The GuideView System for Interactive, Structured, Multi-modal Delivery of Clinical Guidelines

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When the Doctor is Really Far Away!

- During space exploration a physician may not be available if astronauts need medical care.
- All astronauts cannot be physicians, or the physician may need medical care.
- Astronaut-physician may be unfamiliar with a particular medical procedure.
- Many other settings also have low physician density.
- Rural areas, less developed countries, first responders, and battlefield situations.

Clinical guidelines can be a solution if implemented using technology and user interfaces appropriate to user's medical training.

Main Features of GuideView

- Complex guidelines are broken into simple steps in a process flow.
- Instructions for each step are presented in multiple modes: Text, Voice and sound, Pictures, Full-motion video, Live action (with annotations), Animation.
- GuideView interacts with the user in two modes: Mouse clicks, and Voice Navigation: both hands can be free to assist the patient.
- GuideView can interact with medical sensors using Bluetooth (wireless) or wired connections.
- Automatically traverses guideline pathways depending on data values received.
- Saves time and improves accuracy.
- GuideView is user-friendly platform with consistent look-and-feel.
- Over the web on Windows and Macintosh clients running Internet Explorer.
- Stand-alone on Windows computers.
- On Windows Mobile PDAs (Pocket PCs).

GuideView User Interface

GuideView supports mobility.

- User interface is identical to the desktop version.
- Full-motion video and voice output available.
- Video and text-factors very desirable for mobile professionals and astronauts.
- Voice navigation is being developed.

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GuideView Design Goals

- Reduce Complexity
- Each process step is a simple task that can be completed even by those with minimal medical training.
- Decrease Cognitive Load
- At each step only a small (5 maximum) choices to next step.
- Support backtracking
- No choice is final. Can always return easily to a previous step and follow different path.
- Enable repetition
- Provides instructions for any step as often as desired.
- Support modularity and re-usability of guidelines:
- Guidelines can be developed in small modules.
- Modules can be shared and reused as needed to create complex protocols.
- Reinforce learning by providing multiple instructional modes:
- Each step is presented using multiple media: text, voice and visual aids.
- Look and feel as similar as possible over multiple platforms.
- Achievability using Flash technology from Macromedia.
- Support mobility
- GuideView may need to be used by mobile professionals, either within a space habitat or terraforming.
- Separation of content and presentation.
- Content stored as XML.

GuideView Author

- Used to develop clinical guidelines and save them in a form capable of being played back using GuideView.
- Up to 5 branch points at each node.
- Flat and zoom functions for navigating across complex, lengthy protocols.
- Supports insertion of text, voice, pictures and video.
- Content saved as XML.
- Cross-platform capability.
- Can create GuideView-compatible protocols over the web.
- A graphical editor for creating, editing, and updating GuideView process flows.

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Future Work

- Interface GuideView with electronic health record systems.
- Improve voice navigation.
- Add expert mode for use by physicians.
- Develop extensive module library with management and search features.
- Enable connectivity with medical devices and sensors.
- Explore engineering applications for GuideView technology.

References


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Results of Usability Study

- Voice instructions rated useful to indispensable by 100% of subjects.
- Video also rated highly.
- Task Load Index significantly higher (p < 0.002) with voice navigation than without.
- Reason: Microphone and recognition software were oversensitive and interpreted external noises as commands.

Clinical Guidelines

Clinical Guidelines are stepwise instructions for performing diagnostic or therapeutic medical procedures.

Typically guidelines are available as text, designed for use by physicians/nurses.

Example - Disorders of the Elbow:

- Search for any evidence of dislocation and arterial problems.
- Perform a clinical examination for deformity, tenderness, or ecchymosis, or associated nerve, neurovascular, or tendon injury. Also look for the inability to perform abduction and external rotation.
- Search for any evidence of an open wound in the vicinity of the elbow.
- X-ray the elbow. Special views should be obtained when space travel. (J.Clark, MD, personal communication).

Two GuideView Procedures

So far two GuideView procedures have been developed.

- Ophthalmic: Evaluation of redeye includes diagnosis and treatment of eye irritation:
- Instructions for performing eye exam.
- Detection and removal of foreign body in eye.
- Orientation and treatment of abrasions in eyes.
- Diagnosis and treatment of bacterial and viral conjunctivitis.
- Foreign body in the eye is the most common medical problem in space travel. (J.Clark, MD, personal communication).
- Airway stage. Diagnosis and treatment of acute breathing problems:
- Heimlich maneuver.
- Insertion of ILMA (Intubating Laryngeal Mask Airway).
- Cannotherapy.
- Assisted breathing using Ambu bag.
- Others.

Usability Study

- A usability study was performed at the Human Patient Simulation Laboratory, Wyle Life Sciences, Houston, TX.
- Ten subjects used GuideView on a laptop to perform two procedures: Heimlich maneuver and insertion of ILMA.
- A usability questionnaire and the NASA Task Load Index were administered immediately after completion.

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