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The CPR in Eleven Paperless Physicians' Offices: Performance, Processes, and Results

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INTRODUCTION

Clinical applications in the ambulatory setting are not widespread, despite the Institute of Medicine's landmark reports, "The Computer-Based Patient Record: An Essential Technology for Healthcare" [1] and "To Error is Human: Building a Safer Health System" [2] These reports conclude that the computer-based patient record (CPR) is "an essential technology for healthcare,"[1] and that computerized physician order entry is a "powerful method for preventing medication errors." [2] Even more uncommon are instances of CPRs integrated with workflow systems that automate manual processes and distribute information within a workgroup. Research on paperless ambulatory care offices is also scarce.

This study describes the characteristics of a workflow-enabled CPR from a common vendor installed at twenty-five sites and the results from a survey intended to measure user satisfaction in the areas of time savings, quality of care, and office productivity. The typical site goes paperless (except for printed prescriptions and paper documents from external sources) in less than two weeks. Two practices have been paperless long enough to have converted the records-keeping areas to other office functions.

The purpose of this study was to identify the common characteristics of these paperless offices; to examine the core processes of the workflow system; to measure user satisfaction; and to provide feedback for subsequent implementations.

Definitions

Paperless refers to an office where the work processes have been streamlined and computer communications replace the flow of paper. All clinical charting by all providers is done electronically and patient data are stored electronically (and not routinely printed). Paper still exists in the form of automatically printed prescriptions and externally generated documents that in many cases are scanned into the CPR. Experts estimate that less than 1 percent of US doctors have paperless offices.

Workflow automation refers to "the automation of a business process, in whole or in part, during which documents, information, or tasks are passed from one participant to another for action, according to a set of procedural rules."[3] The range of business processes that have been automated as a result of implementing the CPR that was the subject of this study include patient check-in, collection and recording of patient vital signs, documenting a physician examination, ordering of lab procedures and other tests as well as other data driven activities, like writing prescriptions, and discharging a patient from the office.

A *workflow system* is a complex, dynamic assemblage of:

- Tasks—These are activities that must be completed in order to achieve a business goal. The CPR in this study has a task-based orientation.
- Actors—Tasks are performed in a specific order by specific actors (that is, receptionists, nurses, physicians) based on business roles.
- Roles—Roles are defined independent of the actors or the processes that fill that role. For example, the CPR defines a nurse's role as different from a physician's role in the ambulatory care office.
- Processes—Processes are the sequences of tasks to be performed based on business conditions. Workflow automation may mirror existing processes or call for redesigning processes to eliminate redundancies and bottlenecks, and to facilitate communication.
- Practices—Practices are what actually happen in organizations. Only by capturing the practices is it possible to truly automate how physicians' offices run.
- Policies—Policies are often formal written statements of how certain processes are handled. In most physician practices, policies are unwritten and must be remembered by the person assigned to the task.

The CPR in this study provides checklists, sequential screens, and a rich knowledge base to aid memory.

Description of Offices

The primary care ambulatory sites discussed here are comprised of independent physician and physician group offices that, as early adopters, had voluntarily purchased a CPR. Eleven of the twenty-five installed sites have been paperless for at least three months. These sites are primarily located in urban areas in nine states. They vary in size from solo practitioners to a group that includes ten providers. The offices represent a mix of both new and well-established offices. Each practice uses EncounterPRO®, a computer-based patient record and workflow system produced by JMJ Technologies of Marietta, GA. The total patients contained in all the sites is over 300,000.

The first office went "paperless" in December 1995. All sites except for two have at least six months of data captured electronically at the point of care. Touchscreen monitors attached to each practice's central database server are installed in every exam room. The only exception is in one case that is wireless and makes use of pen-based computers for data entry and retrieval. No office experienced any significant downtime after they went on line with the system. Nor have any reported significant losses of office productivity during implementation and training that immediately followed going live.

CHARACTERISTICS OF THE CPR

Problems with Paper-based Offices

Much has been written about the forces and incentives driving clinical automation.[1,4] These forces include rising healthcare costs with the CPR as an instrument of cost management; the emergence of integrated delivery systems; the central role of primary care within managed care; the decentralization of the healthcare workforce; and changes in reimbursement requirements.

The reasons for purchasing the CPR as expressed by the physicians and office managers during interviews for this study varied. One physician with progressive arthritis in his hands needed a touchscreen solution. Physicians identified the CPR as a way to increase patient volume. Physicians of three practices wanted to start-up paperless, avoiding paper charts altogether. One office manager was convinced that he needed a CPR when he confronted the fact that "fourteen pieces of paper are generated by a typical encounter using paper records."

All offices had the typical problems with paper that are well documented in the journal literature and by the Institute of Medicine in their reports on computer-based patient records[1] and prevalence of medical error[2]. These problems include time spent waiting for missing or unavailable charts, poorly organized or redundant and/or disputable data, illegible handwriting and poor quality printed or FAXED reports and information. As one physician in this study put it, "I can't even read my own writing." In addition, paper records are often incomplete, inaccurate, and lack standardization in content and form.

Characteristics of the CPR Solution

The implemented CPR includes a patient tracking screen; a vitals screen for nurses' examinations; an encounter-screen for physicians' orders, progress notes, histories, and other records; allergies and immunization screens; dynamic short lists configured to the preferences of every practice, and in some cases to every physician in the practice; alerts; and prescription writing. The patient record is available to multiple users at the same time, especially valuable in the multi-site physician office configuration. Data is entered via touchscreen although users have the choice to use a mouse. Data is captured as structured text and can be queried. For each patient encounter documentation both normal and abnormal values are gathered.

Direct Data Entry

Physicians and nurses are the key users of this application. Patient data is directly entered by the physician. The exception is a two-site practice that had traditionally used scribes before the implementation of the CPR and wished to continue to do so. These intermediaries enter patient data dictated by the physician in the exam room. In all but one practice, patient information is entered into the computer while the patient is in the exam room. In this exception, the physicians immediately document the encounter after the patient leaves the exam room**.** Thus, except for pending labs and tests (which are documented as such), all encounters at these twenty-five locations are completed before the patient leaves the office. There is no delayed charting (at lunchtime or after hours) at any of these offices.

The touchscreens and "dynamic short lists" allow encounters to be rapidly charted at the point of care. Physicians report that most of the time they can chart a patient in well under the benchmark of two minutes that it typically takes a doctor to complete a paper chart. One physician reports that he can document most of his patients in thirty seconds.

User Training

The majority of the 300 users in this study had little or no computer experience before purchase of the CPR. Key people in each practice, however, recognized the value of computers in the clinical care setting. Providers were trained in two phases. First, before going on line, physicians were given hands-on training from two to eight hours, depending on the individuals' needs. Training for nurses who entered vital signs into the CPR was less, usually two to four hours. Training for non-clinical staff was usually two hours or less. Training was accomplished through both group instruction and individual tutoring. Only two of the doctors resisted training, saying that "the office manager will show me how to do it." After going on line, trainers typically spent from one to three days at the practice "shadowing" the

staff. All sites except one used a full-immersion approach to implementation. That two-site office preferred a user-incremental approach whereby a small number of physicians become proficient in the system before full office implementation.

BUSINESS PROCESSES

Workflow Automation

The workflow-enabled CPR reduces the amount of time required to retrieve information, document care, order labs and procedures, and communicate among clinical and non-clinical staff by two important mechanisms: smart sequences and simultaneous communication. Smart sequences are based on who you are (physician, nurse), where you are (exam room, tech station), and "when" you are (that is, what has been accomplished, such as vital signs, and what remains to be done, such as physical exam), and drive the sequence of user interface screens. Simultaneous communication is based on posting tasks to be done in a central location (a CPR screen that provides an office "big picture"), which allows everyone to know what needs to be done and act accordingly.

Information Retrieval

In these paperless offices with workflow, check-in can be accomplished by simply clicking on the patient's name on the appointment schedule. The task of pulling charts is completely eliminated. A log is made of the patient's arrival and arrival time. The medical record is automatically called up and ready for nurse and physician documentation. The triage nurse is notified that a patient is waiting. The seamless flow of information allows the front office staff and the triage nurse to work together to maximize their productivity.

Care Documentation

The triage nurse's duties varies among offices, but typically consists of eliciting the chief complaint and the history of the present illness, measuring the pertinent vital signs, and choosing a patient priority level. Documentation of common conditions can be made very quickly using a "pick list" of frequent complaints. Research shows that use of such lists improves efficiency and increases compliance with practice-defined guidelines[1].

The physician is able to see all the information previously gathered by the triage nurse. He or she also has a "pick list" to document additional historical information. By keeping typing and dictation to a minimum, the documentation process is dramatically faster. When the physician chooses a medication to treat the patient's illness, the medication is checked against the patient's allergy list, the dosage is calculated, the therapy is documented in the medical record, the patient's drug list is updated, and the prescription is printed. With the CPR, these functions are accomplished with just one touch and errors are virtually eliminated. In all of practices under study, dictation has been reduced to almost zero.

Orders

The CPR and workflow system allows instant communication within the office and simultaneous access of a medical record by various people in the office. When the healthcare provider orders a lab or procedure, the nurse is notified automatically and immediately. The physician need not bother with or waste productive time trying to locate a nurse or turning on a certain light. While the physician is still with the patient, the nurse can prepare for the procedure. In the case of vaccinations, the dosage, manufacturer, lot number, and the intended site of administration can be documented before even entering the exam room and while the physician is still charting the exam. The nurse can also enter the results of labs and the information will appear in the exam room for the physician, thus preventing interruptions.

Communications

At the heart of the workflow system is the "big picture" screen that tracks patients throughout the visit. From this screen, configured to the office specifications of each site, everyone can see where each patient is, which provider the patient is waiting for, what service the patient is waiting for, and finally, how many minutes the patient has been waiting. And the observer can easily take charge of a pending task simply by touching its representation on the "big picture" screen.

Consistent with workflow automation, information—beginning with patient check-in—flows from screen to screen in an accumulative and value-added process, until patient check-out. Members of the workgroup add value by adding more information or by making judgments based on the information provided to them by the application. This information—all current and past encounters—is available in real time to multiple users throughout the process.

SURVEY RESULTS

Approach

Several methods were utilized to gather data. (1) Likert-scale surveys (1 to 5, 1 = low satisfaction, 5 = high satisfaction) measured the perceptions of the medical, nursing, and non-clinical staffs after the installation of the CPR and workflow system. The questionnaire was adapted from Zdon and Middleton's study.[5] See Table 1. (2) The evaluation team interviewed in person or by telephone the key person in each practice, usually the office manager. (3) Several offices were randomly selected for personal observation.

Table 1: Physician Survey [n=17] of Satisfaction with Ambulatory CPR (1-5 scale, 1=Low, 5=High)

Survey Item	Avg.
Ease of accessing a patient's medical record	4.59
Ease of finding specific information within a patients medical record	4.18
Confidentiality and security of patient records	4.05
Overall efficiency of office's business operations	4.28
Overall quality of care delivered to patients	4.23
Efficiency with which you exchange information with clinical staff	4.47
Efficiency with which you exchange information with administrative staff	4.00
The overall quality of workflow at this office	4.31
The management of patients from check-in to check-out	4.50
The CPR helps to deliver better patient care	4.13
The CPR helps to prevent overlooked patient information	3.70
The CPR helps me practice better preventive medicine	3.94

Physician Acceptance.

Prior to installation, physicians and their office staff expressed positive expectations regarding the CPR. Also, since this was an application purchased from the vendor and not mandated by outside organizations, each practice had one or more enthusiastic sponsors of the application. One measure of physician acceptance is the level of usage. After pre-installation training, physician compliance was 100% in every practice. One of the physicians in this study even went so far as to state, "I am married to this system."

Office Productivity

At all sites, the physicians indicated that they were satisfied with the efficiency of their office's business operations (4.28) and that they were very satisfied with the management of patients from check-in to check-out (4.5). Interviews disclose that the physicians perceive that productivity has been increased because of everyone's ability to better prioritize their work. The medical record is instantly and simultaneously available throughout the office, thus eliminating many hours of searching for and filing medical charts. Because charting with the CPR is much faster than paper records, less time is needed to document the encounter. Most of the physicians report that they can document a typical encounter is well under two minutes. Communication within the office greatly reduces the lag time created by paper-based workflow systems such as routing slips and color-coded light systems.

Time Savings

The physicians produced a mean score of 4.59 when asked their perception of easily accessing a patient's record. When asked about finding specific information within a patient's medical record, their mean score was slightly lower, 4.18. When asked about the efficiencies of interoffice communications with the non-clinical staff and the clinical staff, their mean responses were 4.0 and 4.47. Since, in general, physicians are estimated to spend an estimated 38%—and nurses 50%—of their time writing up patient charts[1], these survey scores are even more notable.

Quality of Care

Physicians agreed (4.13) that the CPR adds value in delivering better patient care. They also agreed that the CPR helped them practice better preventive medicine (3.94). They agreed to a general question regarding the overall quality of care that their office delivered to their patients (4.23).

Quality of care becomes a major advantage of the CPR over paper medical records. The patient's problem list, medication list, allergies, and immunizations are the more common items that are extracted from each encounter and encoded into separate tables for easy access at any time in the future. This information leads to better management of interrelated problems such as fewer drug-to-drug interactions, fewer drug allergy reactions, and finally, fewer missed vaccine opportunities and improved immunization rates. Improving the patient's visibility in the office through patient tracking prevents important life-threatening situations from going unnoticed behind a closed exam room door. Waiting times are reduced so that important medical issues can be dealt with in a timely manner. More time is available to the provider to spend directly examining and interacting with the patient. In turn, better patient care directly corresponds to greater physician satisfaction with his or her work.

Profitability

In an earlier study of changes in office patient volume and staffing levels, volume was observed to grow at five times the rate of growth in staff. Since patient volume correlates positively with revenue, and staffing level correlates positively with expense, there is good evidence that the workflow-enabled CPR increased profitability by allowing medical practices to see more patients with a less than corresponding increase in human labor.

CONCLUSIONS

According to the IOM, the greatest motivation for practitioners to use CPR's would be evidence that CPRs can help to improve the quality of patient care and to reduce administrative burdens. This study yields preliminary evidence that a computer-based patient record combined with a workflow management system can yield a paperless office within two weeks or less after installation and that paperless offices indeed can produce immediate improvements in time savings, profitability, and staff productivity.

AUTHOR BIOGRAPHIES

Charles Webster, MD, MSIE, MSIS, Vice President, Medical Informatics, JMJ Technologies, has degrees in medicine, accountancy, industrial engineering, and intelligent systems. Before joining JMJ he founded the Department of Health Management Systems at Duquesne University.

Jeffrey D. Cooper, MD, FAAP, has degrees in Music and Medicine from Emory University. After a pediatric residency at Emory, he entered private practice and established Cooper Pediatrics in 1992. His practice has been paperless for four years.

Dee McGhee is the Office Manager of McDonough Pediatrics in McDonough, GA. In February 1998, her three-physician office installed a computer-based patient record and went permanently paperless after three days.

REFERENCES

[1] Dick, R., Steen, E, and Detmer, D. The Computer-Based Patient Record: An Essential Technology for Healthcare. Revised ed. 1997, Washington, DC: National Academy Press.

[2] Kohn, L., Corrigan, J., and Donaldson, M. To Error is Human: Building a Safer Health System. 1999, Washington, DC: National Academy Press.

[3] Mueller, M., Ganslaandt, T., Frankewitsch, T., Kreiglstein, C., Senninger, N., Prokasch, H., "Workflow Analysis and Evidence-Based Medicine: Towards Integration of Knowledge-Based Functions in Hospital Information Systems," Proceedings of the AMIA Annual Fall Symposia., 1999:330-334

[4] Argo, M. "Healthcare Automation: Developing the Basics," MDComputing, July/August 1999, 16(1), 33.

[5] Zdon, L. and Middleton, B., "Ambulatory Electronic Records Implementation Cost Benefit: An Enterprise Case Study," 1999 HIMSS Proceedings: vol. 4, 99-113.