

Automated Survey Collector (ASC): A Universal Platform for Interactive Collection of Clinical Data

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ABSTRACT

The aim of this project was construction of a universal platform for rapid development and implementation of interactive computer-based collection of clinical data. A TabletPC was used to pilot-test the platform and to implement two self-administered questionnaires: SF-12 Health Survey (SF-12) and Health Utilities Index (HUI). Qualitative analysis of the system acceptance in 12 patients showed that computer-assisted data collection in elderly patients with no previous computer experience can be successfully implemented using a TabletPC.

INTRODUCTION

Recent advances in information technology have made the use of computers in healthcare systems increasingly common. Computerized data management is becoming increasingly important in clinical practice and research. Use of new interactive technologies such as touch screens and voice activated screens provide greater efficiency in data collection than that provided by scanning of pencil and paper forms. Traditionally, the collection of health-related data has been through interview-based and self-administered paper questionnaires. This type of data collection and storage is a very laborious and time consuming process. It is also subject to human error and limitations of patient recall, is costly, and has few controls to prevent missing data. The use of new technologies could reduce the time used in data entry, reduce human error by limiting the number of steps directly involving human intervention, and reduce the amount of missing data by prompting for answers to skipped questions. Elderly patients have traditionally had less exposure to computer technology than younger patients. Problems inherent in the use of information technology and interactive data collection in a geriatric population include phobias, declining motor skills, and impaired sensory function. Despite significant improvement in the TabletPC as a mobile multimedia tool current literature does

not provide systematic assessment of the use of such a platform for computer-assisted data collection particularly in older patients. The goal of this project was development of an interactive data collection tool and pilot testing of this tool in patients with limited computer experience using qualitative analysis.

SYSTEM DEVELOPMENT

Microsoft Visual Studio 6.0 and Microsoft Tablet PC API have been used for software development. The software has been implemented for Windows XP-based TabletPC and tested using ViewSonic V1100. As a result of this project we developed an authoring tool that can be used as a universal platform for rapid development and implementation of interactive computer-based surveys: Automated Survey Collector (ASC). The presentation layer in the ASC system has been separated from the actual survey content (Figure 1). A survey or questionnaire is entered in Access database on a desktop using a simple data entry form controlled by an authoring application. The Access database is then transferred to the TabletPC and is used by a universal ASC presentation module installed on the TabletPC to present the questions to users and collect their responses.

METHODS

Using ASC we implemented and tested two standardized quality of life questionnaires: SF-12 Health Survey (SF-12) and Health Utilities Index (HUI). Patients were given both computer and paper versions in a random order. An attitudinal survey was used for the evaluation of ASC acceptance. Patients were asked to use ASC while they were waiting in pulmonary clinics. Twenty-five consecutive patients agreed to use ASC and to give their feedback.

RESULTS

Patient background characteristics including level of computer literacy and English

proficiency are given in the Table 1. Patient age was 52±10 ranging from 35 to 69 years. The majority of patients (92%) never used TabletPC and about third of the patients never used any computer. Attitudinal survey results are presented in the Table 2. All patients were very enthusiastic for using ASC and all of them stated that they prefer using ASC as a survey tool (100%) rather than the pencil and paper questionnaire. All patients demonstrated a high level of acceptance of the user interface including multimedia content and stated that it was easy to use. The majority of patients (96%) claimed that operating ASC “was not complicated at all” and 96% of patients felt that it was “very easy to navigate through the program.” On average, the patients spent 2.1 minutes less completing HUI and 1.7 minutes less completing SF-12 using TabletPC as

compared to pen & pencil questionnaire (both differences are statistically significant, p<0.05).

DISCUSSION

Our results showed that computer-assisted data collection can be successfully implemented on the basis of a TabletPC in a population with limited computer experience. Both patients and research personnel showed a high level of acceptance of TabletPC as an interactive data collection tool. Such features of the TabletPC as small size and mobility may be very useful for data collection in variety of settings. We conclude that the TabletPC may serve as a feasible alternative for effective data collection in clinical trials. ASC system can be used as a development platform for multiple interactive data collection programs in patient populations with limited computer skills.

Table 1. Background characteristics of the patients .

Question	Answer, %			
	1	2	3	4
Age, yr				
31-40	4			
41-50		36		
51-60			44	
> 60				16
Job				
Permanent	40			
Temporary/Part-time		16		
Student			---	
None				44
Tablet PC use				
Once a day	4			
Once a week		---		
Once a month or less			4	
None				92
ATM use				
Once a day	20			
Once a week		48		
Once a month or less			24	
None				8
Computer use at home				
Once a day	40			
Once a week		28		
Once a month or less			4	
None				28
Computer use at work/school				
Once a day	40			
Once a week		4		
Once a month or less			---	
None				56
English Proficiency (self-reported)				
Excellent	56			
Good		44		
Poor			---	
None				---

Information Flow in the ASC Application

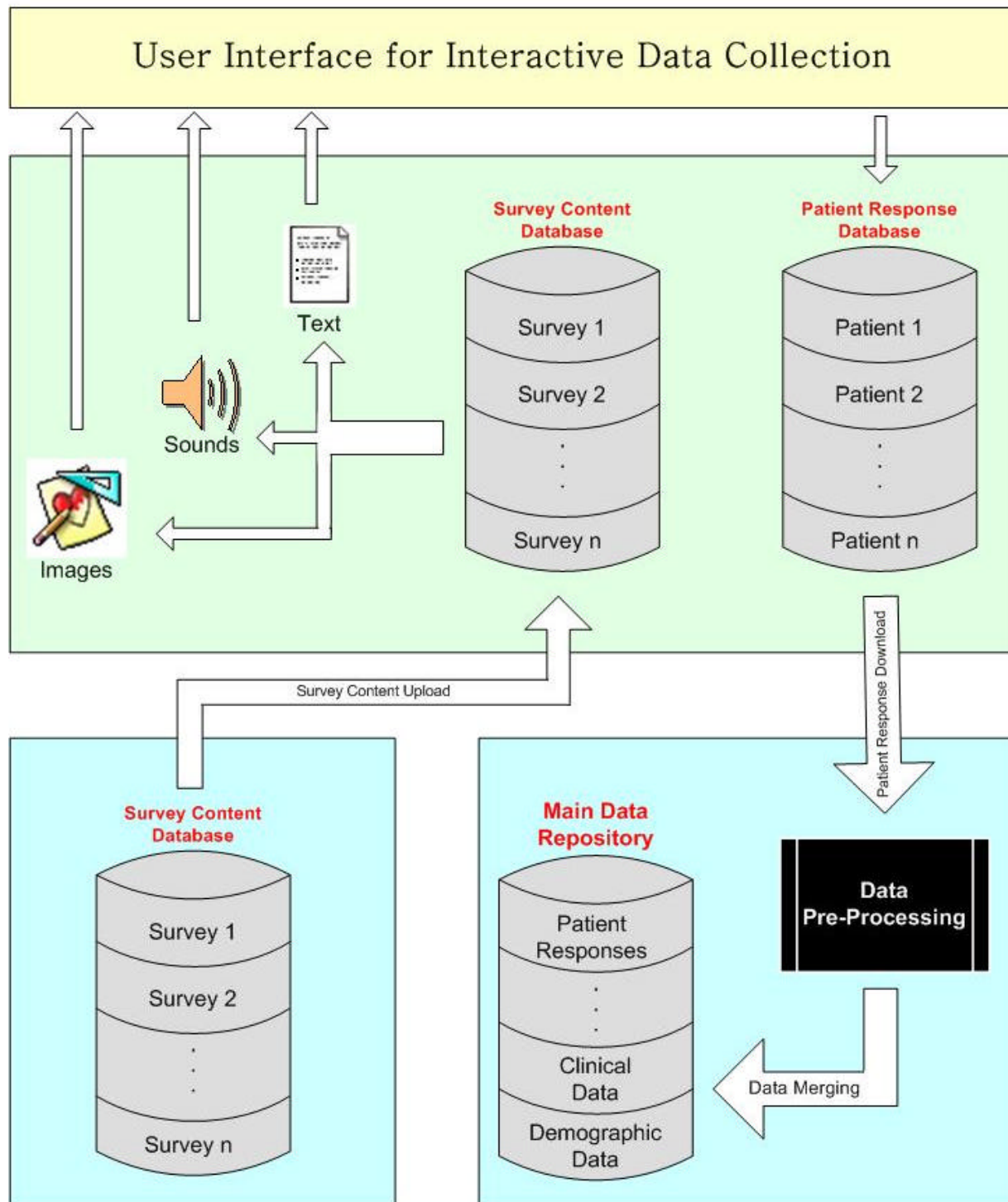


Figure 1. ASC design

Table 2. Attitudinal survey results.

Question	Answer, %			
	1	2	3	4
How complicated was it to use the computer?				
Very complicated	0			
Moderately complicated		0		
Slightly complicated			4	
Not complicated at all				96
How difficult was it to use the stylus (the black pen)?				
Very complicated	0			
Moderately complicated		0		
Slightly complicated			20	
Not complicated at all				80
How difficult was it to find the button to tap?				
Very complicated	0			
Moderately complicated		0		
Slightly complicated			20	
Not complicated at all				80
Did you have any difficulties in reading text from the computer screen?				
Not at all	92			
Very rarely		8		
Frequently			0	
All the time				0
Was the size of the text presented on the screen sufficient?				
Fully sufficient	96			
Sufficient almost all the time		4		
Sufficient some of the time			0	
Not sufficient at all				0
Did you like the colors used on the computer screen?				
Certainly yes	92			
To a large extent		8		
To some extent			0	
No				0
Did you like the audio assistance & audio feedback played during this program?				
Certainly yes	28			
To a large extent		28		
To some extent			32	
No				12
Was it easy for you to navigate through the program?				
Not at all	0			
Very rarely		0		
Frequently			4	
All the time				96
Did you get all the necessary information about using the computer for this program during the initial practice session?				
All information	96			
Almost all information		4		
Partial information			0	
Very limited information				0
How difficult was it to answer the multiple choice questions?				
Very difficult	0			
Moderately difficult		0		
Slightly difficult			4	
Not difficult at all				96
Overall how would you grade this computer program?				
Needs serious improvement	0			
Satisfactory		0		
Good			8	
Excellent				92
Given an option to use paper & pencil based questionnaire or computer based questionnaire, which one would you prefer?				
Paper & Pencil	0			
Computer		100		