Hospital Improves Patient Assessment Efficiency with .NET Compact Framework

MELBOURNE HEALTH

When the Royal Melbourne Hospital wanted to improve the efficiency of its patient assessment process, it turned to a solution that puts patient information directly into the consulting physician's hands, on a Pocket PC device. The eAssessments application uses the Microsoft .NET Compact Framework to give the physician a responsive, easy-to-use application for capturing the assessment of the patient's condition. The Pocket PC application integrates with a server using SQL Server CE synchronisation.

CUSTOMER PROFILE	BUSINESS SITUATION	SOLUTION	BENEFITS
As one of Australia's leading public hospitals, The Royal Melbourne Hospital has built a reputation as a leader in patient care, teaching and clinical research. Today, the RMH is a major health care facility managed by Melbourne Health Service.	RMH used a manual, paper-based system for patient assessments. Retrieval and analysis of the data was tedious and time consuming.	With the help of Microsoft Consulting Services, RMH built a system called eAssessments that combines a server, a browser-based interface for administration, and a Pocket PC application for use at the patient's beside.	▪ Improved efficiency, both for the consulting physicians and the hospital administration ▪ Better service for patients ▪ More structured assessment process ▪ Structured data storage will allow easy reporting

Situation

The Royal Melbourne Hospital provides a range of general medical and surgical services to people living in Melbourne's northern and western communities. As one of Australia's leading public hospitals, The Royal Melbourne Hospital (RMH) has built a reputation as a leader in patient care, teaching and clinical research.

Like many hospitals, RMH wanted to streamline several areas of its operations. One such area is patient assessments. After a patient is admitted to the hospital, he or she is seen periodically by a consulting physician – for example, a dermatologist to track a skin disease, or a neurologist to evaluate a condition like epilepsy. RMH had a paper-based process for assigning consultations and collecting assessments that was consuming more time than anyone would have liked.

Mary Wollmering, Acting Chief Information Officer: "The computing environment prior to this application was virtually non-existent. Records were kept on pieces of paper and filed away. Retrieval and analysis of the data was tedious and time consuming."

It was clear that the hospital needed to put the patient's information into the consultant's hands at the bedside, and also to collect the consultant's assessment of the patient at the bedside. Microsoft Consulting Services (MCS) proposed to work with the hospital's IT department to implement a solution that would connect their servers to Pocket PC devices.

Nicholas Christopoulos, MCS consultant: "The project targeted two departments within the Royal Melbourne Hospital, neurology and dermatology. These departments relied on their own manual paper based assessment processes. With eAssessments, we hoped to increase patient assessment efficiency and make better use of assessment information through advanced reporting."

Before the eAssessments project, the Melbourne Health internal development team had never used Visual Studio® .NET, and was unfamiliar with the Microsoft® .NET Framework. The development team had experience using previous Microsoft development technologies, but no practical experience using object-oriented programming.

Solution

Christopoulos: "eAssessments (see Figure 1) is collectively a .NET and .NET Compact Framework solution comprising of two interfaces, for consultation and administration. The consultation interface resides on the device, and the administration interface is an ASP.NET web application that resides on the application web server.

"The client interface encompasses two .NET Compact Framework applications used to conduct patient assessments, with each application specific to its corresponding department. The information is stored locally within a SQL Server™ 2000 Windows® CE Edition (SQL Server CE) database, with all information replicated to and from the server.

"The client applications are driven by a list of patient referrals that are created using the administration interface. The referrals are then replicated to the clients upon application synchronisation using SQL Server merge replication. We also interface to the hospital's Sybase demographics database, to maintain data integrity and avoid re-entry of patient information.

"eAssessments aims to improve assessment efficiency by providing a set of processes for each department, which consultants can follow when observing patients. Windows

Forms gave us a means to enhance the user experience by allowing us to develop intuitive custom controls, such as the human body control we developed for the Dermatology assessment."

Benefits

Melbourne Health developers found the Visual Studio .NET environment easy to learn and use, and appreciated both the smart user interface they were able to develop with Windows Forms, and the ease of synchronising the portable database with SQL Server. Melbourne Health's administration and medical staff appreciated the improved clinician efficiency and improved data tracking they gained from the eAssessments application.

Development Tools Easy to Learn and Use

Julian Quirit, Lead Developer, Melbourne Health: "Having used software development applications in the past, I was expecting to have a steep learning curve to adapt to Visual Studio .NET. To my surprise I found the interface intuitive, powerful and extremely easy to use. The IntelliSense feature allowed me to focus less on the syntax and more on the application development and program logic. I had not programmed in C# before, but I was up and running in less than a day with the aid of the MSDN® Library for Visual Studio .NET and IntelliSense® technology.

"The drag and drop feature of the IDE components greatly reduced development time and allowed us to quickly create the UI for testing our other classes. The debugging features were invaluable and helped keep debug time to a minimum. "

"Overall I was extremely impressed with Visual Studio .NET and would definitely recommend it."

Better Clinician Efficiency

Wollmering: "This application saves a lot of time in the clinician's day. Patient lists are instantly available, data is only entered once, and data is easy to retrieve.

"This application assists in research which ultimately leads to improved patient care. Accurate and reliable data improves the quality of research. Clinicians can access patient data efficiently."

Smart, Reliable User Interface

Christopoulos: "The .NET Compact Framework provides an excellent development platform for creating robust and reusable software. The UI controls played a big part and the fact that we could inherit from the ordinary controls to develop our own custom versions was a great advantage.

"Another important feature was reusability. Within eAssessments we plan to develop a number of custom user controls. We did not want to have to develop a separate control for each target device. The .NET Compact Framework allows us to create one control that can be re-used on a number of other devices.

Portable, Synchronised Database

"The client interface uses SQL Server CE to store information locally; this enabled us to work within a disconnected environment and removed the need for a wireless presence. Once the device was synchronised with the server, the application then disconnects from the server and works with the information locally. The assessments are then replicated back to the server on subsequent synchronisations, where new information is sent to the device and the updated consultations are sent back to the server. All patient consultations are stored within a SQL Server 2000 database hosted on the application server.

"Synchronisation is achieved using the ActiveSync® pass-through connection

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proxy, a feature of Pocket PC 2002. It is intended that a consultant would synchronise their information at the start of the day and then re-synchronise the information at the end of the day. Another avenue that we are considering for the future would be to host the eAssessment client on a Pocket PC Phone Edition device and to perform synchronisations anytime using GPRS. This would also to allow us to take advantage of SMS notifications, which would be very useful."

Portable, Synchronised Database

Prof. Christine Kilpatrick, Deputy Director of Neurology: "The eAssessments application has provided an easy and reliable way of documenting patient information. It has allowed us to keep track of the large volumes of information about patients that we need to document over a period of time, e.g. several weeks, and readily review the information already documented.

"We hope and anticipate that the application will allow us to aggregate information about patients and use this for research and quality assurance purposes. We hope that the application may be used for other aspects of epilepsy work, i.e.

documenting information regarding other groups of patients. Currently we are using it to document information about patients who come in for video-EEG monitoring which is an inpatient assessment. One of the major reasons for admitting patients for video-EEG monitoring is prior to epilepsy surgery.

"Currently this is used for only one aspect of our work, the epilepsy monitoring program. This is only one aspect of the work done by the epilepsy neurologists. Nonetheless this is an important part of our work and which requires large amounts of information to be managed and so far the eAssessment has been very helpful in this.

"I anticipate it would have broader applications for neurologists in other specialties such as stroke and multiple sclerosis. As mentioned it would also be useful in other aspects of epilepsy such as patients who attended our outpatient clinics or First Seizure Clinic. Its major advantage, however, is in managing large amounts of information, which is difficult for patients admitted for video-EEG monitoring."

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