Reviewer’s report

Title: Computerized Clinical Documentation System in the Pediatric Intensive Care Unit

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Reviewer: Dr Edward Hammond

Level of interest: A paper whose findings are important to those with closely related research interests

Advice on publication: Accept after revision, which I do not need to see

General Comments

Although there is little new in this paper, I think there is value in reestablishing the fact that a commercial clinical documentation system can improve care by providing better access to quality data. The authors establish five reasonable objectives for the study, and note that all of these objectives have been studied in adult settings with positive results, but not in a pediatric setting.

I have a number of problems with this paper. First, the paper is, at best, written at an average level. The paper includes no characteristics of the unit in which the study was performed: how many beds, average length of stay, number of admissions per year; number of persons and type of persons involved in the study. These characteristics are necessary to understand the costs analyses. The term clinician is used very loosely. While I generally take this term to mean physicians, nurse practitioners, and physician assistants, I would accept a broader meaning to include nurses and therapists. However, at times in the paper, I do not know who is entering data - nurses or physicians. I think this distinction is important. What is not clear to me is whether the documentation includes only nursing notes but also, for example, progress notes and problem lists, defined by the doctors.

The paper is not clearly written in several additional areas. The authors appear confused about certain terms that will be discussed below. Further, the authors are not clear about the criteria used to evaluate a number of the objectives. I think using the delay in giving a medication as a medical error is misleading. At Duke, the time scheduled for giving most of the medications is a general time for all patients. Without having a nurse for each patient and a bell sounded to simultaneous give each drug, precise timing is not possible nor is it necessary. Only in a few, identified cases is it necessary to note the precise time at which a medication is administered. I suspect that the reason times were recorded to the nearest hour of administration is as discussed above.

LL Leape and others reported (JAMA 1995; 274:35-43) that medication errors occurred in Ordering (39%), Transcribing (12%), Preparing (11%), and Administering (38%). Perhaps looking into these areas would provide another metric for determining medication errors.
The paper does not give details in a number of areas. What is the nature of the data capture, what type of data elements were omitted in the preCDS studies and what were there importance. How valuable were the additional data elements captured in the CDS. Were templates used? What was the satisfaction in freedom and flexibility of data entry? How was data presented? These user characteristics seem importance in evaluating improvements - whether more is better or not.

Specific Comments

Page 3, Background. In the first paragraph, do you mean decreased turn-around time or quicker availability? What is meant by "easier quality assurance process"?

Computer Software/Hardware: What is the difference in the local area network and client server architecture? The way you wrote this section implies that these are two variations of the same thing? What was the architecture before you went to client/server? I assume the connectivity from the beginning was a LAN.

Page 4. Although I know mirrored copies are used in the literature, it is not a meaningful term. Do you redundantly store two copies of the data in real time? How does synchronization occur? Why are you using redundancy? Is it to improve system performance or is it to increase reliability? Or both? I assume the cardio respiratory monitor is from HP. What is the nature of the interface. How often is the system updated from the monitor? What data is passed? What purpose does the monitor serve compared to the inclusion of the data into the CDS? Are you using HL7 to transfer the data or are you using a propriety interface?

A graphical user interface describes the characteristic of a workstation. What do you mean by "data entry is monitored by the system"? Do you mean the data is check for validity? If so, please describe what is done and the method used. What do you mean by non-textual data? Do you consider numbers expressed as ASCII characters to be numbers? Do you consider structured data to be text? By text do you really mean "free text" or open narrative form? It is not clear the purpose of the Decision Support database? Is it used for decision making or simple archival storage that is available for SQL queries? You state that the data in ECLIPSYS is stored in a propriety database. Why? Is this good or bad? Is this form or database a result of a legacy system or does the propriety database provide significant advantages. By the way, I am making comments on what you have in your paper. I may think that some of these issues are not important to this topic, but you brought them up, so I am responding.

Under Methods: Why did you define two initial three-month periods? What is different about the periods? Are the people the same? Is the location the same? Why only one post-implementation period? If you felt the training period impacted the study, why not add another period to see what changes have occurred?

I also question the use of determining the time for abnormal potassium and ionized calcium values to return to normal as an indication of the speed of decision making. There are many other factors involved in the potassium and ionized calcium levels, including diseases and levels of abnormality. Can you tell when an intervention first started as an indication of awareness? I actually this is an indication of awareness of an abnormality rather than speed of decision making.

The evaluation of the nursing documentation is not clear. What existed before the introduction of the system? The data suggests that little structured documentation occurred prior to the implementation of the system. Perhaps all that automation did was to teach the nurses what a structured nursing note might be. You perhaps need more detail on the analysis.
Results: What do you mean by the laboratory normalization time data? I do not know why the data were missing from the paper chart audit? You need more detail here. Was the detail available from another system? Or were the doctors and nurses working in the absence of results from ordered tests? Can you very specific numbers and more detail?

You indicate that nursing documentation was superior in content and legibility. Legibility is a given - typed text is always more legible than script. How was content determined - by an increased volume alone, or was the content evaluated in value and appropriateness as well. Were the additional data pertinent to patient care, and was that care improved as a result of better documentation?

Please tell me more about the increase of managerial control for the nurse manager. I have no idea of what you mean by the phrase "enhanced her ability to develop employees". Was the automatic logging of information just the data input from the HP system or was it more? Did you compare the automatic logging results from those enter by humans? If so, what was the error rate? If not, how can you make that statement?

I have no idea of what a reasonable cost might be. What all is included? Does it include maintenance? Does it include supplies? Does it include computer staff? How was the system purchased? Was it part of a larger system? What was the actual purchase price? Was it purchased or licensed?

Page 8: I would like to see you address the record locking issue. What prevented a record from being updated at each of the 18 stations at the same time? Were there rules controlling the use of terminals? Was a workstation logged on to a specific user? Was a specific patient brought up on a terminal and left logged in? How long did access to a system take? What privacy, confidentiality and security issues were discussed and dealt with?

What was the transcription error rate?

Why did the CDS audit take 20 minutes? I would have expected a much faster response time.

Please discuss how the shift change occurs (both pre and post automation)? What new features did the CDS provide? What are the characteristics that were improved?

Your references are somewhat dated. Has this issue more recently been addressed?

I have coauthored three papers on this topic that you might find interesting. These papers are older yet and were written about our experiences in the Surgical Intensive Care Unit at Duke. Our study had some similar aspects to your study. The references are:


Competing interests:

None declared.