

Usability Testing and Comparison of Six Electronic Nursing Record Systems: User-Task-System Evaluation

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Background: Nurses are rapidly converting to electronic nursing records (ENRs) due to the political, financial, and social needs both within and outside hospitals, and it is hoped that key quality benefits will be obtained from their adoption. Usability factors are a major issue for health information technology adoption, but little is known about the usability of ENR systems. Purpose: To understand and determine the usability of ENR systems in terms of their efficiency and effectiveness. Methods: The usability of a user-task system for laboratory function was evaluated. Six hospitals that have used different ENR systems (including narrative nursing records) for more than 3 years were recruited for this study. They were all academic tertiary hospitals in Korea with more than 1,000 beds and their own, self-developed ENR systems. Nine nurses from internal medicine wards, surgical wards, or intensive-care units were randomly selected from each hospital. Three paper-based clinical scenarios (appropriate to the ward/unit) and scoring criteria developed by the researchers were used. The 54 nurses were asked to imagine that they were taking care of a patient and to create a narrative nursing note with the hospital's ENR system. They were also asked to vocalize what they were thinking while using the system. The user-system interactions were recorded digitally, classified into three categories, and scored by two researchers as follows: +1 (optimal), 0 (correct, but not optimal), and -1 (incorrect or failure). The scores were used to calculate the efficiency (the ratio of summing the total number of positive entries divided by the total number of all entries made), effectiveness (the ratio of the number of points earned divided by the maximum number of points), and competency index (combination of the efficiency and effectiveness scores into one index). The time taken to complete the task was also measured. Data were collected between June 2013 and October 2013 after acquiring permission from the institutional research review board at each hospital. Descriptive statistics and variance analysis were used to compare the systems. Results: The mean number of entries was 12.4 sentences (range, 5-22 sentences). The overall efficiency of the six hospital ENR systems was 94.2% (95% CI, 91.4-96.9%; range, 84.3-99.3%). The differences between the systems were statistically significant ($\chi^2=12.3$, $P=0.030$). The mean effectiveness was 60.6% (95% CI, 54.3-66.8%; range, 42.8-66.6%). The competency indexes ranged from 42.4% to 50.0%, and the mean index was 47.4% (95% CI, 46.0-48.8). The nurses took a mean of 317 sec (95% CI, 273.7-360.8 sec) to complete the task; the time taken ranged significantly according to the system, from 226.3 to 457.2 sec ($\chi^2=11.2$, $P=0.048$). Conclusions: The six ENR systems exhibited a high degree of efficiency and moderate-to-low effectiveness in terms of usability. Improvements in the quality of data entry are required for all of the six tested systems. Several of the systems require efforts to improve their efficiency and the user-system interactions to reduce the time required to complete a narrative nursing record.

