SELF-REPORTED HEALTH BENEFITS IN PATIENTS RECRUITED INTO NEW ZEALAND'S 'GREEN PRESCRIPTION' PRIMARY HEALTH CARE PROGRAM

KM Sinclair and MJ Hamlin

Lincoln University, Lincoln, Canterbury, New Zealand

Abstract. To assess the effectiveness of the 'Green Prescription' (GRx) program in promoting self-reported health benefits in previously inactive individuals, between 2001 and 2002, a retrospective survey was administered to 124 GRx patients throughout New Zealand. Participants were a non-randomized subset of a larger GRx population. Logistic regression was used to calculate odds ratios (OR) and 95% confidence intervals (CI) for differences in health outcomes between participants who had increased physical activity levels compared to participants who had decreased or not altered activity levels since first being prescribed the GRx. Completed surveys were obtained from 124 of 263 eligible participants; a response rate of 47%. Fifty-six percent of participants reported increases in physical activity levels after the GRx program, with 70% still undertaking some form of physical activity. Participants accumulated at least 30 minutes of physical activity per day on 3.4 ± 2.5 days (mean ± SD) per week. Participants who reported increased physical activity levels after the GRx reported substantially higher energy levels and improved breathing when compared to participants who reported less or about the same physical activity after the GRx intervention. Increased physical activity in GRx patients was associated with greater perceived health benefits. Effective and ongoing support networks were seen as important for behavior change.

INTRODUCTION

It has been firmly established that physical inactivity is directly linked to a range of lifestyle diseases including chronic heart disease, hypertension, elevated cholesterol, non-insulin dependent diabetes mellitus, and osteoporosis (Kesaniemi *et al*, 2001); and that physical activity interventions can reduce the risk of some of these diseases (Department of Health and Human Services, 1996; Kesaniemi *et al,* 2001; Pescatello, 2001). Regular physical activity can also positively influence individual's self-efficacy, confidence, cognitive functioning, and overall quality of life (Dunn *et al,* 2001; Spirduso and Cronin, 2001).

It is increasingly recognized that the promotion of the 'lifestyle-based physical activity' approach is as good as, or potentially better than, the traditional 'structured endurance exercise' approach to stimulating at-risk populations to adopt a physically active lifestyle (Phillips *et al,* 1996; Dunn *et al,* 1997; Pescatello, 2001; Sadovsky, 2001). The success of less-structured, more convenient lifestyle-based physical activity programs highlights the immense potential for general practitioners (GPs) and other health professionals to advocate physical activity for health (Dunn *et al,* 2001; Pratt, 1999). It has been suggested that New Zealand in particular is an ideal place for such interventions, because 80% of New Zealand adults visit their GP at least once a year (Ministry of Health, 1998).

Physician-based lifestyle physical activ-

Correspondence: Dr Michael J Hamlin, Environment Society and Design Division, PO Box 84, Lincoln University, Canterbury 8150, New Zealand.
Tel: +64(03) 325-3820; Fax: +64(03) 325-3857
E-mail: hamlinm@lincoln.ac.nz

ity programs from the United States and the United Kingdom have shown a positive impact on short-term (3-6 months) behavioral modification, which were generally not maintained in the long term (> 12 months) (Calfas *et al,* 1996; Hartland *et al,* 1999; Norris *et al,* 2000). Although New Zealand researchers have recently demonstrated the long-term health benefits and cost-effectiveness of a primary-care based lifestyle physical activity program, called the 'Green Prescription' (GRx), on a localized regional population (Elley *et al,* 2003, 2004), little is known about how the patients perceived the health benefits. The aim of this study was to use a retrospective survey design to investigate perceptions of responses to the GRx program, which may be used to inform future intervention development and delivery.

MATERIALS AND METHODS

Study design and participants

Participants were recruited between November 2001 and January 2002 from a list provided by Sport and Recreation New Zealand (SPARC, formally the Hillary Commission). In SPARC's routine correspondence, GRx patients were asked whether they would be interested in being contacted for further research purposes. SPARC then contacted those who had indicated their interest and invited them to be involved in this study. The GRx patients were then informed that they would be contacted further by the authors of this study. A list of candidates who had agreed to participate was sent from SPARC to the authors at Lincoln University. These candidates were subsequently contacted by the authors, given information on the study, and asked to complete the questionnaire. The research project and final questionnaire was approved by the Lincoln University Human Ethics Committee (reference number 2001/21). All of the self-selected subjects were contacted, and those who gave consent at the time were included in the sample. The sample consisted of patients from throughout New Zealand who were first prescribed their intervention in late 1999, 2000, and early 2001. All participants were administered their intervention at least 10 months prior to the survey, with the majority (80%) of participants having received their intervention for at least 12 months.

Subjects were recruited into the GRx scheme by their GP (general practitioner) or practice nurse because of the potentially positive impact that regular involvement in physical activity could have for their health. Prior to participation in the GRx program, patients were typically not sufficiently active to meet physical activity guidelines for health.

The Green Prescription intervention

The GRx program, which was initiated by SPARC in 1998, includes the use of specific and tailored physician advice, detailed physical activity prescriptions, the promotion of lifestyle activities, assistance with overcoming barriers to physical activity, a team-based structure for exercise promotion, and the provision of supplementary educational materials (Table 1).

The GRx program involves assessing the physical activity needs of at-risk patients and providing them with tangible recommendations in the form of a prescription. The GRx program provides substantial support and encouragement for patients through a team-based approach to physical activity counseling. This team-based approach involves the collaboration of health care professionals, Regional Sports Trusts (RSTs), SPARC, and local leisure centers. The RSTs act as facilitators and a support base for patients to gain additional information on activity programs and also assist in the formation of activity groups (*ie*, walking groups), which in turn provide additional avenues for interpersonal support and

Table 1
Timetable of the follow-up and support procedures for the Green Prescription patients in this study.

Timeframe	Support and follow-up details.
Day 1	Patient visits their GP or practice nurse, and a green prescription script is administered. If the GP in consultation with the patient decides that increased physical activity is an appropriate goal, the GP will discuss this with the patient and then write down specific, usually home-based, physical activity and walking tasks on a standard green prescription and give this to the patient. With the patient's consent, a copy of the green prescription is forwarded to the Regional Sports Trust (RST).
First week	A follow-up telephone call (approximately 30 minutes) from an exercise specialist (patient support personnel) at the RST occurs. The call is to give support and encouragement to the patient. Motivational interviewing techniques are used, and specific advice about exercise or community groups that offer exercise is provided if appropriate.
1-3 months	Up to three follow-up telephone calls from the patient support personnel who made the initial call occur to maintain motivation and support and provide further information.
3 months	Patients receive their first Green Prescription newsletter. The newsletters continue to be sent out four times a year and contain information about physical activity initiatives in the community and motivational material. Other mailed materials such as specific exercise programs are sent to interested patients.

motivation. This collaborative approach involves the initial prescription of physical activities by an individual's GP, followed by behavioral assessments by the RST patient support personnel and exercise professionals. These professionals help to determine the most suitable form of physical activity for each GRx patient throughout the behavior change process.

Measures

A survey was administered by telephone to 116 GRx patients and by mail to 8 patients that were unable to be contacted by phone. All patients had been on the program for at least 10 months, with the majority (80%) on the program for 12 months or more. The interview consisted of 14 questions and lasted approximately 5-10 minutes. We asked patients about the changes they had noticed in their health and well-being since first being prescribed the GRx, including perceived changes in health outcomes, such as number of medications, body weight, breathing ability, energy levels, mobility, strength, and overall general wellbeing. Patients were also asked about any health changes that their GP had notified to them during the GRx period. In addition, patients were asked how many days over the previous week that they had accumulated at least 30 minutes of physical activity, and whether they were spending more or less time on physical activity as compared to before the GRx intervention. The survey was based on similar un-validated surveys used by SPARC (van Aalst and Daly, 2004, 2005), and was amended slightly after a pilot study with 12 subjects. Validated physical activity surveys were not used because they lack the subjective health-related questions required to ascertain perceived health gains in GRx patients; however, a question from the validated short-form New Zealand Physical Activity Questionnaire (Moy *et al,* 2003) was included in the

survey to determine the compliance of GRx patients to the New Zealand physical activity guidelines.

Data analysis

Data were analyzed using the Statistical Analysis System (SAS Institute, Version 8.0, Cary, North Carolina). Descriptive statistics were used to characterize the types of people that participated in the study, along with their subjective health changes and adherence rates after the GRx prescription. To investigate the effect of physical activity on the various subjective health outcomes, patients were separated into subjects who reported increased levels of physical activity after the intervention from those who reported decreased or no change in physical activity levels. Logistic regression was used to model the data for the two groups and produce odds ratios (ORs) with 95% confidence intervals (95% CI) (Proc Genmod). To make inferences about true (population) values of the effect of physical activity on health outcomes, p-values and statistical significance were not used. Instead, uncertainty in the estimate of changes was presented as 95% confidence intervals. Cohen's effect sizes were then used to make inferences about the magnitude of the effect. For example, an odds ratio of 1.0 = trivial, 1.5 = small, 3.5 = moderate, 9.0 = large, and 32 = very large (Cohen, 1988).

RESULTS

Characteristics of respondents

Of the 263 patients contacted, 124 completed the survey by telephone interviews (n = 116) or mail out (n = 8). The response rate was 47%. The majority of participants were female (66%) and aged between 50-79 years (65%). New Zealanders or European New Zealanders made up 75% of the population sample, while 12% were European, 6% New Zealand Maori, 1% Asian, and 6% were of other ethnic origins. The predominant medical condition for which participants were first prescribed their GRx was diabetes (20%), followed by weight issues (18%), and high blood pressure, stroke, or risk of stroke (15%) (Table 2).

Adherence to the Green Prescription

The majority of participants (70%) reported that they had continued to be physically active since starting the GRx program (43% continued to follow the GRx exercises or physical activities, and 27% were undertaking physical activity but different from that prescribed in their GRx). The remaining participants were temporarily off the GRx exercises and physical activities (15%) or were no longer following the GRx program at all (15%). Of those currently not following the GRx program, 51% stated that injury and illness or physical restriction prevented their participation in physical activity, 27% reported time constraints, and 11% indicated that a lack of motivation prevented them from continuing with the GRx program.

Self-reported health changes

A large number of participants (n = 98, 79%) noticed changes in their own health while adhering to the GRx program. Of those participants noticing a change in health, the majority (83%) observed either a decrease or no substantial change in the medication they required since being issued the GRx. A high proportion of participants (88%) also indicated that their body weight had either decreased or stabilized since beginning the GRx program. Forty-nine percent noticed breathing was easier after the GRx. Overall, it was found that the majority of patients had experienced positive health changes since commencing the GRx program (Table 3), with 80% indicating they generally felt better.

Physician-reported health changes

Of the 35% (n = 43) of those participants who had indicated that their doctor or nurse had mentioned health changes, 63% men-

Table 2
Medical conditions for which participants were first prescribed a green prescription.

Medical condition[a]	n (%)
Arthritis, osteoporosis and back pain or problems	9 (8)
Diabetes	25 (20)
Pain (miscellaneous)	4 (3)
Smoking	1 (1)
High cholesterol	6 (5)
Body weight issues	22 (18)
Asthma and other respiratory problems	7 (5)
Heart problems (angina, heart attack, etc)	11 (9)
High blood pressure, stroke or risk of stroke	19 (15)
Stress, anxiety, fatigue or depression	7 (6)
Other	13 (10)

[a]Data are numbers and (%) of participants with the medical condition.

Table 3
Self-reported health changes witnessed by participants after being issued a GRx (n = 98).

Health parameter	Increased n %	Decreased n %	Unchanged n %
Medication	17 (17)	24 (25)	57 (58)
Body weight	12 (12)	51 (52)	35 (36)
Energy levels	65 (66)	9 (9)	24 (25)
Mobility	59 (60)	9 (9)	30 (31)
Aches/Pains	23 (23)	34 (35)	41 (42)
Strength and fitness	75 (77)	4 (4)	19 (19)
Calmness	56 (57)	3 (3)	39 (40)

Data are numbers and (%) of participants who reported the health change.
As each participant could answer more than 1 question the data does not sum to 100. Data is provided for the 98 participants who indicated a change in their own health while adhering to the GRx program.

tioned that their doctor or nurse had commented on the patient's decreased weight, over half (53%) mentioned a decrease in blood pressure, and 48% mentioned a decrease in blood cholesterol levels of patients.

Physical activity

Over half (n = 69, 56%) of participants indicated that they were currently spending more time in physical activity compared to before being prescribed the GRx. In contrast, 19% of participants commented that they were undertaking less physical activity compared to before being prescribed their GRx. Of those undertaking less physical activity, nearly two-thirds (64%) reported that illness, injury, or physical restriction had resulted in diminished activity levels, while another 14% claimed that time constraints (especially relating to work commitments) were the major limitation for physical activity adherence.

Moderate to large effects were found for responses relating to increased energy levels

Table 4
Changes in subjective health outcomes in patients after at least 10 months of GRx intervention, n (%).

	Increased physical activity levels after GRx intervention			Decreased or unchanged physical activity levels after GRx intervention		
	Decreased	Unchanged	Increased	Decreased	Unchanged	Increased
Medications	19 (30)	33 (52)	11 (18)	5 (14)	24 (69)	6 (17)
Body mass	34 (54)	23 (37)	6 (10)	17 (49)	12 (34)	6 (17)
Energy levels	1 (2)	13 (21)	49 (78)	8 (23)	11 (31)	16 (45)
Mobility	3 (5)	22 (35)	38 (60)	6 (17)	8 (23)	21 (60)
Aches/Pains	22 (35)	27 (43)	14 (22)	12 (34)	14 (40)	9 (26)
	Harder	Unchanged	Easier	Harder	Unchanged	Easier
Breathing	0 (0)	29 (46)	34 (54)	4 (11)	17 (48)	14 (40)
	No	Unchanged	Yes	No	Unchanged	Yes
Strength/fitness improvement	2 (3)	10 (16)	51 (81)	2 (6)	9 (26)	24 (69)
Feel relaxed	0 (0)	28 (44)	35 (56)	3 (9)	11 (31)	21 (60)
Feel better	0 (0)	7 (11)	56 (89)	1 (3)	12 (34)	22 (63)

Data are the numbers and (%) of patients in each group with the change in the subjective health outcome.

(OR = 24.5, 95% CI = 2.8-210.0) and easier breathing (OR = 9.7, CI = 1.0-94.7) in the participants who reported increased physical activity compared to participants who reported less or about the same physical activity levels after the GRx intervention. The effects for the categories of patient wellbeing (OR = 2.5, CI = 0.1-42.5), number of medications (OR = 2.1, CI = 0.5-8.4), body weight increase (OR = 0.5, CI = 0.1-1.7), body weight decrease (OR = 2.0, CI = 0.6-7.1), and strength and fitness (OR = 2.1, CI= 0.2-16.0) between the participants who reported increased physical activity compared to those whose physical activity remained the same or decreased were trivial to small and unclear (Table 4). Participants from both groups reported similar increases in mobility after the GRx, but the group that reported more physical activity were also less likely to report decreased levels of mobility (OR = 0.3, CI = 0.1-1.2). Reported aches and pains were similar in both groups after the GRx.

Well over half of the participants (n = 74, 60%) had undertaken at least 30 minutes of physical activity on 3 days over the last week, with 34% having met the current physical activity guidelines (30 minutes on at least 5 out of 7 days), and 20% having undertaken physical activity every day (7 days). Overall participants had been physically active for 30 minutes a day on 3.4 ± 2.5 (mean ± SD) days per week.

Support networks

Most respondents (n =98, 79%) indicated that they perceived the support received from the Regional Sports Trusts and SPARC as relatively important, while 36% indicated that the support was very significant in assisting them to be physically active. Only 6% of participants perceived that the support was not at all important.

DISCUSSION

Telephone surveys are relatively easy and inexpensive to administer, and have been used successfully to gather information on most

dimensions of health (Liao *et al,* 2004); but, they may suffer from poor reliability or validity. This study utilized an uncontrolled retrospective survey to measure health and physical activity outcomes after the GRx intervention. Verifying the reliability and validity of the measures used in the survey was beyond the scope of this project and therefore a weakness of this study. Despite this weakness, this study provides a valuable insight into the self-reported health changes associated with participation in the GRx program. Furthermore, findings from two independent surveys conducted on substantially more GRx patients (1,190 and 1,888 patients in 2004 and 2005, respectively) reported similar findings to this research, which gives us confidence that this study had reasonable reliability and validity (van Aalst and Daly, 2004, 2005). Nonetheless, because GRx patients may have had difficulty with not only recalling pertinent information, but also correctly recognizing health changes, the results of this study should be regarded as speculative until further prospective studies are completed. In addition, the rather small sample size, which was due to the unavailability of many subjects in this study, needs to be considered because it may not be representative of the entire GRx patient population.

The compliance rate of 47% was higher than previous reports (van Aalst and Daly, 2004, 2005), but it should also be regarded as a possible source of variability because a low compliance rate may lead to an unrepresentative population sample and thereby restrict the generalizability of the results to the entire population of GRx patients. In addition, because subjects were self-selected, a further bias may have been introduced because it is likely that those who are more active are also more likely to volunteer for such a study. However, this was overcome, somewhat, by separating the subjects by activity levels. The lack of a control group in our study did not allow us to gauge the magnitude of change between GRx patients and similarly sedentary individuals in the general population. But, if New Zealanders are similar to individuals in other developed countries (Martinez-Gonzalez *et al,* 1999) where physical activity is on the decrease, then the increased physical activity levels found in the GRx patients in this study probably represents an improvement in overall physical activity compared to the general population. Additional research is required to substantiate this.

Despite the fact that Maori and Pacific Island people were under-represented in this study by national averages, the participation rate of these ethnic populations was representative of all GRx patients in 2001 and 2002 (van Aalst and Daly, 2006). Although this study had a number of limitations, the results were real perceptions of patients after the GRx intervention, which may be of use for future improvements of the program.

This survey found that 56% of respondents increased their physical activity levels compared to baseline. The fact that most patients (80%) were administered their GRx more than 12 months previously suggests an association between participation in the GRx program and exercise adherence in mostly inactive individuals. A recent randomized controlled trial on the effectiveness of the GRx program in promoting long-term physical activity adherence over 12 months reinforces this finding (Elley *et al*, 2003). The lifestyle approach to physical activity participation, the provision of support networks, and the education of individuals on the health benefits of physical activity probably contributed to the success of the GRx program in this and other reported studies (Elley *et al*, 2003, 2004; van Aalst and Daly, 2004, 2005).

As indicated by the US Department of Health and Human Services 1996 report, at least 30 minutes of moderate intensity physical activity per day, most days of the week is

sufficient to provide substantial health benefits (Department of Health and Human Services, 1996). The current survey indicated that after at least 10 months on the GRx program participants were undertaking 30 minutes of physical activity on approximately 3.5 days per week, with one-third of the respondents (34%) meeting or exceeding physical activity guidelines. Despite the finding that only one-third of subjects undertook 30 minutes of physical activity on five or more days of the week, this result is comparable to national averages which report that only 39% of New Zealand adults meet this guideline (Sport and Recreation New Zealand, 2003), and is a substantial shift from prior to the GRx intervention when no patients were meeting this physical activity guideline.

The majority of respondents observed a positive change in health status since they were first administered their GRx, with 80% of these individuals reporting that they generally felt better. While respondents overall reported improved health, the health benefits were more obvious for the respondents who had reported increased levels of physical activity since being given the GRx. This group scored substantially higher on most of the health outcomes compared to the group that reported they were doing less or about the same amount of physical activity since being given the GRx. These changes appear to correspond with recent research that associated long-term physical activity adherence with substantial chronic health benefits (Kesaniemi *et al,* 2001). However, it must be acknowledged that, of the participants who reported no change or a reduction in their physical activity levels since starting the GRx, 64% indicated injury or illness was to blame, which may account for their poorer overall well-being, rather than any reduction in physical activity. Additionally, although not directly comparable, our results were consistent with findings from a more comprehensive randomized control trial which found positive changes in general health and wellbeing after a similar GRx intervention (Elley *et al,* 2003).

While previous research has indicated that continuous follow-up and support from health care professionals is imperative for successful physical activity adoption and maintenance of individuals participating in primary health care programs (Glasgow *et al*, 2001), the current study indicated that surprisingly few patients (35%) reported that their physician or practice nurse had noticed or mentioned any changes in their health since they initiated the program. Although the GRx initiative appears to reduce many of the physician barriers to physical activity counseling, these findings possibly indicate a lack of follow-up protocols to advise long-term exercise maintenance. Further funding may be required to ensure the continuous involvement of practitioners throughout the behavior modification and maintenance process in the GRx program. The low number of health professionals mentioning changes in their patient's health since initiating the GRx program may also indicate a discrepancy between the perceived and actual health benefits gained through participation in the GRx by patients and health professionals, respectively. Further research is required to investigate the perceived and actual changes in health as reported by patients and their health professionals after participation in the GRx program.

Support is a crucial factor throughout the behavior change process (Spanier and Allison, 2001). Overall, participants perceived the support provided by SPARC and the RSTs as very important in helping them to become physically active. Many participants also commented on the approachability of the RSTs 'patient support personnel' and the value of the additional support gained through group-based physical activities organized by the RSTs. These findings further illustrate the significance of the 'team' approach to assisting sedentary indi-

viduals to become physically active. While participants were impressed with the initial contact and support provided through the GRx program, a few were disappointed with the lack of continuing support beyond three months of involvement in the program. In accordance with the transtheoretical model, continuing support is essential throughout the maintenance stage in order to maintain motivation levels and prevent behavioral relapses (Pinto *et al,* 1998; Duffy and Schnirring, 2000).

While a previous randomized control trial (Elley *et al,* 2003) demonstrated the effectiveness of the GRx program in maintaining 12-month physical activity levels, information on the health benefits of such an intervention from the patient's perspective is missing. Overall, GRx patients who increased their physical activity levels reported substantially greater improvements in health outcomes when compared to patients who maintained or decreased their activity levels. This unique collaborative approach to exercise prescription provides various avenues for participants to access information and support throughout the behavior change process. Further improvements in health outcomes of GRx patients may be expected with additional support beyond the 3-month follow-up period and more follow-up input from GPs.

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