# Quill:  A Novel Approach to Structured Reporting

Edward Shultz. MD[1], Trent Rosenbloom MD[1,2,3], Wendy Kiepek MS[1], Fern Fitzhenry, PhD[1], Perry Adams[1], Arathi Mahuli[1], Kiki Shuxteau[1], Alison Culley RN[1], Debi Camp RN[1], Melissa Luther[1], Waleed Irani MD[3], Kevin Johnson, MD, MS[1,2]

**Department of Biomedical Informatics, Pediatrics, and Internal Medicine
Vanderbilt University Medical Center**

The authors will demonstrate Quill (QUestions and Information Logically Linked), a comprehensive structured reporting environment for ambulatory care that was developed at the Vanderbilt University Medical Center.  A notes capture tool was sought with the immediate hope of decreasing or eliminating transcription costs (currently around $6M/yr) and paper based processing while providing a foundation for decision support and research in the future.

After reviewing the commercially available structured notes capture tools, there were a number of desirable features not typically present. The most important missing features were the ability to incorporate laboratory and other hospital database information;  to utilize pen, mouse, keyboard, and speech for data input; to create templates using a controlled but customizable vocabulary; to support merging of problem-based templates; to allow multiple providers to collaboratively build a note; and to reuse previous notes as a template for subsequent notes.  After a careful examination of the marketplace and a consideration of the needs of providers, we decided to construct a structured reporting tool that incorporated their stated needs.

Quill is a Java-based application that is a component of our EMR.  Quill has been in active use at Vanderbilt for over a year, and has been used primarily by our Cardiology group to document thousands of encounter summaries during that time.  Quill supports documentation of the entire encounter summary, during or after the visit. Vital sign and laboratory data may be imported or automatically populated from the electronic medical record. Medications and problems are retrieved from, edited and stored in a longitudinal summary list that resides within the EMR. All pilot physicians have been able to achieve documentation times that meet or exceed their time to complete a note prior to using Quill.

Documentation using Quill occurs through the use of user-customizable templates-- collections of elements from the Quill controlled frame-based vocabulary. Templates prompt documentation of particular problems or to follow specific guidelines. Quill is designed to be useful across multiple knowledge domains, so that it could be used equally for a child's health maintenance visit or an admission history and physical exam of a patient with chest pain. Other features include an augmented transition network to generate prose, an editor for construction of new findings and a letter merge tool for referral letters.

Quill output is stored both as an XML file and as computer generated clinical prose. The XML file currently is used to bring categorical information from prior sessions in Quill forward to populate subsequent notes. Its evolutionary use will include populating research databases and serving as a real-time information resource for other clinical applications such as order entry.