



Students Calcium Awareness Program: A Proposal of Mobile Devices Health Promotion Program

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Aims: The aims of this health promotion program are to increase the knowledge and awareness regarding calcium dietary intake among college students and to positively change their attitude towards it.

Methodology: This health promotion program is designed to target the undergraduate university students (18-22 year old). The program will be delivered to the students through their mobile devices by downloading a free mobile app directly from the internet to their smart phones and tablets. The logic model used in the educational program (Intervention) is to increase participants knowledge and awareness regarding calcium (Determinant), to assist them in selecting their dietary options rich in calcium (Behavior) and eventually prevent osteoporosis and fractures (Health Goal). The behavioral theory used is health belief model, as we aim to create enough concern regarding this health issue and make the participants to really feel that they will be vulnerable to osteoporosis in the future, therefore making the behavioral changes look beneficial for them.

Discussion and Evaluation: Program evaluation will be divided into two phases, process; using app statistics, and summative; using a non-experimental evaluation with pre- and post-tests that will be submitted by the participants through the app.

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Keywords: Calcium; osteoporosis; healthy lifestyle; students; intervention; health promotion; health belief model.

1. INTRODUCTION

Calcium is an essential mineral required by the human body for healthy bones, teeth, and proper function of the heart, muscles and nerves. As the body is not able to produce calcium, it must be absorbed through diet. Good sources of calcium include dairy products, dark green leafy vegetables, calcium fortified foods and nuts. Moreover, adequate calcium consumption and weight bearing physical activity help in building stronger bones, optimizes bone mass, and may reduce the risk of osteoporosis later in life. Osteoporosis is a disease of the skeletal system characterized by low bone mass and deterioration of bone tissue which increases the risk of fractures. In the United States 2% of men and 10% of women above the age of 50 suffer from osteoporosis. Interestingly, by the age of 20, the average people have acquired most of their skeletal mass [1-2]. As the risk of osteoporosis increases as large decline in bone mass occurs in older adults, increasing. It is important for young people to reach their peak bone mass in order to maintain bone health throughout life, a person with high bone mass as a young adult will be more likely to have a higher bone mass later in life. Insufficient calcium consumption and lack of physical activity early in life, could result in a failure to achieve peak bone mass in adulthood. Daily calcium intake is essential for healthy bones and recommended amount of calcium vary for individuals [3-7] (Table 1).

Table 1. Adequate intakes of calcium [2]

Ages	Amount mg/day
Birth - 6 months	210
6 months - 1 year	270
1-3	500
4-8	800
9-13	1300
14-18	1300
19-30	1000
31-50	1000
51-70	1200
70 or older	1200
Pregnant & lactating	1000

In recent years, mobile devices became very helpful and have been utilized in chronic disease management, monitoring and improving health

outcomes and medical system efficiency [8]. It has been reported that a fully automated Internet and mobile devices motivation systems can significantly increase and maintain the level of physical activity in healthy adults as part of a healthy behavior [9]. Moreover, several intervention studies showed the effectiveness of computer-assisted self-monitoring of healthy attitudes and behaviors [10]. This proposed mobile devices based health promotion program has been designed to encourage young adults to change their behavior and lifestyle choices toward the selection of food rich in calcium and healthier dietary options to build healthier bones; which will help them in preventing osteoporosis and fractures when they get older. The program has been called "Students Calcium Awareness Program".

1.1 Aim

To increase the knowledge and awareness regarding calcium dietary intake among college students and to positively change their attitude towards it. The objective of this report is to present the proposal of the proposed program.

1.2 Goals

To reduce the risks of fractures among older adults and to prevent osteoporosis among them.

1.3 Priority Population

Undergraduate university students in the age group of 18-22 year old.

2. METHODS

2.1 Program Planning and Intervention

This educational program is designed to target the undergraduate university students (18-22 year old). The program will be delivered to the students through their mobile devices by downloading a free mobile application (App) directly from the internet to their smart phones and tablets. Using a mobile app to deliver the program has several advantages, first of all it will be free and does not have the cost of transportation or the time spent on lectures or public events. It will be also easy to use and does not need prior training and does not need

participants to be physically available at the school to participate in the program. Instead, participants will simply download the app from the app store into their mobile devices and the app will automatically send them educational messages. The frequency of the messages received could be adjusted according to the participants' preferences, they can opt for day, night, daily or weekly messages. The logic model used in this educational program (Intervention) is to increase participants knowledge and awareness regarding calcium (Determinant), to assist them in selecting their dietary options rich in calcium (Behavior) and eventually prevent osteoporosis and fractures (Health Goal) (Table 2). The model is further discussed in the evaluation section below.

2.2 Behavioral Theory

The behavioral theory used in this educational program is health belief model, as we aim to create enough concern regarding this health issue and make the participants to really feel that they will be vulnerable to osteoporosis in the future, therefore making the behavioral changes look beneficial for them. The messages of the educational program consist of two main categories, knowledge and attitude. Knowledge messages will include messages on the health benefits of calcium and vitamin D, dietary information about diet rich in calcium and facts about osteoporosis and fractures. On the other hand, attitude messages will include messages on the healthy diet and the benefits of sunlight exposure and physical activity in preventing osteoporosis.

2.3 Stakeholders

One of the most important steps during program planning is stakeholder identification, the stakeholders for our program are:

- Students: We will design the program and the app in an attractive way for this age group and their daily life. We should match its appearance with their preferences and what they expect to get from an educational program that they opt to enroll in.
- Parents: Will be contacted and consulted during the planning process as this is an educational program that affect their kids' dietary choices while they are away from home.

- University administrator: This program will affect students' daily lifestyle. Therefore, school's administrator should be aware of the program and its expectations.
- University Health services: Would be aware of the program so we do not conflict with their own interests and programs.
- On-campus dining halls: We have to communicate with the dining halls to provide the dietary options rich in calcium to the students.
- Web designers: They are the backbone of this program as they will transform our ideas and educational messages into a mobile app.
- Operating systems: There are several mobile operating systems in the market. Therefore, we will select one or two operating systems to deliver our app depending on the popular ones among the student we are targeting.

2.4 Reporting

The above mentioned stakeholders will be regularly addressed with program's progress and updates. There will be newsletters and fact sheets describing the progress toward goals and visual displays showing the summary of impacts, they will be sent out at the beginning of the program and quarterly throughout the program. The best practices and the issues to address will be published in journals and national conferences once the data is available.

2.5 Program Evaluation

Program evaluation will be divided into two phases, process and summative as follows:

2.5.1 Process evaluation

Using a mobile app has an excellent feature, which is the app statistics. These statistics allow us as the app developers to track the number of download, receive feedback from the users and even allow us to know the geographical locations of the users.

2.5.2 Summative evaluation

A non-experimental evaluation with pre-test and post-test will be submitted by the participants through the app. The participants will answer the pre-test when they log in to the app for the first time as a prerequisite to use it, and after

completing the program they will be asked to answer the post-test. Pre-tests and post-test will consists of questions regarding participants' knowledge and attitude toward calcium and bone health. To encourage participants to answer the post-tests, a gift card will be awarded monthly for one of the participants who answer the post-test. The gift card would be from the same app store where they have downloaded the app in the first place to help them purchase more apps for their phones. The evaluation design will follow the logic model (Fig. 1). The inputs are the financial resources available, the human resources and their expertise that will help in creating this program, the planning process to be designed from the beginning and the materials needed to implement the program. The activity is the educational program where its output will be measured as discussed above in the process evaluation section. The outcomes will be divided into three categories, short, medium and long-term outcome. The short-term outcome is the ability of the participant to select the food items rich in calcium and put them in their food menus. The medium term outcome is the ability of participants to incorporate these new skills and change their behavior and attitude to shift to a healthier lifestyle. The long-term outcome is to reduce fractures risk factors by preventing osteoporosis in the future.

2.6 Data Analysis

SPSS statistical package 22.0 will be used for data analysis. Descriptive statistics will be produced as frequencies and percentages for discrete variables, while means and standard

deviations will be calculated for continuous variables.

2.7 Program Marketing

To market the program effectively, we have to understand and utilize the university culture and the student in the university.

2.7.1 Kick-off

The first step in marketing the program is having a kick off event, a booth with students promoting the program to be held at the university campus, where most of the students visit and meet their colleagues during the day.

2.7.2 Shuttle busses

Posting banners in the students' shuttle busses to promote the program is an important and yet expected to be a strong way of marketing the program among students as they use the busses on daily bases to move around the campus.

2.7.3 Online course tools

University students are usually having an online course tool that they check regularly. Therefore, finding an online marketing tool to outreach is essential. Posting ads in the main page of the online course tool when the students log in to their courses would be very useful. Moreover, instead of the ad we can also post a Quick Response Code (QR code), so the students can snapshot the code using their mobile phones and the app will be downloaded right away to their devices.

Table 2. Logic model of the educational program

Intervention	Determinant	Behavior	Health goal
Educational Program	Knowledge and awareness	Dietary options rich in calcium	Prevent osteoporosis/fractures

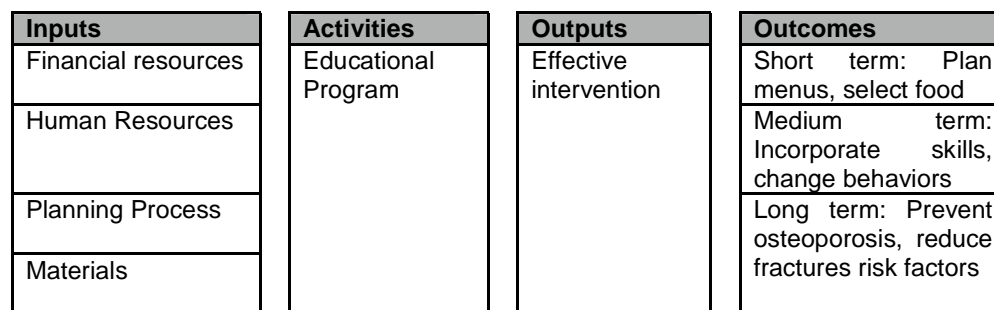


Fig. 1. Evaluation according to the logic model

Table 3. Budget forecast for the first 3 years of implementation

No.	Item	FY1	FY2	FY3
1	App designer	\$1000.00	-	-
2	App maintenance and updates	\$6000.00	\$6000.00	\$6000.00
3	Marketing	\$1000.00	\$1000.00	\$1000.00
4	Gift cards	\$300.00	\$300.00	\$300.00
Total		\$8300.00	\$7300.00	\$7300.00

2.8 Timeline

The program will be implemented all over the academic year as per the following timeline:

- Program kick off: At the beginning of the semester
- Process evaluation: Throughout the program.
- Summative evaluation: At the end of the semester
- Re-run of the program: At the beginning of the following semester.
- Gift card winner: Every month.

2.9 Program Budget

This program has been designed to be a low-cost program due to the fact that very limited resources are actually needed. There is no need for class rooms, instructors, food and refreshments etc. Instead all what we need is an app designer to create the application and to update it on a regular basis, we also need a marketing campaign budget. The cost of above mentioned items:

- App designer: \$1000.00 (FY1 only)
- App maintenance and update: \$500.00/Month
- Marketing campaign: \$1000.00/FY
- Gift cards: \$25.00/Month

The following budget is the forecast for the first 3 years of implementation (see above Table 3)

ETHICAL CONSIDERATIONS AND PRIVACY OF PARTICIPANTS

Study participation is on a voluntary basis and participants will be assured of the confidentiality of the study by having the surveys anonymous and keeping the completed ones in password protected databases and computers.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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