Nurses’ Attitudes towards Computers: Cross Sectional Questionnaire Study

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Aim
To estimate the attitudes of hospital nurses towards computers and the influence of gender, age, education, and computer usage on these attitudes.

Methods
The study was conducted in two Croatian hospitals where integrated hospital information system is being implemented. There were 1,081 nurses surveyed by an anonymous questionnaire consisting of 8 questions about demographic data, education, and computer usage, and 30 statements on attitudes towards computers. The statements were adapted to a Likert type scale. Differences in attitudes towards computers were compared using one-way ANOVA and Tukey-b post-hoc test.

Results
The total score was 120±15 (mean±standard deviation) out of maximal 150. Nurses younger than 30 years had a higher total score than those older than 30 years (124±13 vs 119±16 for 30-39 age groups and 117±15 for >39 age groups, P<0.001). Nurses with a bachelor’s degree (119±16 vs 122±14, P=0.002) and nurses who had attended computer science courses had a higher total score compared to the others (124±13 vs 118±16, P<0.001). Nurses using computers more than 5 hours per week had higher total score than those who used computers less than 5 hours (127±13 vs 124±12 for 1-5 h and and 119±14 for <1 hour per day, P<0.001, post-hoc test).

Conclusion
Nurses in general have positive attitudes towards computers. These results are important for the planning and implementing an integrated hospital information system.

The implementation of integrated hospital information systems (IHIS) can dramatically improve performance, reduce costs, provide more time for direct patient care, and ensure a better connection with patients, suppliers, and physicians (1-3). During 2003, Croatian Ministry of Health and Social Welfare launched informatics projects in health care system. Pilot projects of IHIS implementation were carried out in four Croatian hospitals: Dubrava Clinical Hospital, Holy Ghost General Hospital in Zagreb, and Rijeka and Split Clinical Hospital Centers (4). One of the key issues, constantly present during preparations for IHIS implementation, was the most adequate way of transition from standard “paper and pen” environment to one based on modern and more effective information technology (5,6).

IHIS implementation does not include only the supply of brand-new hardware and software technology, although this part of the process should not be neglected. As Stronge and Brodt (7) have suggested – the key of a successful implementation lies in paying attention to the end users. Positive users’ attitudes towards computers are a necessary prerequisite for a successful implementation of IHIS (3,8). The most crucial end users of IHIS are nurses. Keeping this in mind, one should be aware of nurses’ attitudes towards computers.
Literature on previous studies on nurses’ attitudes towards computers shows conflicting results. Some authors have found that nurses’ attitudes were generally positive and with no significant influence of age or education (9, 10), whereas others found significant influence of age and education (11, 12). The aim of this study was to assess nurses’ attitudes towards computers in Croatian hospitals and compare the results to similar data published in other countries.

Subjects and Methods

Subjects

From November 2003 to March 2004, the study was conducted at two out of four hospitals included in the IHIS project: Dubrava University Hospital in Zagreb and Rijeka University Hospital Center in Rijeka. Head nurses distributed the questionnaires during usual daily meetings of nursing staff to all nurses currently employed at the Rijeka University Hospital Center and to randomly selected sample consisting of one quarter of nurses at the Dubrava University Hospital. Before distributing the questionnaires, nurses were informed about the subject of the study, and the confidentiality of responses was ensured. Out of 1,130 surveyed nurses, 1,081 properly filled out and returned the questionnaire: 141 nurses from Dubrava University Hospital and 940 from the Rijeka University Hospital Center (total response rate 96%). All subjects were analyzed as a single group due to the absence of any significant differences in gender, age, education, and computer science education among nurses in these two hospitals.

Questionnaire

The Nurses’ Attitudes Toward Computers (NATC) instrument (7) was modified, supplemented with new items (13) and used in this study. Final questionnaire, which consisted of 8 closed questions and 30 statements on attitudes, was divided into three parts: A – demographic data (4 questions), B – data about computer experience (4 questions), and C – statements on attitudes towards computers. Demographic data included gender, age, education, and computer science education. The second part contained questions about the place, frequency, and purpose of computer usage.

The third part of the questionnaire consisted of 30 statements which measured the respondents’ attitudes towards computers. One half of the statements were negatively and the other half positively phrased. Their order of appearance was randomized. The answers were offered on a Likert type scale, where “1” indicated strongly disagree, “2” disagree, “3” undecided, “4” agree, and “5” strongly agree with a particular statement (14). Respondents were advised to fill out the questionnaire according to their first reaction to the statements after reading, with no time limit for filling in the whole questionnaire.

Statistical Analysis

The results are shown with a mean, standard deviation (SD), and 95% confidence intervals (CI) of mean. Factor analysis was performed on all statements after reverting 15 negative into positive statements (15). Three-factor solution was obtained by scree-plot analysis (16). Since these three factors were highly correlated, we performed the second order principal components factor analysis, which converged at one factor solution. According to this result and high reliability for one factor solution (α = 0.86), it was decided to form a single measure of attitudes. Thirty answers were summarized and the total score for each respondent was computed. The total score range was 30 to 150. One-way ANOVA was used to compare the average total score between groups and Tukey-b test for post hoc analysis. All statistical values were considered significant at the P level of 0.05. Statistical analysis of data was performed using SPSS version 12.0 (SPSS Inc., Chicago, IL, USA); Statistica for Windows version 6.1 (StatSoft Inc., Tulsa, OK, USA); and MedCalc version 7.5 (MedCalc, Maaikekerke, Belgium).

Results

Attitudes toward computers were presented as the total score. The average total score (mean ± standard deviation) was 120 ± 15 (Table 1). There was no difference in the total score regarding gender.

Nurses younger than 30 years had significantly higher total score than older nurses. Nurses with a bachelor’s degree also had higher total score than nurses with a high school degree.

Computer science education was also related to a higher total score. Nurses who attended classes of medical informatics during their formal education obtained significantly higher total score than others (Table 1). Previous computer
experience had a significant influence on the total score, with users who did not use computers scoring less (114±16) than nurses using computers at home (Table 1).

Nurses using computers more than five hours per week obtained significantly higher total score than those using computers one to five hours or one hour per week (Table 1).

Using computer for any purpose (work, education, pleasure, communication) was also related to higher attitude towards computers (Table 1).

Discussion

Successful implementation of IHIS depends on whether its end users accept it or not (3,8). In our study, nurses showed a high total score (average score 120±15 out of maximum 150) indicating their positive attitudes towards computer. Nurses younger than 30 had more positive attitude than older nurses, which was consistent with other studies (11,12). They may be more knowledgeable and aware about information technology and benefits introduced by IHIS, as well as willing to change and adapt to IHIS. Older nurses may be in general less amenable to the introduction of information technology into their daily practice, as shown by Scarpa (9). Furthermore, for the last six years, courses of basic computer science have been mandatory in all Croatian nursing schools, which could contribute to the positive attitude of younger nurses.

The variable with a significant effect on the total score was the degree of education. Nurses with a bachelor’s degree had more positive attitudes than those with high school. The reason is probably also connected to computer science education, because nurses with a bachelor’s degree had to attend a Medical Informatics course during their studies and acquired knowledge and skills of computer usage, as well as learn the importance of information technology use in nursing. Similar findings were reported for IHIS implementation in Limpopo province (South Africa), where the authors considered that one of the major reasons for the failure was not recognizing the education of users as an essential precursor (18).

Table 1. Attitudes towards computers among nurses according to gender, age, education, computer science education, computer usage, frequency, and purpose of computer usage

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. (%)</th>
<th>Total score† [mean±SD (95% CI)]</th>
<th>ANOVA</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>50 (4.6)</td>
<td>121±14 (92-146)</td>
<td>0.29</td>
<td>0.589</td>
</tr>
<tr>
<td>female</td>
<td>1,019 (94.3)</td>
<td>120±15 (96-141)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>218 (20.0)</td>
<td>124±13 (103-142)</td>
<td>14.87</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>30-49</td>
<td>700 (64.8)</td>
<td>119±16 (95-141)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥50</td>
<td>165 (15.2)</td>
<td>117±15 (90-141)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>high school</td>
<td>819 (75.8)</td>
<td>119±16 (93-141)</td>
<td>9.35</td>
<td>0.002</td>
</tr>
<tr>
<td>bachelor’s degree</td>
<td>262 (24.2)</td>
<td>122±14 (104-142)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer science education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>768 (71.0)</td>
<td>118±16 (92-141)</td>
<td>34.07</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>yes</td>
<td>313 (29.0)</td>
<td>124±13 (104-141)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer usage at:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nowhere</td>
<td>405 (37.5)</td>
<td>114±16 (87-135)</td>
<td>36.68</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>home</td>
<td>346 (32.0)</td>
<td>122±13 (96-141)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>work</td>
<td>156 (14.4)</td>
<td>123±14 (98-140)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>home and work</td>
<td>163 (15.1)</td>
<td>126±13 (104-142)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer usage (hours per week):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>253 (38.5)</td>
<td>119±14 (91-139)</td>
<td>26.01</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1-5</td>
<td>244 (37.2)</td>
<td>124±12 (104-142)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;5</td>
<td>180 (24.3)</td>
<td>127±13 (102-143)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purpose of computer usage:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no use</td>
<td>405 (57.0)</td>
<td>114±16 (87-135)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>work</td>
<td>305 (43.0)</td>
<td>125±13 (100-142)</td>
<td>103.41</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>education</td>
<td>196 (32.6)</td>
<td>126±12 (105-143)</td>
<td>127.11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>communication</td>
<td>200 (33.1)</td>
<td>128±12 (107-144)</td>
<td>153.06</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>pleasure</td>
<td>405 (50.0)</td>
<td>123±14 (95-142)</td>
<td>99.17</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*Data on absolute and relative frequencies do not sum up to n=1,081 (100%) for gender, as some participants did not answer that question.
†Total score indicates summarized score of all items (higher score represents more positive attitudes towards computers; average total score 120, average score for the 30-item part of the questionnaire 4).
‡Significant difference vs both other groups.
§Significant difference vs all other groups.
∥Significant difference among all three other groups.
¶Multiple choices were possible.
**Significant difference between “no use” and each other purpose.
Our results thus emphasize the importance of computer science education in nursing schools, as stated in Recommendations of the International Medical Informatics Association (IMIA) on education in health and medical informatics (17) and in other published studies (1,5,18). Nurses educated in computer science had significantly higher total score than those without computer education. Previous computer experience and higher frequency of computer usage increased nurses’ total score. Nurses with computer experience were already familiar with computer usage and aware of its benefit. Our data are consistent with other studies which found that nurses with computer experience are aware of the advantages of IHIS (1,10).

There are several limitations to our study. We did not gather any data on particular clinical wards, whereas some studies showed a major influence of clinical wards on attitudes, where nurses working in intensive care units had higher motivation towards using the information technology (11). The other limitation lies in the fact that all nurses filled out the questionnaire in the presence of head nurses (during regular nurses’ meeting), and they might have felt uncomfortable to state negative attitudes towards computers. Since this was a cross-sectional study, our results present the situation at the time of implementation of IHIS. It might be interesting to evaluate what will happen after one or two years of computer usage. We plan to follow up attitudes in our sample.

In conclusion, our findings suggest that computer science education and computer experience are the most important parameters that substantially contribute to the development of positive attitudes towards computers. Therefore, it is important to assess and develop adequate computer science education program for nurses which will provide a successful implementation of IHIS.

References

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