138	184	151	95	107	98	84	1320
Not referred[b]	160	194	43	04	136	149	161	169	129	126	136	100	1707

[a] Respondent stated that he or she was referred to the test by a staff member.
[b] Respondent stated that he or she was not referred to the test by a staff member.

Table 2
Size of PHC unit, referral groups, computer localization, number of tests and active referrals to the test.

Unit	Listed patients ≥18	Individuals aged ≥18 who attended the PHC[a]	Number of groups selected[b]	Number of completed tests	Number of respondents actively referred to the test	Proportion completed tests/individuals attending the PHC (%)[a]	Proportion referred/total number of completed tests (%)	Proportion referred/individuals attending the PHC (%)[a]
A[c]	4209	3277	2	232	128	7.1	55	3.9
B[d]	5612	3592	3	281	246	7.8	87	6.8
C[c]	6179	4063	2	453	339	11.1	75	8.3
D[e]	7598	4738	2	170	82	3.6	48	1.7
E[c]	9127	4907	2	291	79	5.9	27	1.6
F[c]	10766	6744	1	260	58	3.9	22	0.9
G[c]	11223	6049	1	282	148	4.7	52	2.4
H[c]	14421	8798	1	368	167	4.2	45	1.9
I[e]	16509	10720	6	690	73	6.4	11	0.7
Total	85644	52888	n.r.	3027	1320			
Average						5.7	44	2.5

[a] During the 1-year study period, starting March 2007.
[b] Each unit selected groups of patients who should be referred to the test.
[c] Computer placed in corridor.
[d] Computer placed in separate room.
[e] Computer placed in waiting room.

performed by individuals who stated that they had been referred by staff. These represent 2.5% of the individuals who visited their PHC unit during the study period (range 0.7–8.3% per unit). The unit that selected the highest number of referral groups had one of the lowest proportions of referred patients. Two units selected referral groups that did not coincide with the questions in the test, and could not be analysed according to how they met the selection criteria. Among the remaining seven units 59% (range 16–91% per unit) of the referred patients did meet the selection criteria. There was no correlation between staff groups selected to refer patients to the test, and number or proportion of referred patients.

3.2. Responder characteristics

Slightly more than half of the tests (52%) were completed by women. One-fifth of the respondents scored for hazardous alcohol consumption (range 16–23% per unit) and one-fourth (range 21–30% per unit) of the respondents had low levels of physical activity (insufficiently active 13%, inactive 14%). Men had higher rates ($p < 0.001$) of hazardous alcohol consumption (28%) than women (14%), and lower rates ($p < 0.05$) of being physically active (72%) than women (75%).

Sixty percent of the hazardous alcohol consumers were, according to the Stages of Change model, identified as pre-contemplators, 24% as contemplators, and 16% as being in the preparation phase for change [31]. There were no differences according to gender.

Three-fourths of the respondents stated that they intended to increase their physical activity level and one-fourth did not express such an intention. Those already physically active were significantly more interested in increasing their current physical activity than those who were categorized as insufficiently active or inactive ($p < 0.001$), the proportions were 56% among those insufficiently active or inactive, and 82% among the physically active. No gender differences were found.

Those who had been referred to perform the test (44%) were significantly older than those performing the test spontaneously ($p < 0.001$). Almost half of the referred participants (43%) were aged 60 years or older, 21% were aged 51–60, 14% were aged 41–50, 10% were aged 31–40, 6% were aged 21–30 and 5% were 18–20 years old. With regard to levels of hazardous consumption or physical activity, no differences were found between respondents who were referred by staff and those performing the test spontaneously. The proportion of spontaneous tests was positively associated with the proportion of interrupted tests at each unit ($r = 0.8$, $p < 0.05$).

3.3. Responder attitudes to the test

The vast majority (88%) of the respondents who completed the test found it easy or very easy to perform, with no correlations with gender or age. Referred patients found the test significantly easier to perform than those who performed the test spontaneously ($p < 0.001$). Of the referred patients 90% found it easy, 7% neither easy nor difficult, and 3% had difficulties; 5% of the non-referred reported difficulties and 87% found the test easy to perform. The majority of patients (84%) who were referred to the test found referral positive, whereas 3% found it negative to be referred. Men were less positive to the referral than the women, with 4% of men, and 2% of women reporting that they found it negative to be referred ($p < 0.01$). Respondents with hazardous alcohol consumption ($p < 0.001$) or low physical activity levels ($p < 0.05$) found it significantly less positive to be referred. Among the hazardous alcohol consumers, 6% were negative, and among others 2%. Among the inactive or insufficiently physically active respondents, 4% were negative to the referral; 2% of the physically active respondents had a negative attitude to being referred to the test.

4. Discussion and conclusion

4.1. Discussion

This study was conducted in order to investigate the usage of a computer-based concept for assessment of and tailored advice concerning alcohol consumption and physical activity, when implemented in routine PHC. The reason why only these two topics were studied was to keep the test short, but still focus on important factors influencing health. In the future, the test will be developed to include other lifestyle issues as well. The results showed considerable variation between the participating PHC units with regard to the proportion of patients who performed the test and the proportion of respondents who reported having been referred to the test, despite similar implementation efforts. Referral rates were likely affected by many factors not investigated in this study, but the placement of the computer, the size of the unit and the number of selected referral groups appears to have impacted on the proportion of patients being referred. Interestingly, the unit that selected the highest number of patient groups to refer actually had the lowest proportion of referred patients of all units. This could suggest that a high number of selected groups leads to confusion among staff members, and thus obstructs the referral process. Another explanation might be that those who selected the groups were not referring themselves. It could be possible that the staff members who selected the groups would like to pay more attention to lifestyle interventions than the referring staff. Among the referred patients almost half did not meet the referral group criteria, which also indicates that the strategy to select specific referral groups did not facilitate the referral process. In terms of hazardous behaviour regarding alcohol consumption or physical activity, there were no differences between referred patients and those who performed the test spontaneously.

An average of 5.7% of all individuals attending the nine PHC units during the 1-year study period completed the test. This proportion could probably have been higher if more effort had been made to encourage the staff to refer patients to the test. However, the purpose was to examine the implementation of a new working method under real-world conditions, i.e. studying implementation effectiveness rather than efficacy. The implementation decisions were a top-down process, with managers deciding whether to participate in the project. It is possible that a higher degree of staff involvement in the decision phase would have resulted in higher referral rates, and thus, in a higher proportion of individuals performing the test. In a study conducted in Virginia, USA, where primary care clinicians referred their patients to a web site that provided information for behavioural change, 4% of patients who had attended the participating family care practices visited the web site [33]. Implementation success has been shown to depend on the characteristics of the innovation, adopter characteristics and the context in which the implementation occurs [34]. In our study the innovation itself did not differ between the units, but adopter characteristics and the context varied to a certain degree.

Responder attitudes to the test were found to be mainly positive. The respondents stated that they found the test easy to use and those referred to the test were predominantly positive to the referral, which implicates a feasible concept at the responder level. However, those most negative to being referred to the test probably did not answer the test at all, or initiated it but did not complete it. It is also possible that respondents who had difficulties in performing the test were more likely to leave it unfinished than those who found it easy.

Men were found to be less positive than women to being referred to the lifestyle test. Past research, though, has shown that men are more likely to change their alcohol consumption after brief interventions than women, which could indicate that men are more positive to perform a test and get advice [35–36]. However, men had higher alcohol consumption, and consumption levels were associated with a more negative attitude to referral to the test. A similar pattern was seen with regard to physical activity; those respondents who had low levels of physical activity were more negative to being referred than those who were physically active. Awareness of having a less healthy lifestyle probably predicts a more reluctant attitude to being referred to the test.

The proportion of respondents reporting hazardous alcohol consumption in our study was higher than in former studies in Swedish settings although the measurement methodology differed somewhat [37,38]. The levels of physical activity found coincided quite well with former studies in Sweden [39]. The alcohol consumption levels reported could possibly be a result of more honest self-reports from respondents using the computer, instead of a face-to-face counselling session. The fact that the test was performed anonymously may also have contributed to more truthful reporting. Previous research has demonstrated that the use of computerized self-administered assessment tools results in higher reporting of socially undesirable behaviours [26].

A considerable proportion of the respondents stated that they were prepared to change their habits. According to the test results, more than one-third of the hazardous alcohol consumers were thinking about changing their alcohol consumption habits, and more than half of those reporting low levels of physical activity were determined to increase this. This information about the patients could possibly help PHC staff in their efforts to guide and support their patients to a lifestyle change. In terms of physical activity, one way of doing this could be the method of ''physical activity on prescription'', which has been evaluated and found feasible in various settings [40,41]. According to Pinto et al. [5], addressing lifestyle factors should be a ''gold standard'' in primary care. When doctors, nurses, or other staff groups refer their patients to the lifestyle test, it is a way of emphasizing to the patient the medical staff's concerns about the influence of lifestyle factors on health. There is also a potential learning effect for the staff, since discussions about the feedback concerning hazardous lifestyle among patients could lead to increased awareness of the importance of supporting the patients to choose a healthy lifestyle, and in the next step to new routines in everyday care, i.e. a double-loop learning process [42].

4.2. Study limitations

One limitation of this study is that there is no information about those patients who were referred to the test but did not do it, or, since the computers stored information only from completed tests, those who did not complete it. Neither we can be sure about whether the same patient did complete the test more than once. A few patients probably did, but we believe this did not significantly affect the results. We also lack information about how many patients that were actually referred, since the research team did not have access to the medical records, but only to the data collected by the computers. Another limitation is that only a small number of implementation aspects were considered.

4.3. Conclusions

The study shows that the computerized test can be used for screening and intervention regarding lifestyle behaviour in a PHC setting, even though a fairly low proportion of the patients were referred to perform the test. The responder characteristics revealed high levels of hazardous behaviour regarding alcohol consumption. Responder attitudes to the test and to the referral were generally positive, thus the concept could be considered feasible at responder level.

4.4. Practice implications

The computerized concept offers a means of providing lifestyle intervention in PHC. A more widespread implementation of computerized lifestyle tests could be a beneficial complement to face-to-face interventions.

Conflicts of interest

None.

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