



The impact of online self-evaluation on self-awareness and lifestyle habits

Impacto da auto-avaliação online no hábito de vida

Impacto de la autoevaluación *on-line* en el hábito de vivir

Alexandre Campos Moraes Amato¹, Ana Augusta Gayoso Neves², Larissa Serejo Marinho², Marcos Galan Morillo³, Marisa Campos Moraes Amato⁴

ABSTRACT

Keywords:
Cardiovascular Diseases;
Diagnostic Self
Evaluation; Internet

Objective: The goal of this study was to evaluate the impact of online self-evaluation on self-awareness, alert the user about his or her risk factors for cardiovascular diseases. **Methods:** 195 users answered the same questionnaire in at least 2 different moments. Between the first and last time the user answered the questionnaire, there were significant changes in some of the risk factors. **Results:** Personal history of cardiovascular disease improved in 5.6% (P=0.97, K=0.29). Age has worsened in 9.2% which was statistically significant with almost perfect agreement (P=0.012, K=0.83). Hypertension improved in 13.3% and worsened in 16.4% of users (P=0.73, K=0.43). Obesity improved in 27.3% and worsened in 20.1% (P=0.34, K=0.45). Stress showed a statistically significant improvement of 34.4% among users and a worsening in 23.1% (P=0.20, K=0.23). Smoking improved in 22.8% (P=0.023). Physical activity increased in 29.7%. This result was statistically significant and had a fair association (P=0.0076, K=0.23). Eating habits improved in 35.9% and worsened in 35.4% (P=0.92; K=0.16). **Conclusion:** Virtual Check-up is a low cost evaluation method with a high impact that reaches a broad range of people. Therefore, even though the questionnaire showed small improvements in health indicators, it should be used widely.

RESUMO

Descritores: Doenças
Cardiovasculares;
Internet; Autoavaliação
Diagnóstica

Objetivos: Avaliar o impacto da auto-avaliação online para conscientizar e alertar o usuário sobre os seus fatores de riscos para doenças cardiovasculares. **Métodos:** Analisamos os questionários online respondidos duas vezes pelo mesmo usuário em momentos diferentes ao acessarem o site www.checkup.med.br. Comparamos as respostas dos fatores de riscos para doenças cardiovasculares e se após esse intervalo, esses fatores melhoraram, pioraram ou permaneceram inalterados. **Resultados:** 195 usuários responderam o questionário e houve melhora em quase todos os fatores de risco, tais como: Stress com 34,4% de melhorados contra 23,1% de piorados (p=0,030 e K=.23), Atividade Física com 29,7% de melhorados e 18,5% de piorados (p=0,0076 e K=.23) e Tabagismo com 22,8% de melhorados (p=0,023). Comparando as respostas entre o primeiro e o último questionário respondido a média aritmética foi de 34,75 no primeiro e 33,16 no segundo, o que representa uma melhora nos fatores de risco. **Conclusão:** A auto-avaliação online da saúde com o questionário é um método de avaliação de baixo custo e alta abrangência populacional, que mostra ao indivíduo como estão os seus fatores de risco. Estudos prospectivos caso controle poderão demonstrar a melhor eficácia desse tipo de instrumento de avaliação.

RESUMEN

Descriptores:
Enfermedades
Cardiovasculares;
Autoevaluación
Diagnóstica; Internet

Objetivos: Evaluar el impacto de la autoevaluación *on-line* para educar y alertar al usuario acerca de sus factores de riesgo de enfermedad cardiovascular. **Métodos:** Se analizaron los cuestionarios en línea respondieron dos veces en diferentes momentos para acceder al sitio www.checkup.med.br. Se compararon las respuestas de los factores de riesgo de enfermedad cardiovascular. Y después de ese intervalo entre un cuestionario y otro, estos factores han mejorado, empeorado o se ha mantenido sin cambios. **Resultados:** 195 usuarios responde a un cuestionario, hubo una mejora en casi todos los factores de riesgo, el estrés con el 34,4% mejoró desde el 23,1% empeoraron (p=0,030 y K=.23), la actividad física, con el 29,7% mejoró y el 18 de 5% empeoraron (p=0,0076 y K=0,23) y el tabaquismo con un 22,8% mejoró (p=0,023). Comparar las respuestas entre el cuestionario primera y la última media aritmética era 34,75 en la primera y 33,16 en la segunda. **Conclusión:** La línea cuestionario de autoevaluación con el chequeo de salud es un método virtual de evaluación de bajo costo y alta cobertura de la población, que muestra cómo el individuo son sus factores de riesgo. Futuros estudios puede demostrar la eficacia mejorada de este tipo de herramienta de evaluación.

¹ Professor do Departamento de Cirurgia Vascular e Endovascular da Universidade de Santo Amaro - UNISA, São Paulo (SP), Brasil.

² Estudante do Curso Médico da Universidade de Santo Amaro - UNISA, São Paulo (SP), Brasil

³ Geriatra em Amato Consultório Médico, São Paulo (SP), Brasil

⁴ Livre Docente em Cardiologia pela Universidade de São Paulo, FM-USP, São Paulo (SP), Brasil

INTRODUCTION

Today, cardiovascular diseases, including acute myocardial infarction, acute ischemic stroke, and heart failure, are the leading cause of death in the world, mainly due to atherosclerosis⁽¹⁾. Hospital admissions due to these diseases have led to increasing costs over the last decade⁽²⁾. During the last thirty years, there has been a decline in cardiovascular disease mortality in developed countries; however, mortality has increased rapidly and substantially in developing countries, such as Brazil⁽³⁾.

According to DATASUS, the Brazilian health system database, cardiovascular diseases caused 31.8% of all deaths in 2008⁽⁴⁾. This percentage has been growing since 2001. Therefore, adequate control of hypertension, diabetes, cholesterol, triglycerides, and weight is extremely important for reducing morbidity and mortality⁽¹⁾.

It is possible to estimate the effect of each atherosclerosis risk factor on having a myocardial infarction. Hence, in Brazil, a person who has the following risk factors has a greater risk of having a myocardial infarction: smoking (4.9-fold), diabetes (2.8-fold), obesity (2.5-fold), family history of cardiovascular disease (2.3-fold), high cholesterol (2.1-fold), and hypertension (2.1-fold). It is important to emphasize that the risk factors when combined have a multiplicative, not additive, effect on the risk of cardiovascular disease. Therefore, therapeutic interventions targeting these risk factors are extremely important for population healthy care. Through high-quality information and education, people can make lifestyle improvements⁽¹⁾. The motivation to change lifestyle only occurs when one realizes how each risk factor can affect health⁽⁵⁾. Intrinsic risk factors, such as family history, personal history, age, and male sex, are considered unchangeable, whereas other factors, such as hypertension, stress, obesity, hyperlipidemia, and glucose intolerance, smoking, poor eating habits, and physical inactivity, can be controlled or modified⁽⁶⁾.

Virtual Check-up, an online self-evaluation questionnaire made in 2000, informs the user of his or her cardiovascular disease risk to encourage self-awareness and lifestyle changes⁽⁵⁾. Virtual Check-up and other online health questionnaires are currently being evaluated. The relative low cost of these questionnaires give them a high potential for impacting health⁽⁷⁾.

METHODS

The Virtual Check-up (www.checkup.med.br) consists of 40 questions concerning the following risk factors: physical inactivity, smoking, poor diet, high cholesterol, diabetes, obesity, hypertension, stress, family or personal history of cardiovascular disease, male sex, and age. Once logged in, the user entered his or her email and gave permission to use the gathered data for research. For those who accepted the terms, a reminder email was sent advising the user to answer the questionnaire. The user completed the questionnaire when he or she first logged into the website and again sometime later.

A total of 14,093 questionnaires were answered between September 4, 2005, and July 12, 2009. Sixty five percent of

users (n=9202) allowed their data to be used for research. We excluded data with discrepancies, such as those who were over 100 years old or under 10 years old. After this exclusion, 8972 questionnaires remained. Furthermore, we excluded users where more than one person had used the same login, answer time was less than 200 seconds, or the user was under 18 years old. After being filtered, 397 (2.81%) questionnaires from 195 individual users (1.38%) were identified.

For statistical analysis, Kappa's test was performed to evaluate differences between questionnaire answers. The answers were interpreted as proposed by Landis and Koch (0 = poor, 0.01-0.2 = slight, 0.21-0.4 = fair, 0.41-0.6 = moderate, 0.61-0.80 = substantial and 0.81-1 = almost perfect) and analyzed using MedCalc software (Version 3.11). McNemar's test was used for calculating marginal frequencies represented as a positive or negative difference from questionnaire answers. A p-value of less than 0.05 was considered to be statistically significant⁽⁸⁻⁹⁾.

The health Website www.checkup.med.br is in compliance with the HONcode⁽¹⁰⁾.

RESULTS AND DISCUSSION

A total of 195 users answered the same questionnaire at least 2 different times, 22 answered three times, three answered four times, and one answered five times (Table 1). Only the first and last questionnaires answered were considered. Ninety-two (47.2%) users were female, and 103 (52.8%) were male. The mean age was 39.3 years (range=18-70, SD=12.21). The most represented age groups that answered the questionnaire were the third and fifth decades (Figure 1). The mean time between answering the questionnaire for the first time and last time was approximately 100 days.

Table 1 – Total of times that the questionnaire was answered

Questionnaires answered	n	%
2	169	86.7
3	22	11.3
4	3	1.5
5	1	0.5
Total	195	100

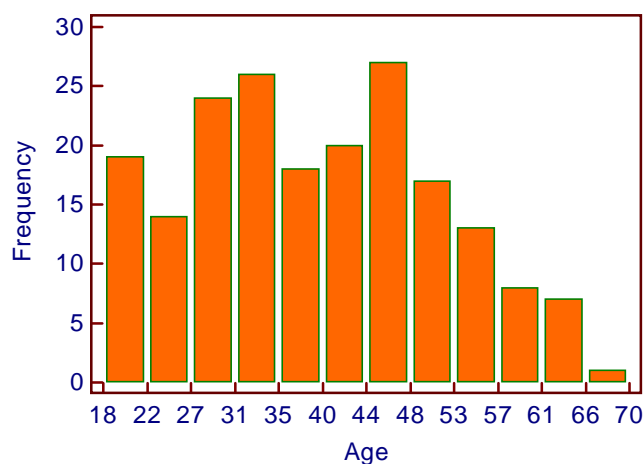


Figure 1 – Frequency of answered questionnaires by age groups

Between the first and last time the user answered the questionnaire, there were significant changes in some of the risk factors (Table 2). Personal history of cardiovascular disease improved in 5.6% and worsened in 5.1% of users ($P=0.97$, $K=0.29$). Family history of cardiovascular disease improved in 10.8% and worsened in 15.9% ($P=0.38$, $K=0.58$). Sex/age has worsened in 9.2% and improved in 2.1%, which was statistically significant with almost perfect agreement ($P=0.012$, $K=0.83$). Hypertension improved in 13.3% and worsened in 16.4% of users ($P=0.73$, $K=0.43$). Obesity improved in 27.3% and worsened in 20.1% ($P=0.34$, $K=0.45$). Cholesterol improved in 16.9% and worsened in 14% ($P=0.78$, $K=0.47$). Serum glucose improved in 11.3% and worsened in 7.2% ($P=0.18$, $K=0.33$). Stress showed a statistically significant improvement of 34.4% among users and a worsening in 23.1% ($P=0.20$, $K=0.23$).

Smoking improved in 9.2% and worsened in 7.7%. This result is due to the presence of non-smokers because they were not excluded from the first analysis and obviously could not have any improvement. Analyzing only the smokers in the first questionnaire (79 users), there was a statistically significant improvement in 22.8% and worsened in 7.6% ($P=0.023$). Physical activity increased in 29.7% and worsened in 18.5%. This result was statistically significant and had a fair association ($P=0.0076$, $K=0.23$). Eating habits improved in 35.9% and worsened in 35.4% ($P=0.92$; $K=0.16$) Table 3 shows the progress

of each risk factor between first and last questionnaire.

The online Virtual Check-up is a self-evaluation questionnaire that offers feedback to users about his or her cardiovascular risk and key information for improving various risk factors. This study was based in a retrospective analysis of the answers of the questionnaire. We collected data from the users that answered the questionnaire at least two times. We analyzed the changes between the first and last questionnaires. We tested whether, after receiving his or her cardiovascular risk results, the user would adopt healthier habits.

Our study showed that people in the third and fifth decades of life answered the questionnaires more frequently. Perhaps those in the third decade have greater access to the internet, whereas those in fifth decade recognize they are a high-risk group. Most of the users took less than 100 days to answer the questionnaire a second time. This result may be due to the desire of the users to track any changes in risk level.

Of the eleven risk factors analyzed, physical inactivity, stress, and smoking showed significant improvement. Physical inactivity is a factor that can be easily changed because it is easily controllable and does not depend on economic status. In this study, the questionnaire was enough to stimulate an improvement. Stress is subjective and difficult to manage. The improvement shown in this study can be attributed to the objective questions in the questionnaire, which helped users to understand and modify bad habits

Table 2- Comparing the average results of the questionnaires stratified by factor evaluate and compared the first and last questionnaire, with 95% confidence interval.

Risk Factors*	1 ^o Questionnaire Mean(CI 95%)	Last Questionnaire Mean(CI 95%)	Status
Familiar History	0.33 (0.14-0.52)	0.26 (0.12-0.39)	Improve
Personal History	0.73 (0.60-0.85)	0.81 (0.68-0.94)	Worse
Sex/ Age	2.70 (2.23-3.18)	2.76 (2.30-3.24)	Worse
Hypertension	1.25 (0.95-1.55)	1.31 (1.0 - 1.63)	Worse
Obesity	3.80 (3.31-4.30)	3.67 (3.18-4.15)	Improve
Cholesterol	3.90 (3.28-4.52)	3.80 (3.15-4.44)	Improve
Serum glucose	1.31 (0.89-1.73)	0.97 (0.60-1.35)	Improve
Stress	7.49 (7.14-7.84)	7.12 (6.75-7.48)	Improve
Smoking	1.81 (1.42-2.19)	1.73 (1.37-2.10)	Improve
Physical activity	7.89 (7.42-8.36)	7.06 (6.53-7.59)	Improve
Eating Habits	7.02 (6.67-7.36)	6.97 (6.62-7.31)	Improve
Mean Risk Index	34.76 (33.24-36.27)	33.16 (31.65-34.67)	Improve

Table 3 - Comparison of discordant results, stratified by risk factor

Risk Index	Unchanged (%)	Improved (%)	Worsened (%)	McNemar Test	Kappa Test
Personal History	89.2	5.6	5.1	$P= 0.9763$ N.S*	$K = .29$
Familiar History	73.3	10.8	15.9	$P= 0.3829$ N.S	$K = .58$
Sex/ Age	88.7	2.1	9.2	$P= 0.0116$ **	$K = .83$
Hypertension	70.3	13.3	16.4	$P= 0.7334$ N.S	$K = .43$
Obesity	52.6	27.3	20.1	$P= 0.3447$ N.S	$K = .45$
Cholesterol	68.7	16.9	14.0	$P= 0.7827$ N.S	$K = .47$
Serum glucose	81.5	11.3	7.2	$P= 0.1821$ N.S	$K = .33$
Stress	33.3	41.0	25.6	$P= 0.030$ ***	$K = .23$
Smoking	83.1	9.2	7.7	$P= 0.8737$ N.S	$K = .71$
Physical activity	51.8	29.7	18.5	$P= 0.0076$ ***	$K = .23$
Eating Habits	28.7	35.9	35.4	$P= 0.9203$ N.S	$K = .16$

*N.S = not significant; ** Improved < Worsened (statistically significant);*** Improved > Worsened (statistically significant)

by sleeping better, doing relaxing activities, and minimizing the negative psychological effects of everyday situations. The questionnaire had the greatest impact on smoking, showing that users only needed an extra stimulus to quit or reduce smoking or lessen the addiction.

Sex/age had a statistically significant worsening, which was expected since people became older between first and second questionnaire. Sex cannot change; therefore, the observed 2.1% improvement is likely a study bias, such as failure to exclude questionnaire with discrepancies. Although the variable sex/age is a very important risk factor, and a good basis for questionnaire relevance comparison, it is immutable: it was expected to have worsened through time, and it is not possible to be improved by any means. The others risk factors were not statistically significant due to a small study population, but most of them showed a trend towards improvement.

There was a slight insignificant improvement in personal history of cardiovascular disease, which was not initially expected. Reexamining this section of the questionnaire, increasing the length of time since the cardiovascular event infers improvement. Thus, a user who had a cardiac event 3 months ago gets a higher risk score than the person who had an event 4 years ago. Therefore, this improvement in personal history is justified.

As a retrospective study, this study has certain limitations and biases, including variation in the lengths of time between questionnaires and the lack of a control group. Also, users who answered the first or second survey were already interested in their quality of life and may utilize healthcare more than the general population. Older users may have had more difficulties using the questionnaire

online alone, and that could lead to another bias, but the data retrieved showed that most of the older users used the same account than other users, and had similar answering times, meaning friends or family coached them. A prospective study with a well-defined population would solve those problems. Finally, implementing the questionnaire on a large scale may not have the desired effect. There may be a higher risk level than the expected.

Despite these limitations, the study clearly shows the positive effect of self-assessment via the Virtual Check-up online questionnaire in a mixed population of volunteers. Future studies should be conducted to elucidate the effects of this questionnaire in a specific population.

CONCLUSIONS

Virtual Check-up showed a statistically significant improvement in stress and physical activity. Its impact on smoking reduction was significant, clearly establishing this questionnaire as an effective tool in smoking cessation. Risk factors, such as familiar or personal history of cardiovascular disease, obesity, high cholesterol, glucose intolerance, and poor eating habits also showed improvements but require further analysis. On the other hand, blood pressure worsened when compared to the first questionnaire.

Virtual Check-up is a low cost evaluation method with a high impact that reaches a broad range of people. Therefore, even though the questionnaire showed small improvements in health indicators, it should be used widely. Prospective case-control studies will demonstrate efficacy of this evaluation tool.

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