HANDi Stroke Rx: A Hand-held Tool for the Evaluation of Acute Stroke Patients

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HandiStroke

Abstract

The management of acute ischemic stroke is time sensitive. Decision making in management requires data not only from laboratory testing and neuroimaging, but also from a detailed history and neurologic examination. The neurologic examination provides baseline information and assists in differentiating acute stroke from its mimickers. There is a strong need for tools to facilitate the evaluation and decision making in the acute stroke patient in order to make the correct diagnosis and, when indicated, to administer intravenous fibrinolytic therapy correctly. The authors have developed an application for Palm based handheld computers, designed with Satellite forms™ (Pumatech Inc., San Jose, CA), to aid physicians in their evaluation and management of patients presenting to the emergency department (ED) with acute ischemic stroke. The goal of this project was to: 1) create a program to aid physicians in their evaluation of patients presenting to the emergency department (ED) with acute ischemic stroke, 2) create an educational tool with which residents and other health care professionals can gain a level of proficiency in treating these patients, 3) create a data gathering tool for future clinical studies investigating the treatment of stroke patients, and 4) increase the use and documentation of the National Institutes of Health Stroke Scale (NIHSS) in acute ischemic stroke patients.
Handi Stroke Rx

Introduction

Handheld computers such as Palm Operating System (OS) based devices are gaining wide acceptance among emergency physicians. Their use of programs running on these handheld devices as reference tools, clinical assistants in the form of calculators and decision-aids, and as data collection tools is increasing. The creation of Palm based applications in the health care setting using off-the-shelf development tools like Satellite Forms from PumaTech, or Pendragon Forms from Pendragon Software Corporation is both feasible and economical, and can produce highly satisfying end results.\(^1,2,3\)

The NIH stroke scale (NIHSS) is an 11-item tool that was developed for use in clinical trials and to assist clinicians in diagnosing acute stroke and to create a baseline assessment against which stroke progression and/or response to therapy can be judged. The NIHSS has been widely used and its reliability\(^4,5,6\) and validity\(^7,8\) have been well documented in the literature. The NIHSS is easy to use though requires familiarity with its components and applications. Performance of NIHSS scoring ensures a comprehensive evaluation of a patient with an acute neurological complaint and therefore is an important quality assurance marker in the care of these patients. One study in the recent literature suggests that as few as 1.2% of emergency physicians document an NIHSS for stroke patients.\(^9\) In recent pilot data obtained from a chart review of stroke patients in our own emergency department, there were no instances of the NIHSS being documented.

The use and efficacy of intravenous rt-PA therapy within 180 minutes of onset of symptoms in patients presenting with acute ischemic stroke is well established in the literature.\(^10,11,12,13,14\) It is also well established that the earlier a patient presenting with acute ischemic stroke is treated, the better the outcome.\(^15\). Because of the inherent difficulty in obtaining faster “door to needle” times in these patients, we developed a comprehensive handheld based tool to assist the clinician in the rapid evaluation of patients presenting with acute ischemic stroke.

Handi Stroke Rx™ is a Palm OS based tool we developed on the Satellite Forms platform in a total of about 200 hours with grant support from the Foundation for Education and Research in Neurological Emergencies (FERNE). Content for the protocol guidelines were taken from a publication by The National Institute of Neurological Disorders and Stroke (NINDS) rt-PA Stroke Study Group.\(^16\) The program allows clinicians to rapidly evaluate acute ischemic stroke patients in the ED, and provides a resource for those in training to become familiar with treating patients for stroke. The program includes the following components: 1) an NIHSS score calculator with full explanations for each of the 11 steps easily accessible with one click, 2) inclusion and exclusion criteria for r-TPA therapy using interactive check boxes, 3) a weight-based r-TPA dose calculator, 4) a brief review of the sequence of events as a framework for managing stroke patients in the ED, 5) lists of sample orders for various points in the clinical course, 6) protocol guidelines
for the management of ICH and increased blood pressure, 7) suggested documentation for informed consent prior to r-TPA therapy, and 8) product information on Alteplase.

These components flow in a linear fashion that follows a logical, chronological order and allows the clinician to go through the program at the bedside while working up a stroke patient. Alternatively, there are “jump” buttons at various points in the program that take the user to the “jump menu” which functions as a table of contents and allows the user to use individual aspects of the program (such as the r-TPA dose calculator) without having to run through other aspects of the program that the user might not need to use at a given time.

Methods: An initial prototype of the program was build using Pendragon Forms (Pandragon Software Corporation, Libertyville, IL). There were limitations in the amount of characters that could be included in text portions of the program, and the version of the software available at the time of development did not offer support for including the NIHSS images inline.

The initial phase of this program development was to create a clinical assistant and educational tool. A second phase, that is currently being developed, is to use the program as a data collection tool, with the forms based clinical assistant running in the foreground, and a database application running in the background and capturing data. We wanted a robust forms generation software package that would allow us to capture data at the bedside using the handheld computer, and then during hotsync operations, have it stream over the internet to a server based database program. The ideal is to have a large database of stroke patient encounters that could be then mined for clinical analysis.

Satellite Forms version 4.1 was chosen for the final development of the application. This software package offered multiple advantages including virtually unlimited ability to incorporate content and to a more limited extent, inline bitmap images. The development platform runs on a PC and offers WYSISIG (what you see is what you get) interactivity which allows a large amount of flexibility in form layout and design, which is what the end user will see on their handheld screen. Furthermore, with Pumatech’s Enterprise Intellisync™ server software, the ability to work with multiple database applications in the background will allow a tremendous amount of flexibility when we move into data collection.

Using the current model, there would be virtually no opportunity for human error from the time that the data is captured by the practitioner at the bedside, through the data being mined and imported into statistical analysis software. This program could be widely distributed across multiple sites, and have patients captured in the database every time the user hotsyncs their handheld.

Discussion: We believe that this free application will have an impact on the acute care of stroke patients. By making the NIHSS easy to do and accessible we believe that more EP's will rapidly and appropriately assess stroke patients in the ED. Although all EP's do
not own nor currently use PDA's we believe that these tools are common amongst EP's. Recent data suggests that ____MD's and ____EP's nation wide have PDA's.(ePocartes) This number is sure to increase as technology advances and prices continue to decrease. Even since Bird's recent article the cost of handhelds with appropriate storage have decreased from $350 per unit to under $300 per unit. (3)

Some will say, "why bother, we have limited treatment protocols for acute stroke what difference will it make to know the patients NIHSS. " That is what we hope to change. We hope to increase awareness amongst EP's of NIHSS and acute stroke protocols as only part of a multi-faceted approach to improving the lives of the 600,000plus acute stroke patients annually. (AHA) Stroke is the third leading cause of death in the US we must do everything we can to educate and improve the quality of care of stroke patients.

Limitations and Future Studies

Currently the tool is available only for Palm OS. The development team has been working on a version for Pocket Pc's. Satellite Forms 5.0 shows promise of becoming an application that can be used on either operating system.

In future studies we will demonstrate an increase in the efficiency with which patients are able to move through the ED during the initial evaluation, decrease the time to treatment for those patients who are eligible for thrombolytic therapy, and increase the use and documentation of the NIHSS.

We believe that this program will be successfully validated in a study currently under design to compare this tool with a traditional paper and pencil based NIHSS. We also hope to receive funding to develop the next version of HandiStroke that can be used as a real time data gathering tool that will prove for future clinical studies with stroke patients.

Conclusion

We believe that Handi Stroke Rx will assist clinicians in their evaluation of patients presenting to the ED with acute stroke. We also believe the free application will be an effective educational tool and should facilitate understanding of the current guidelines for management of acute ischemic stroke patients.

Version 1.0 of HandiStroke is available for free at FERNE.org.

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Reference List


