

## Implementing EMRs: Learnings from a video ethnography

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*This yearlong video ethnography of a healthcare clinic that transitioned from a paper process to a scanning solution documents in detail how the new technology impacted different groups in the clinic. While the scanning solution reduced the retrieving, filing, and paper-processing work for the Medical Record clerks, the ethnographic analysis showed that it also eliminated some of that work's tangible benefits for providers. Ultimately, the scanning solution resulted in a shift in the division of labor in the clinic from Medical Records to the healthcare providers who were burdened with additional administrative tasks. Indeed, the scanning technology did not make the clinic more efficient overall, as the number of patient visits per day remained the same.*

### INTRODUCTION

In the 2009 Address to the Joint Session of Congress, President Obama explained, “Our recovery plan will invest in electronic health records and new technology that will reduce errors, bring down costs, ensure privacy, and save lives.” He thus joined a chorus of Healthcare Information Technology (HIT) apologists and researchers (e.g., Hillestad, 2005, Rifkin, 2001, Wang, 2003) who herald the great benefits the technology will bring. Certainly, several studies have found tangible benefits of paperless records, including the legibility, completeness, and accuracy of the information in the records (e.g., Hippisley-Cox, 2003).

However, there are increasing signs that the expected cost reduction from Electronic Medical Records (EMR) implementations has not been fully realized. Healthcare costs have continued to rise despite an increase in the use of EMRs. Individual practices that use EMRs have increased billing (likely the result of more complete documentation to support additional billing), but do not appear to have decreased the labor cost associated with their production (Sidorov, 2006). While this can be a good result for a healthcare organization, this does not make the healthcare system as a whole more efficient. With regard to patient safety, there are indications that EMRs have had decidedly mixed results: reducing the number of small mistakes, but increasing mistakes with greater impact (Ash et al. 2004, Koppel et al., 2005, Koppel & Gordon, 2012).

Many of the studies of EMR systems have relied upon interviews and focus groups, along with analysis of outcome metrics, providing a representation of use without actual examination of use. Ethnographic studies of such technology, on the other hand, have focused on how technologies are taken up in the course of healthcare work. As Timmermans & Berg (2003) wrote, in this approach to the study of “technology-in-practice” technologies are seen to be:

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embedded in relations of other tools, practices, groups, professionals, and patients and it is through their location in these heterogeneous networks that treatment, or any other action, is possible in health care. (p.104)

As such, ethnographic studies of healthcare have led to a number of deep insights into how technologies are affecting healthcare practice. For instance, ethnographic studies of doctor-patient interaction have shown how the usage of computers during the doctor-patient encounter has changed the interaction between doctor and patient (Greatbatch et al., 1995; Luff et al., 1992). Many physicians lament this change and some are unwilling to use the computer in the exam room. Another reason for physician resistance to EMRs is the benefit of having tangible paper records (Heath & Luff, 1996, Fitzpatrick 2004, Sellen & Harper). Not only is paper easier to read, navigate and mark up, it has a certain "ecological flexibility" and can be "mobilised and manipulated for various purposes" (Luff et al., 1992). Paper can also more easily serve as a resource in collaborative decision making (Hartwood et al., 2003, Clarke et al. 2007) than digital technology.

There have been a growing number of studies examining the effects EMRs have on physician's practice, but less on how EMRs have impacted the work of people other than healthcare providers. Aside from the work by our colleagues Martin & Wall (2008), for instance, very few studies have looked at the work practices of the staff in Medical Records. Our study builds on their work, and expands it by tracking the transition from paper charts to electronic records and the accompanying changes to the work processes and practices of the different stakeholders affected by the change. We show that the attraction of the paper chart lies, in part, in the flexible division of labor it affords between the clerks in Medical Records and the providers.

## BACKGROUND

This research project was initiated by a division of Xerox that wanted to explore the possibility of developing scanning solutions in healthcare. We contracted with them to study a healthcare organization that was in the process of transitioning from paper charts to an EMR. The healthcare clinic we studied employs primary care providers as well as some specialists: pediatrics, psychiatry, neurology, podiatry, physical therapy and massage therapy. It is a non-emergency clinic that is open five days a week, patients are seen by appointment only, although some exceptions are made for the occasional walk-up patient.

While the clinic had transitioned from paper records to electronic records a few years before our study, they had yet to get rid of the paper charts completely. The electronic medical record system was for the internally generated records only. The providers used the EMR to document each visit, order prescription medications for their patients, maintain a list of current and discontinued medications, as well as enter the diagnostic codes, which were then used by the accounting department for billing.

The reason the clinic still used paper charts was that they received a lot of paper from other healthcare institutions. Whenever the clinic's patients went to some outside provider, for instance if they had been to the emergency room in the local hospital, or had an MRI with a radiologist in town, the clinic, as the primary care provider for the patient, would receive a report in the form of a letter or fax from that institution. These incoming reports were filed into the paper chart of the patient by the clerks in Medical Records. So whenever a patient visited the clinic the providers would use a paper

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chart alongside the EMR. It was this incoming-paper process that was radically changed when the clinic adopted a scanning solution.

### METHOD

This ethnographic study was conducted by two researchers. We observed the clinic on 21 days over a one-and-a-half-year period, both before and after the transition to the new technology. While we observed the different workers in the clinic (33 total), we video recorded their work and collected more than 150 hours of video. The groups we observed included the providers who saw and treated patients: physicians (5), physician assistants (2), and registered nurses (1); the medical assistants (5) who roomed the patients; the clerks in medical records (6); the transcriptionists (2); the pharmacist (1) and pharmacy assistants (2); administrative staff: referral clerks (1), front desk employees (2), billing clerks (4); and the employees in verifications (2), who checked the insurance status of the patients. Additionally, we conducted informal interviews with the clinic's management.

After each visit we studied the video recordings in a secure video laboratory at our research center. The recording of patient data was allowed under the clinic's HIPAA policy which included a statement that the patient records may be used for research purposes. We kept the data in a locked cabinet and the video on computers that were disconnected from the network. In presentations we made sure all patient information was thoroughly disguised.

In the next sections we will describe the work practices of the employees before and after the clinic implemented the scanning solution. We organize our description by roughly following a document from the moment it is received by medical records, since this is the process that was affected by the scanning solution.

### The paper-based workflow for incoming documents

The clinic's medical records group employs eight clerks, two of whom are full-time transcriptionists. It is one of the largest groups in the clinic. Before the introduction of the EMR, the group maintained the paper charts, which was a very labor intensive job. The paperwork was reduced dramatically when the organization adopted the EMR. With the introduction of the EMR, the providers started to document the patient visits in the EMR. However, other healthcare providers continued to send the clinic reports in the form of paper. We will describe briefly the processes involved with the incoming documents workflow: updating charts, reviewing charts, "doing the table," and archiving charts.

**Updating charts** - The mail and faxes that came into the medical records department were opened by a clerk and sorted by patient last name. A few times a day, one of the medical records clerks took this sorted stack of paper and went to archives to 'pull' the corresponding patient's charts out of the movable cabinets, in which the charts are organized alphabetically by patient name. The clerk put the newly received documents inside the chart, and stacked them on her desk.

Then the clerk sat down at her desk, opened a chart and punched holes into the top of the incoming documents' pages, and attached them on the top of the left side of the chart (paper can be filed on both sides of the manila folder). She would place a stamp on the paper and attach a flag to the side of each page that the provider had to review and sign. The clerk checked the EMR to see whether

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the patient had already scheduled a next appointment, and if so wrote the date on the stamp (this would help the provider determine whether the already scheduled appointment should be altered given the new information they received). When done, the clerk put the charts on bookshelves, one designated for each provider.

**Reviewing charts.** Providers would visit the medical records department at least once a day to go through the new incoming documents in the charts. They would take down the charts from their bookshelf, open them, and read the new documents on the left hand side of the charts, circling critical values and making notes on the stamp as needed, and sign off on the pages.

In case the content of the reports had implications for care, for instance if they wanted to see the patient to discuss a lab result, the providers could indicate on the stamp when they wanted to see the patient. In case the report required immediate action (if a lab value was extreme, for instance) the chart was put into a special box for the registered nurse, who would contact the patient directly. If not, they would put them on some book shelves the medical records clerks referred to as “the table.”

**Doing the table.** Several times a day the Medical Records clerk assigned to “do the table” would take the charts from the shelves and take them to her desk. The charts on the table came from two sources: the providers who signed incoming paperwork, or were returned from ‘the floor’—the name Medical Records used for the exam rooms—where they had been consulted by providers during a patient visit.

For the former, the medical records clerk would check whether the provider had indeed signed all the pages and read whatever instructions the provider had written on (or near) the stamp and take action accordingly. In case the provider indicated that the patient needed to come in for an appointment, for instance, the medical records clerk would notify the clerk at the front desk who was in charge of scheduling appointments. After taking care of any such follow-up business, the clerk removed the flags from the side of the pages and reattached them at the top of the page as a reminder; the change in the flag’s location served as an indication to the providers that they had yet to discuss the results with the patient.

For the papers coming back from the floor, by contrast they would remove the flags from the top of the pages, as presumably the providers had discussed the information with the patient (if not, the providers were supposed to indicate as much on the page), and would file the papers under the appropriate tabs inside the paper chart. Then they put the chart on a set of shelves (organized alphabetically), which would be emptied by another clerk. That clerk would then file the paper charts in the alphabetically organized archive.

The incoming paper process is illustrated in Figure 1 and was designed to ensure that the providers were kept abreast of any medical information about their patients gathered by other healthcare providers outside the clinic, such as labs or emergency rooms. The second process that involved the paper charts made sure that the providers had access to the paper charts when the patients came to visit the clinic.

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FIGURE 1. The incoming paper process

**The Patient visit process** - Every afternoon one of the medical record clerks printed the names of the patients scheduled to visit the clinic the following days and collect their charts from the archives; marking them off the list as she found them and collecting them on a cart, one cart for each day.

Since charts were moved around the clinic regularly, they would often not be in the archive. In that case, the clerk would check the other shelves in medical records—the provider shelves, the “table,” the desks of the other clerks, etc.—and if it was there she would either collect it or—in case that the date of the visit was still a few days away—attach a note on the front of the chart with the date of the patient’s appointment date. In the case a chart would not be in Medical Records at all, it could be out on “the floor,” possibly in a provider’s office. Since there would always be missing charts the medical records clerk would start pulling the charts for appointments several days ahead of time, so she could start keeping an eye out for the missing charts; after all, the charts must come back to Medical records at some point.

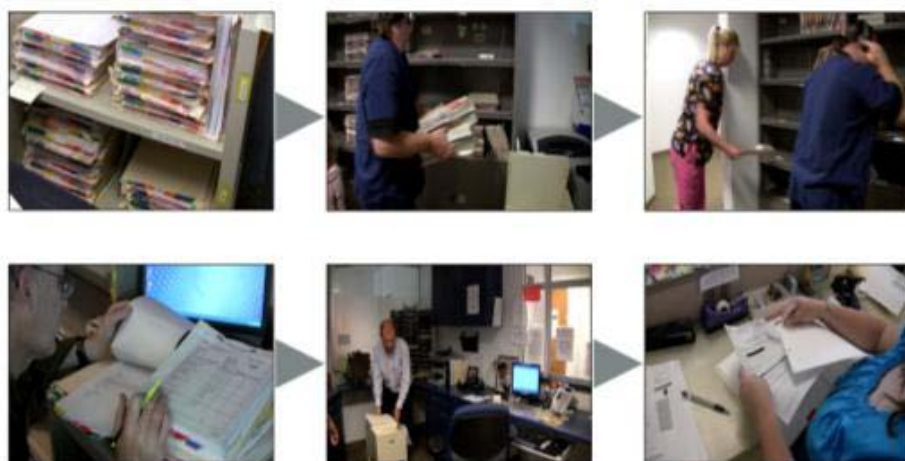
In the afternoon, the clerk would push the cart with the charts for the next day’s patients to the front desk. The front desk clerk would unload the charts from the cart and put them on shelves, now no longer organized by patient name, but by provider first and then organized by the time of their appointment.

**Using the chart during the patient’s visit** - The next day, when the patient checked in at the front desk, the front desk employee would pull it from the stack of vertical charts and put it horizontally next to the otherwise vertically stacked charts. The front desk clerk then flipped a notification flag mounted on the wall, a different color for each provider, a sign to the medical assistants that a patient in the waiting room was ready to be ‘roomed’. When an exam room became available (each provider has at least two) the medical assistant would walk to the front desk, grab the chart from the shelf and collect the patient in the waiting room and bring the patient to the exam

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room. After taking the vital signs and the initial interview, the medical assistant would leave the chart in the room for the provider to review with the patient.

All the providers had to do to view the latest incoming documents was to open the paper chart and look at the left-hand side of the chart where any papers they had yet to discuss with the patient would be directly visible and marked with the flags at the top of the page (older papers would be filed under tabs). After the visit, many providers would take the chart to their room and refer to it when they documented the visit in the EMR. When done with the chart they put it in a cabinet whence they would be collected by Medical Records clerks and returned to “the table” for further processing. The process is illustrated in Figure 2.



**FIGURE 2** The patient visit process

## PAPER PROCESS - DISCUSSION

As can be seen from the description above, the incoming paper process in the clinic was quite labor intensive, because the charts needed to be pulled from the archive and moved through the clinic, and papers needed to be punched, filed, stamped, and flagged. It was a full time job for one of the clerks, and several others were assigned specific parts of the process like “doing the table.” Searching for charts alone would take up considerable time each day and often involved multiple people.

It was clear that a full EMR system that would eliminate much of this work would be a great improvement over the paper charts. The problem was, however, that the other healthcare providers in the area did not send these documents in electronic form (only lab reports from quest diagnostics could be loaded into EMR directly). Since the incoming paper was not going to be eliminated in the foreseeable future, the organization implemented a scanning solution.

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### The digital workflow with the scanning solution

One of the first differences between the old paper-based and the new digital workflow is that the incoming paper no longer needs to be organized alphabetically, as the scanned image can be linked directly to the patient's electronic record, indeed one of the benefits of the new system was that it made the alphabetical organization of charts superfluous. The scanning clerk opens the letters and faxes and scans them at a workstation with the scanning equipment (Figure 3). She performs a quality check on the resulting digital image and if necessary she adjusts the settings and rescans the document. Then she enters the provider's name as well as a brief description of the document in the notification for the provider, "Dr Wilmott, ped. cardiologist" for example. Finally, the clerk stores the scanned paper documents alphabetically by patient name; Medical Records holds on to the incoming documents for a month before they are shredded.

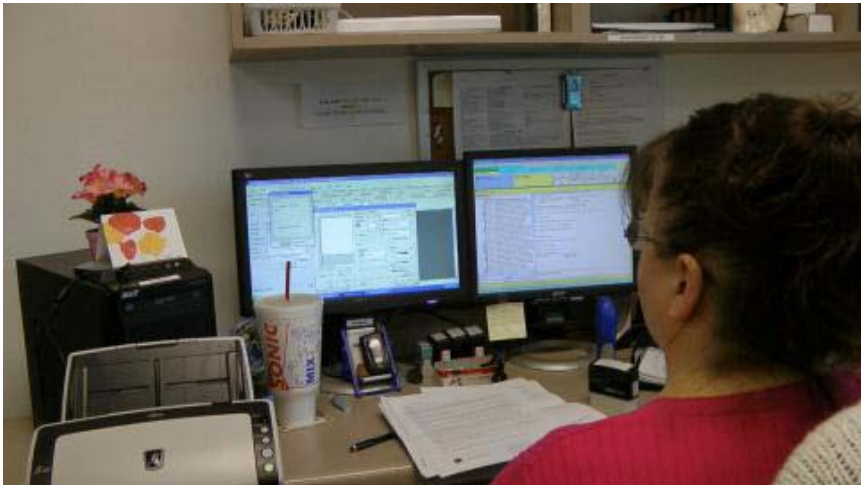


FIGURE 3. Scanning incoming paper

**Reviewing incoming documents.** Whenever a new image is added to a patient's record, the primary care provider for that patient receives a notification through the EMR. The notification list of the EMR is like the e-mail inbox for a provider and part of the official patient record. A notification for a scanned image is marked as "to review" and lists the title of the document so the provider has some sense of what they will be looking at. They can select "display" from a drop-down menu, which will cause the system to access the scanned documents for that patient in the database, which requires that the provider logs in. Double-clicking an image file brings it up in a viewing program which allows them to scroll down the page or jump to the next or previous page.

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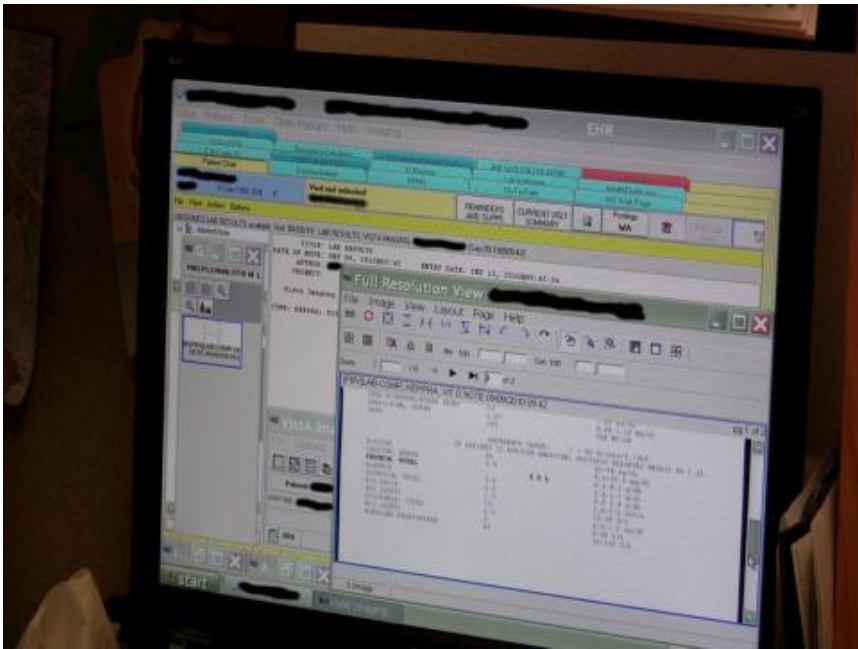


FIGURE 4, The scanned image from a notification

**Signing off on notifications** - Once they have read the document the providers can sign off on the notification, which they can do electronically by entering their password; this also removes the notification from the list, in the EMR.

**Patient visits** - When patients come in for a visit, the Medical Records clerks no longer need to pull a chart for the visit (except when the provider requests it to see older lab values, for example). All the information is now in the EMR system, which the providers can access from the computers in the patient rooms or from the computers in their offices.

## THE DIGITAL WORKFLOW--DISCUSSION

The impact of the scanning solution on the work in Medical Records has been profound. Medical Records clerks no longer need to pull charts or store them back into the archives. Nor do they need to do any of the paper processing, such as the punching of holes, adding and removing flags, and filing paper into the chart. Nor do they need to lug charts to the front desk or retrieve them from the floor several times per day. In short, the scanning solution reduced the work of medical records significantly. The job of scanning documents is not much less time-consuming than the original filing



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work, however; it is a full-time job for one clerk as the quality control processes are quite time-consuming.

The workflow for physicians also changed substantially. For them, too, there are clear benefits of the new scanning technology. For instance, they no longer need to go to Medical Records to sign off on their paper charts, they can do that from the comfort of their own office now. Indeed, they can access these documents while away from the clinic. Perhaps most importantly, the scanning solution eliminated the dual systems they had to manage ever since the introduction of the EMR; finally all the information about a patient is accessible in the EMR.

However, there are distinct drawbacks as well. For instance, when providers receive a notification that there is a new incoming document for them to sign, it takes several mouse clicks before they can actually see the document. Moreover, since the scanned images reside on a centralized, off-campus server, bringing up the images takes a while, certainly much longer than simply opening a paper chart and looking on the left hand side.

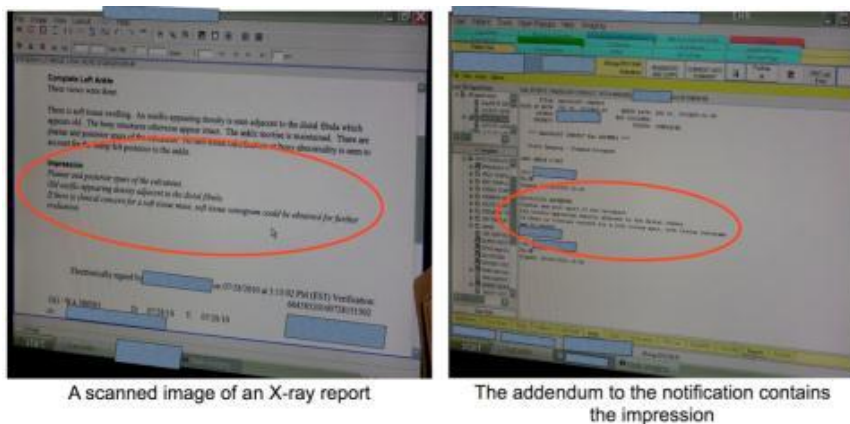
Also, while the quality of the scanner is very good, the scanned images on the computer are more difficult to read than their paper counterparts. The displays used in the clinic are not large enough to show a complete page at a time, so providers always need to scroll to see the bottom of the document. This process of scrolling from the top to the bottom of a page and then selecting the arrow to move to the next page of the document was considered so cumbersome that the providers requested that for any incoming document longer than five pages, the medical records staff would allow them to read the paper copy and sign off on it before scanning the document (it was then scanned into the EMR without sending the provider a notification). Our findings in this regard are consistent with previous research (Sellen & Harper, 2002).

Another advantage of the paper charts was that providers could mark up the paper quite easily and they would routinely do so, for instance by circling a lab value that was out of range or drawing a vertical line in the margin of an important paragraph from a narrative of a specialist's report. This "active reading" (Adler & van Doren, 1972) helps the providers process the information and is more difficult to do when reading an electronic document. Additionally, such markings and notes would immediately draw attention to the most important information when providers opened the paper chart again when they were with the patient. The scanned image, by contrast, could not be marked up, thus depriving the providers from making their second reading of the document more efficient. In the days of the paper record, the provider would be handed a chart and could open it to see the incoming paper records that they had marked up on the left hand side; access was nearly instantaneous. Moreover, the flags on the pages would indicate that the provider had not yet discussed these documents with the patient; the physicality of the paper chart would serve as an indication of what needed to be done. With the scanning solution, by contrast, the provider must search the EMR to see if there are any records that ought to be discussed with the patient. This involved logging into the system, looking up the patient in the list of appointments for the day, finding their own note from the last visit, in order to ascertain which documents in the list were added since the last patient's visit. Moreover, in order to see the scanned images they must go through the same cumbersome process of clicking on an image icon and navigating through the scanned pages as they did when they signed off on the paper. These processes were more time consuming, and meant that providers needed to spend more time before or during each visit to go over the next patient's electronic chart to check what needed to be discussed. But when providers were busy, and their next patient had already been roomed and was waiting, many

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would prefer to just go into the room and care for the patient. This meant that discussing the latest documents became more likely to fall through the cracks.

To make the process of looking at the latest scanned images superfluous, many providers typed a brief summary of the most important information of a scanned document into the notification itself. This would save them time when they had to look at the patients' documents again, since they would not have to go through the rather time-consuming process of opening the image files again and rereading the information in them. However, typing a note is a much more involved process than simply circling an out of range value on a paper-based report. On the left of Figure 5 is a scanned image, and on the right is the notification in the EMR, in which the provider has typed the last paragraph. When I asked her how she had created the paragraph in the EMR, she told me "I wrote it down on a piece of paper. I tried copying it but it just makes you crazy, so then I just wrote it down."



**Figure 5. A provider copies a paragraph from the scanned image into a notification**

The ability to write a quick note on the paper charts also helped other processes. For instance, with paper charts, providers could write on the stamp that they wanted to see the patient, and when the folks in medical records would then process this request by contacting the folks at the front desk who made appointments. In the new process, they need to type a note into the EMR, sign off on it, and then make the people responsible for making appointments co-signers of the notification, which causes the system to send them the notification as well. A process that used to require only a few words on the paper chart, now required numerous keystrokes and mouse clicks to accomplish.

In summary, the transition from paper charts to a scanning solution had different repercussions for different stakeholders in the organization. Medical Records clerks had more time to spend on auditing the providers EMR entries as much of the paper processing had been eliminated; no more searching for charts, no more flagging pages, no more filing papers, etc. However, while most of this work was certainly tedious, it had considerable value for the providers. For providers, the introduction of the scanning solution meant more work, as they now had to do themselves some of the tasks

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Medical Records clerks used to do for them. In the aftermath of the implementation of the scanning solution, then, many providers complained that they spent extra hours after work processing the EMR notifications that they now received. In short, the division of labor shifted from Medical Records staff to providers.

## DISCUSSION

As we have shown, the introduction of the scanning solution has had both positive and negative effects for the organization. It is unclear whether the efficiencies gained in one department outweigh the losses in the other. On the one hand the efficiencies gained in Medical Records did not actually lead to a reduction in resources. While the scanning solution made pulling paper charts unnecessary, the scanning process itself turned out to be a full-time job. The clerk that pulled and filed paper charts full-time before the transition was replaced by someone who scanned all the images. The other staff in Medical Records had much less paperwork, which was a time-savings, but now had to spend more time in front of the computer, which made their work more monotonous. Overall, we believe that there were certainly some efficiency gains for the Medical Records department of the clinic.

Several providers complained about the new workflow when it was first implemented, and this is no surprise given the analysis presented above. However, it was striking that six months or so after the implementation those same providers were used to the new workflow and did not complain about it much. They had by then gotten used to the new workflow and knew their way around the system, which alleviated some of the initial complaints. The providers just adapted to the increased workload by changing some of their other practices. For instance, several started to dictate rather than type their notes into an audio recorder, which would be transcribed by the transcriptionists in medical records, who now had more work, reducing their documentation time. And some providers mentioned that they started coming in earlier or staying later to process their list of notifications, for others there may have been some slack in their schedule that they now used to accomplish the additional work. So while the overall impact of the transition on the clinic's efficiency was minimal, the shift in the work from Medical Records clerks to the providers is a concern. Not just are the providers' salaries much higher than that of the Medical Records clerks, the impact of a reduction of patients on the bottom line would be considerable.

It should be noted that this shift in workload from support staff to providers is part of the real impact of EMRs. Some of the providers mentioned that the transition from paper charts to the EMR that happened a few years before this study had similar impact on the work for providers. Take for instance the Computerized Physician Order Entry (CPOE) process. Providers used to write prescriptions on a paper form, on which they specified the drug, the number of times a day it should be taken and for how many days. The patients themselves would take the prescription to the pharmacy. Nowadays, prescriptions are entered into the computer, and sent directly to the pharmacy. Selecting the drug and specifying the dosage is now done through drop-down menus, not a bad process in and of itself, but quite time consuming. The provider must specify the pharmacy that should fill the prescription, as the system needs to be instructed where to send the prescription. This is something that they never needed to know before and is arguably of little medical importance. Yet finding out what pharmacy the patient uses can involve a time-consuming search through previous prescriptions. In one instance we observed a provider enter a refill prescription for cough medicine

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and just when he was done with the order he discovered that he sent it to the wrong pharmacy. He had to erase the order and redo the entire prescription. Including those mishaps, it took the doctor seven minutes to complete the order. Here, too, we can see that there is a shift in work, in this case from the patient to the provider. And the trouble is that since the work must be done on a computer, and only providers can enter these orders and sign off on them, providers must perform small additional tasks that can add up to a very substantial part of their work day.

Another case in point is the documentation of patient visits. Providers are not only supposed to write prescriptions and write a note, they are also supposed to enter diagnoses for the visit, enter a visit code, keep the list of chronic ailments up to date, etc. In the days of the paper chart much of this work could be done while with the patient. With the EMR many providers perform this essentially administrative work on the computer in the exam room during the patient visit, but most don't like the way the work on the computer interferes with the interaction with the patient and take notes on a notepad and then later enter the information into the computer, essentially documenting the visit twice.

These tasks and many others like it ultimately cut into a provider's time has to see patients. One provider in the clinic reported that she was able to see 35 patients a day when she had her own pediatric practice that used paper charts, and had two dedicated medical assistants. At that time, her documentation consisted of one sheet of paper that she filled out while in the room with the patient, and a dictation that she did afterwards and had transcribed. Now that she had transitioned to the current clinic she could maximally see 20 patients in large part because of the long time it took to do her documentation. Crucially, the paper charts allowed her assistants to fill out the paper-based documentation, so that, in effect, they could do the documentation together, something that the EMR no longer permits.

## CONCLUSION

This paper has shown a heretofore-underreported aspect of how the transition from paper charts to EMR affects healthcare practice. It concerns the shifting of work away from back office work to healthcare providers, by documenting the work processes before and after the implementation of the scanning solution. We saw how the scanning solution did not just automate a back-office work process, but altered the division of labor, in effect increasing the administrative tasks of the physicians, PAs, and RNs.

The question is, of course, if this division of labor can be reconstituted with the new EMR technology through the implementation of new work processes and organizational change. We believe that there are many opportunities here, but they depend on changes in the technology as well. For instance, it would require medical assistants to attain access to the parts of the medical record so they can do some of the documentation for the doctor without being able to sign off on the documentation, which should remain the providers' responsibility. The challenge is that many systems have limited the access of non-provider personnel to certain functions within the system. This certainly is understandable given the concern for patient safety, but it has also led to the undesirable situation in which healthcare providers spend an inordinate amount of time doing administrative tasks rather than practicing medicine.

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