Development of Database System for Clinical Management of Patients with Coronary Artery Disease

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Abstract

The purpose of this study is a development of database system for clinical management in patients with coronary artery disease. The pairwise t-test was done to compare the before and after intervention effect for the health promotion practice of cardiac patients by the information application. The present research showed that practice rate of health promotion application. The present research showed that practice rate of health promotion using database system in an effort to reduce inefficiency and improve reliability of information. By the adoption of this database system, the medical information. By the adoption of this database system, the medical information can be effectively connected with other database system. Pretested in urban area from September 1, 2011 to December 31, 2011. The pairwise t-test was done to compare the drug misuse and abuse before and after computer-aided education. The present research showed that drug misuse and abuse decreased to 54.9-67.1% by the computer-aided education. This paper resulted in significant positive effects in quality of life of patients with drug misuse and abuse and its implications could be used as the basic data for developing further systematic materials on computer-aided education.

Keywords: Database system, Development, Clinical management, Coronary heart disease

1. Introduction

Patients with coronary artery disease continue to be a leading cause of morbidity and mortality among adults in the whole world. In the United States, cardiac disease accounts for nearly 40% of all deaths each year [1]. In Korea, it becomes a major factor of mortality together with cerebrovascular accidents and cancers. The risk factors have included age, gender, hypertension, cigarette smoking, serum total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and diabetes [2].

This paper can provide its effective experience of developing a database system by applying health promotion practice of patients with coronary artery disease. In particular, this paper can identify some issues to be considered in development process, the way that we solved them, and other things related to patients with coronary artery disease. Treatment information according to database system could also be contributed for improving prevention and treatment efficiency. Although precedent foreign researches are numerous so far [3-5], domestic researches are no sufficient for health promotion practice of medical information. Especially, its effect on the adoption of database system for health promotion practice of patients with coronary artery disease has not been dealt with previous studies [6-8]. Therefore, this study was conducted to evaluate whether these technologies can enhance the value of information through user test.
Thus, the purpose of this study is to establish adoption effect for the development of database system for health promotion practice of patients with coronary artery disease. The highly easy access to the database system through the advanced information technology not only results in the optimization of health care and medical information of cardiac patients but also enhances the competitive power of domestic information technology to the foreign information technology.

2. Materials and Methods

2.1. Study design

This paper is to construct effectively database system by making use of information application. The first step is to identify a need-assessment of the participants [Figure 1]. Second step is to identify the functional elements of successful models. In the third step, an experimental stage, where preliminary program is to applied in the field. In the final step, in order to evaluate the program durability, follow-up test has been done after termination of the program [Figure 2].

2.2. Materials

The collected data was surveyed using questionnaires form April 2 to September 3, 212 for patients with coronary artery disease who had been discharged from a general hospital. For this quasi-experimental group have been implemented. Experimental group of 63 patients which was assigned as group with information application. To conduct the intervention research method, group and individual education, e-mail, telephone, counseling and so on were performed. The two groups are compared to know the difference of changes which affects information application of patients with coronary artery disease. In order to evaluate the program durability, follow-up test has been done for four months after termination of the program: 30, 60, 90, and 120 days.

2.3. Methods

General characteristics of study subjects was measured by percentage and number. The pairwise t-test was done to compare the before and after information application for practice rate of health promotion of patients of coronary artery disease. This was conducted to observe some significant differences between the two groups before and after information application. The significance level was 0.05 and this data was analyzed with statistical package the SAS software.

![Figure 1. Development of Database System for Patients with Coronary Artery Disease](image-url)
3. Result

3.1. General Characteristics of Study subjects

Table 1 presents general characteristics of study subjects. Comparing the proportion in the gender, male(52.4%) of the control group showed more than male(46.0%) of the experimental group. In a marital status, married respondents(71.4%) of the control group were higher than respondents(68.3%) of the experimental group. On the other hand, about respondents who have a family history of cardiac disease, the experimental group showed higher than control groups.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Experimental group</th>
<th>Control group</th>
<th>Variables</th>
<th>Experimental group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>29(46.0)</td>
<td>33(52.4)</td>
<td>Under middle</td>
<td>15(23.8)</td>
<td>19(37.3)</td>
</tr>
<tr>
<td>Female</td>
<td>34(54.0)</td>
<td>30(47.7)</td>
<td>High school</td>
<td>27(42.9)</td>
<td>15(29.4)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>Over college</td>
<td>21(33.3)</td>
<td>23(33.1)</td>
</tr>
<tr>
<td>≤59</td>
<td>5(7.9)</td>
<td>7(11.1)</td>
<td>Family history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td>11(17.5)</td>
<td>13(20.6)</td>
<td>Yes</td>
<td>17(27.0)</td>
<td>8(12.7)</td>
</tr>
<tr>
<td>50-59</td>
<td>20(31.7)</td>
<td>18(28.6)</td>
<td>No</td>
<td>46(73.0)</td>
<td>55(87.3)</td>
</tr>
<tr>
<td>≥60</td>
<td>27(42.9)</td>
<td>25(39.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly income</td>
<td></td>
<td></td>
<td>Complication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;200</td>
<td>24(38.1)</td>
<td>21(33.3)</td>
<td>Yes</td>
<td>15(23.8)</td>
<td>6(9.5)</td>
</tr>
<tr>
<td>≥200</td>
<td>39(61.9)</td>
<td>42(66.7)</td>
<td>No</td>
<td>48(76.2)</td>
<td>57(90.5)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td>Comorbidity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>20(31.7)</td>
<td>18(28.6)</td>
<td>Yes</td>
<td>24(38.1)</td>
<td>13(20.6)</td>
</tr>
<tr>
<td>Married</td>
<td>43(68.3)</td>
<td>45(71.4)</td>
<td>No</td>
<td>39(61.9)</td>
<td>50(79.4)</td>
</tr>
<tr>
<td>Total</td>
<td>63(100.0)</td>
<td>64(100.0)</td>
<td>Total</td>
<td>63(100.0)</td>
<td>63(100.0)</td>
</tr>
</tbody>
</table>

3.2. Comparison of Health Management before and after Information Application

Table 2 presents the comparison of health management before and after information application. Comparing the scores in the weight control, subjects’ score (69.42±0.95) after information application decreased significantly than subjects(58.27±1.73) before information application(t=−1.92, p=0.006). There was significantly high difference in food control such as meat, fat, vegetable and fiber intake after information application (t=−4.28, p=0.003).
Suppose that the n measurements $X_1, X_2, \ldots, X_n$ make up a sample. Then the sample standard deviation, denoted $s$, is defined to be in which $X$ is the mean of the measurements.

$$\text{Mean} = \frac{\text{Sum of } X \text{ values}}{N \text{(Number of values)}} \quad (1)$$

\[ s = \sqrt{\frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 + \cdots + (X_n - \bar{X})^2}{n-1}} = \sqrt{\frac{\sum_{i=1}^{n} (X_i - \bar{X})^2}{n-1}} \quad (2)\]

Table 2. Comparison of Health Management Before and After Information Application

<table>
<thead>
<tr>
<th>Items</th>
<th>Before Mean±S.D</th>
<th>After Mean±S.D</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight control‡</td>
<td>58.27±1.73</td>
<td>69.42±0.95</td>
<td>-1.92</td>
<td>0.006</td>
</tr>
<tr>
<td>Exercise</td>
<td>43.50±0.34</td>
<td>65.87±1.29</td>
<td>-1.76</td>
<td>0.028</td>
</tr>
<tr>
<td>Cormorbidty</td>
<td>54.17±0.62</td>
<td>41.34±0.62</td>
<td>5.13</td>
<td>0.072</td>
</tr>
<tr>
<td>BP measure†</td>
<td>59.27±0.41</td>
<td>64.25±0.41</td>
<td>-0.89</td>
<td>0.159</td>
</tr>
<tr>
<td>No smoking</td>
<td>46.74±1.50</td>
<td>58.61±1.18</td>
<td>-2.58</td>
<td>0.017</td>
</tr>
<tr>
<td>No alcohol drinking</td>
<td>49.70±1.93</td>
<td>52.15±1.56</td>
<td>-4.71</td>
<td>0.086</td>
</tr>
<tr>
<td>Food control</td>
<td>41.39±1.62</td>
<td>56.18±1.40</td>
<td>-4.28</td>
<td>0.003</td>
</tr>
<tr>
<td>Stress control</td>
<td>69.13±1.46</td>
<td>71.37±0.41</td>
<td>-2.69</td>
<td>0.082</td>
</tr>
<tr>
<td>Complication</td>
<td>74.15±1.82</td>
<td>63.51±0.52</td>
<td>1.35</td>
<td>0.049</td>
</tr>
<tr>
<td>Medication intake</td>
<td>70.44±1.26</td>
<td>58.27±0.94</td>
<td>2.54</td>
<td>0.025</td>
</tr>
</tbody>
</table>

The t-test assess whether the means of two groups are statistically different from each other. This analysis is appreciate whenever you want to compare the means of two group, and especially appreciate as the analysis for the posttest-only two-group randomized experimental design. This illustrate formula for the standard error of the difference between the means.

$$T\text{-value} = \frac{\text{Difference between group means}}{\text{(variability of groups)}} \quad (3)$$

$$= \frac{\bar{X}_T - \bar{X}_c}{SE(X_T - X_c)} \quad (4)$$

The paired t-test is actually a test that the differences between the two observation is 0, So, if $D$ represents the difference between observations, the hypotheses are: $p$-value associated with it is low $(p<0.05)$. There is evidence to reject the null hypothesis. Thus, this would have evidence that there is a difference in means across the paired this would have evidence that there is a difference in means across the paired observations.

$H_0 : D=0$ (the difference between the two observation is 0)

$H_1 : D \neq 0$ (the difference is not 0)
3.3. Change of Knowledge Information between Two Groups

Figure 3 presents the change of knowledge information between the two groups. According to the clinical knowledge after information application, the mean score of experimental group showed increase after information application than control group.

3.4. Change of Health Management between Two Groups

Figure 4 presents the change of health management between the two groups. According to the health management after information application, the mean score of experimental group showed increase after information application than control group.

3.5. Follow-up of Health Promotion Practice between Two Groups

Figure 5 presents the follow-up of health promotion practice between the two groups. The follow-up survey was estimated to be higher in the experimental group, regardless of the time elapsed of 90 days after the information application. However, the intervention effect was estimated to decrease more rapidly with time elapsed of change of health promotion practice between the two groups. According to the health practice, the score of experimental group showed increases after information application than control group.
Figure 5. Follow-up of Health Promotion Practice between Two Groups

\[ \text{Slope} = \frac{\Delta Y}{\Delta X} \]

Where \( \Delta X \) : time interval
\( \Delta Y \) : variation of reduction of intervention effect

\[ \text{Ratio} = \frac{\Delta Y_a}{\Delta Y_b} \]

Where \( \Delta Y_b \) : practice rate before health promotion before intervention
\( \Delta Y_a \) : practice rate of health promotion after intervention

The slope is often called data x/deta y, this change in x/change in y. To actually calculate the y value of the triangle edge for a given integer value of x, as we move incrementally along the x axis one pixel at a time, we use the slope value.

4. Discussion

This research is conducted to measure the adoption effect for health promotion practice of patients with coronary artery disease by using database system. Throughout the research, construction of a database system for medical information has been successfully implemented. This database system is to develop the comprehensive information programs promoting health for patients with coronary artery disease using intervention. The strategies for effective database system are best for increasing the practice rate of health promotion of patients with coronary artery disease.

The intervention effect did not increase significantly the consumption rate of alcohol in health management of patients with coronary artery disease, and then multi-disciplinary approach is required to reduce the smoking prevalence. As a result of this study, positive changes of behaviors related smoking diminished the progression rate of disease. The finding was similar with the previous studies on the chronic disease [9-10]. Based on the results obtained by the study, it is anticipated that this may be used as effective data for developing and intervening database system for the chronic disease [11-12]. However, in order to maintain non-smoking patients, the result shows that various and long-term smoking cessation program is more successful than single and short-term program. In addition, large intervention studies should be established urgently in order to prove results of this study.

The result of this paper after information application had significantly positive changes for the body weight than before information application in the mean score of body weight control. The finding was consistent with the result of earlier researches [13-15]. Patients who had moderate exercise level and who were under diet care had better quality of life. Therefore, adequate health behavior was willing to improve their quality of life in accordance with proper database program should be recommended. Further studies are needed in community health centers or hospitals to establish the effects of information on comprehensive database system.
Therefore, it needs to perform systematic management of patients with coronary artery disease. There is a need for a separate program to be implemented on the groups who having lower levels of information knowledge and research practice. The present research showed that practice rate of health promotion of patients with coronary artery disease could be increased 65.8-71.4% by the information application, which is similar to data reported in the previous study [16]. However, it should be noted that the intervention effect is not maintained for a long period of time. Accordingly, in order to maintain the intervention effect, it is very important to determine adequate application period and perform various programs in consideration of their circumstances. The present work elucidated throughout the analysis how effectively the synthetic and systematic education contributes to practice behavior for the prevention of cardiac disease.

Until the present, the limitation of medical information lies in that there is nothing put into action despite the increase of knowledge. The result of this study would be the enhancement of performance activity for the prevention of cardiac disease. Thus, this study indicated that the implemented systematic intervention showed significantly positive effects on the life of subjects and health behavior. The quality of life in the experimental group has been enhanced as time passing by compared to control group, conclusively providing that it is an effective program in database system. Therefore, the database program for health promotion practice of patients with coronary artery disease implemented by intervention research is quite meaningful in that it is evidence-based program development which will contribute in replicating the intention under field conditions for patients with chronic disease.

5. Conclusion

This study identified positive effects of database system for health promotion practice of patients with coronary artery disease. Therefore, this database system using information application can be used as an effective method to enhance health promotion of patients with coronary artery disease. It resulted in significant improvement in the quality of life of patients with coronary artery disease and its implication can be used as the basic data for the quality of life of patients with chronic disease. Therefore, the database system would be provided to each hospital nationwide and each academic society.

References


Author

Seong-Ran Lee received the B.S. degree in Consumer Science from Seoul National University, Korea in 1987. She received the M.S. degree in Public Health from Seoul National University, Korea in 1992 and Ph.D in the same area from Catholic Medical College, Seoul, Korea in 2000. Currently, she is an Associate Professor in the Department of Medical Information at Kongju National University, Korea. Her present research interest is medical information.