THE PERSISTENCE OF PAPER FOLLOWING AMBULATORY ELECTRONIC HEALTH RECORD IMPLEMENTATION: A MIXED METHODS STUDY AND ANALYSIS

By

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CERTIFICATE OF APPROVAL

This is to certify that the Master's Capstone Project of

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"THE PERSISTENCE OF PAPER FOLLOWING AMBULATORY ELECTRONIC HEALTH RECORD IMPLEMENTATION: A MIXED METHODS STUDY AND ANALYSIS"

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ABSTRACT

Objective To examine the root causes and unintended consequences of the persistent use of paper following implementation of an electronic health record (EHR) in the ambulatory environment.

Methods Mixed qualitative and survey methods were used to study the persistent use of paper in ambulatory practices in three distinct regions in Maine following the implementation of an EHR. Semi-structured interviews were analyzed and coded using published categories of paper-based workarounds; grounded theory was also used to develop new themes.

Results Paper persists due to a variety of paper based workarounds related to human interaction with the EHR, as previously reported. Paper use was also found to support several unique use cases, including clinician communication surrounding transitions of care, which are not yet fully supported by the current state of document exchange and EHR interoperability. Paper persistence in the EHR environment leads to unintended consequences including extra work and information chaos.

Conclusions It may be possible to reduce paper persistence in the EHR environment by adopting interoperability standards which support document level exchange between clinicians and by increasing attention to EHR usability and the human factors leading to paper-based EHR work-arounds.

INTRODUCTION

Electronic health record (EHR, also called Electronic Medical Record or EMR) systems are rapidly being implemented throughout the United States. Despite this increasing adoption, paper is still in use in many places and for many purposes. The impetus for this study arose from casual observations in several ambulatory practices. Following the implementation of expensive and complex EHR systems, many providers and staff were still observed spending a significant amount of time and effort managing and responding to information on paper.

This study explores the persistence of paper using a mixed methodology. The goal is to learn more about the extent and reasons for persistent paper use in systems that have a high level of EHR adoption.

BACKGROUND

The Health Information Technology for Economic and Clinical Health (HITECH) Act, which was passed in 2009, authorized the Center for Medicare & Medicaid Services to develop an incentive program to encourage the adoption and meaningful use of EHRs in the United States. (1) Approximately $30 billion dollars was allocated by the US Congress to reimburse both eligible providers and eligible hospitals for the cost of purchasing and installing EHR systems through 2017. (2) The US Department of Health and Human Services reported that by 2013, 78% of office-based physicians were using some type of EHR and 48% of physicians had an EHR system that met additional basic criteria for meaningful use. (3) Another measure of Ambulatory EHR adoption is provided by Health Information Management Systems Society (HIMSS). The HIMSS Analytics program uses an *EMR Adoption Model* to identify and score hospitals and ambulatory providers on a scale from 0 to 7 on the path to a fully paperless environment. As shown in **Table 1**, in the second quarter of calendar year 2014, only about 10% of ambulatory providers had EMR adoption at HIMSS Stage 6 or 7, the levels often recommended for optimal EMR use. (4)

The motivation for increasing EHR adoption is to improve the quality of patient care. Potential EHR benefits include improved legibility and accuracy of data, improved access across multiple sites, and improved communication via integration of disparate clinical systems. These technical benefits should translate into clinical benefits through increased provider efficiency and greater access to information, a reduction in redundant testing, and enhanced patient engagement.

Stage	Cumulative Capabilities	2014 Q2
Stage 7	HIE capable, sharing of data between the EMR and community based EHR, business and clinical intelligence	4.30%
Stage 6	Advanced clinical decision support, proactive care management, structured messaging	5.83%
Stage 5	Personal health record, online tethered patient portal	5.56%
Stage 4	CPOE, Use of structured data for accessibility in EMR and internal and external sharing of data	1.23%
Stage 3	Electronic messaging, computers have replaced the paper chart, clinical documentation and clinical decision support	11.42%
Stage 2	Beginning of a CDR (Clinical Data Repository) with orders and results, computers may be at point-of-care, access to results from outside facilities	30.74%
Stage 1	Desktop access to clinical information, unstructured data, multiple data sources, intra-office/informal messaging	34.29%
Stage 0	Paper chart based	6.63%

Table 1. HIMSS Analytics US Ambulatory EMR Adoption Model
(Adapted from https://www.himssanalytics.org/emram/emram.aspx)

Recent studies, however, have raised questions about EHR-induced medical errors and other unintended consequences of EHR implementation. Harrington et al reported in 2011 that shortcomings in the design, development, implementation and use of complex EHR systems could increase the risk of medical errors. This was particularly true for Computerized Physician Order Entry (CPOE), Clinical Decision Support Systems (CDSS) and bar-coded medication administration (BCMA). (5) This report noted that safety issues could be related to technology, workflow processes or human factors. Koppel et al identified up to 31 potential causes leading to workarounds when using BCMA systems. The possible consequences of these workarounds are a greater risk of medication administration errors. (6)

Several authors have also identified the persistent use of paper in clinical workflows despite EHR adoption as one of the unintended consequences. (7-11) Saleem et al published a qualitative study on the persistent use of paper at a Veterans Affairs Medical Center with a highly integrated EHR system. They categorized three main causes of persistent paper use, including: 1) VA policies which mandated paper forms, 2) sub-optimal technology, such as incompatible software and non-integrated systems, and 3) EHR user interface flaws and human-technology integration factors which led to paper based workarounds to meet users' needs for information management. They identified 11 discrete categories of workarounds due to user-interface flaws. (7) Subsequent research by Saleem confirmed similar persistent paper-based workarounds to deal with communication breakdowns in computerized consultation management. (10) Dykstra et al found that in 2009, paper was still in widespread use at fourteen prestigious health systems across the U.S. which had implemented an EHR. (8)

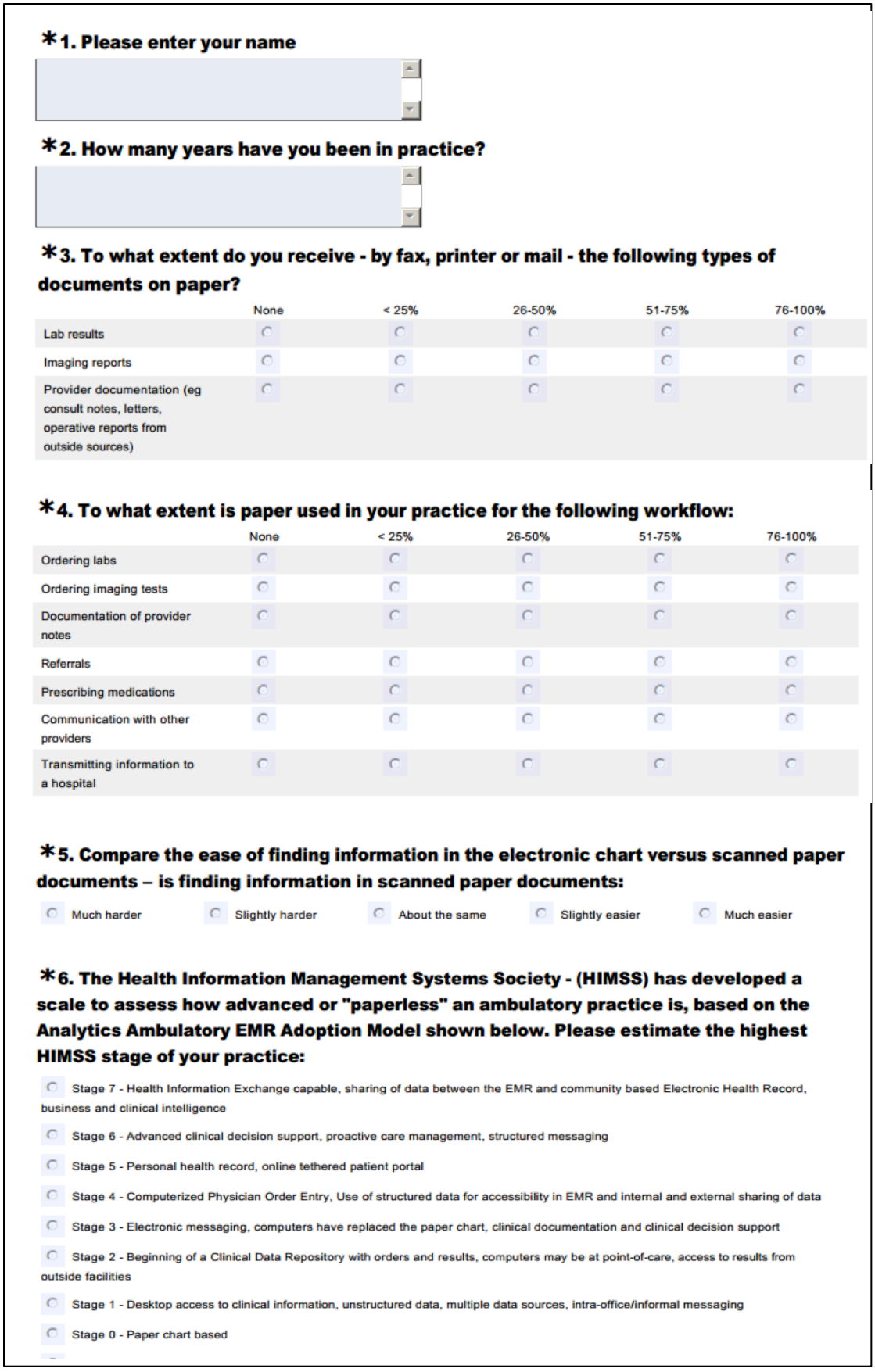
This study will extend earlier studies on persistent paper usage following ambulatory EHR implementation and will develop new themes and definitions for the evaluation of persistent paper usage based on qualitative analysis. We want to identify how frequently paper use persists in ambulatory practices which are comprised of fairly sophisticated EHR users. To the extent that paper persists, what purpose is it serving? Are there positive or negative consequences of paper persistence? What are the implications and potential strategies for remediation?

METHODS

The study used a mixed methods approach with both a survey and qualitative semi-structured interviews. The purpose was to explore current experience with the persistent use of paper in ambulatory EHR environments and provider attitudes toward continued paper use. The survey **(Figure 1)** was administered to all subjects online prior to the interviews in order to provide triangulation of results and to gather some basic demographic information.

The initial theoretical background for the semi-structured interviews was based on Saleem's categorization of the human-technology integration factors that lead to paper-based workarounds. (7) This semi-structured interview process used scripted questions and optional follow-up prompts divided into several major areas of inquiry **(Figure 2).** Each interview was approximately 30 minutes in length. Interviews were recorded unobtrusively using an iPad and subsequently transcribed.

The target audience was active EHR users at ambulatory practices which have a moderately high level of EHR adoption. Three sites well known to the research team were selected and participants were chosen in a purposive manner. Participants included early adopters, as well as average users and EHR "skeptics" or late adopters. Institutional Review Board (IRB) approval was obtained from the Oregon Health & Science University IRB.



*1. Please enter your name

*2. How many years have you been in practice?

*3. To what extent do you receive - by fax, printer or mail - the following types of documents on paper?

	None	< 25%	26-50%	51-75%	76-100%
Lab results					
Imaging reports					
Provider documentation (eg consult notes, letters, operative reports from outside sources)					

*4. To what extent is paper used in your practice for the following workflow:

	None	< 25%	26-50%	51-75%	76-100%
Ordering labs					
Ordering imaging tests					
Documentation of provider notes					
Referrals					
Prescribing medications					
Communication with other providers					
Transmitting information to a hospital					

*5. Compare the ease of finding information in the electronic chart versus scanned paper documents – is finding information in scanned paper documents:

Much harder | Slightly harder | About the same | Slightly easier | Much easier

*6. The Health Information Management Systems Society - (HIMSS) has developed a scale to assess how advanced or "paperless" an ambulatory practice is, based on the Analytics Ambulatory EMR Adoption Model shown below. Please estimate the highest HIMSS stage of your practice:

Stage 7 - Health Information Exchange capable, sharing of data between the EMR and community based Electronic Health Record, business and clinical intelligence

Stage 6 - Advanced clinical decision support, proactive care management, structured messaging

Stage 5 - Personal health record, online tethered patient portal

Stage 4 - Computerized Physician Order Entry, Use of structured data for accessibility in EMR and internal and external sharing of data

Stage 3 - Electronic messaging, computers have replaced the paper chart, clinical documentation and clinical decision support

Stage 2 - Beginning of a Clinical Data Repository with orders and results, computers may be at point-of-care, access to results from outside facilities

Stage 1 - Desktop access to clinical information, unstructured data, multiple data sources, intra-office/informal messaging

Stage 0 - Paper chart based

Figure 1. Survey administered electronically to study participants.

Describe how paper is generated or received in your practice.

- What data or reports do you receive on paper from hospitals or clinics using a different EHR system?
- What paper is created by the EHR for other downstream uses? (eg orders, consult notes)
- What paper do you scan into the EHR?
- What paper forms are required by policy or regulation?
- What paper do patients bring to your office? Do you retain or discard them? Why?
- What information do you print from the EHR? Why?
- Have you ever written down patient data from the EHR onto paper to better organize information during your clinical work? If so, please give example(s).
- What other paper do you use in your clinical work?

What's your opinion on the role of paper in an electronic EHR environment?

- Describe some examples where paper adds value.
- Give some examples where you prefer to use paper.
- Describe some examples where using paper is wasteful or time consuming.
- How do you determine whether using paper is valuable or wasteful?
- How would you ideally use paper in your practice?

What barriers are there to minimizing or eliminating the use of paper in your practice?

- What technology barriers exist?
- What interoperability issues are you aware of?
- Are you aware of any "incompatible" software interfaces that may cause paper generation as a result (e.g., where you have to print from one program and then scan that document into another program)?
- What cultural and/or user preference barriers exist?
- What workarounds have you or others in your practice developed to circumvent poor EHR design?

Figure 2. Interview script for the semi-structured interviews

Study Sites and Participants

The study was performed at three unique ambulatory practice sites in the state of Maine. These sites differ with regard to the ambulatory EHR systems in use, but all have both

ambulatory and inpatient systems which would generally meet the criteria for at least Stage 5 of the HIMSS Ambulatory EMR Adoption Model. Maine Medical Partners is a multi-specialty group practice affiliated with MaineHealth, the largest integrated delivery system in Maine. Pen Bay Medical Center is a 100-bed MaineHealth community hospital in Rockport, Maine which employs approximately 75 ambulatory providers in a multi-specialty group practice. Parkview Adventist Hospital is a 25-bed critical access hospital in Brunswick, Maine which employs primary care physicians. Some providers in this study use integrated ambulatory and inpatient systems from the same EHR vendor, however most do not. Those systems which are not completely integrated are generally connected by interfaces capable of transmitting laboratory and/or radiology results.

Characteristics of the settings and study subjects are shown in **Table 2**. Providers at Parkview and Maine Medical Partners are all employed by the health system; providers interviewed at Pen Bay Medical Center are split between employed and independent practices. Interview subjects included both primary care and specialty providers.

Data Analysis

Interview transcripts were entered into NVivo10 software (QSR International) for coding and analysis. Coding was performed by the primary investigator (JDL) based upon the categories initially developed by Saleem (7), as well as new themes developed using an iterative grounded theory process. Grounded theory is an inductive approach that, according to Berg, "…begins with the researchers "immersing" themselves in the documents…in order to identify the dimensions or themes that seem meaningful to the

Subject number	Provider role	Site	Gender	Years in Practice	Ambulatory EHR	Hospital EHR
1	Internal Medicine Physician	Maine Medical Partners	F	24	Epic*	Epic*
2	Internal Medicine Physician	Maine Medical Partners	M	30	Epic*	Epic*
3	Family Medicine Physician	Parkview	M	14	Meditech‡	Meditech‡
4	Family Medicine Physician	Parkview	M	35	Meditech‡	Meditech‡
5	Family Medicine Physician	Pen Bay - Independent	M	16	athenaClinicals†	Meditech‡
6	Family Medicine Physician	Pen Bay - Independent	M	9	eClinicalWorksϴ	Meditech‡
7	Vascular Surgery Physician	Pen Bay - Employed	F	24	Epic*	Meditech‡
8	Pediatric Nurse Practitioner	Pen Bay - Employed	F	5	Epic*	Meditech‡
9	Family Medicine Physician	Pen Bay - Employed	M	6	Epic*	Meditech‡
10	Internal Medicine Physician	Pen Bay - Employed	M	5	Epic*	Meditech‡
11	Urology Physician	Pen Bay - Employed	M	11	Epic*	Meditech‡

Table 2. Characteristics of the settings and study subjects.

*Epic (Epic Systems Corporation, Verona, WI) ‡Meditech (Meditech, Westwood, MA)

†athenaClinicals (Athena Health, Watertown, MA) ϴeClinicalWorks (eClinicalWorks, Westborough, MA)

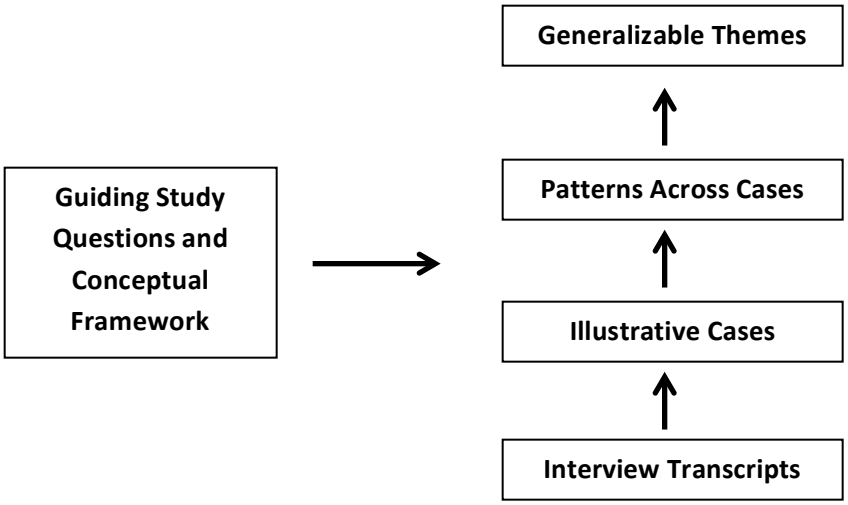


Figure 3. Interview analysis and grounded theory process.
(Adapted from Saleem, 2009)

producers of each message." (12) An iterative process is used to validate the themes which emerge. Beginning with interview transcripts, generalizable themes are determined by filtering the raw data in several steps as shown in **Figure 3**, always influenced by the guiding study questions and conceptual framework. (7)

Coding was validated by an expert in medical informatics (JRL) with experience in qualitative studies. All differences in the independently coded transcripts for paper-based workaround strategies and other themes were resolved to consensus by the two researchers through a series of meetings. Survey results were analyzed in Microsoft Excel using descriptive techniques.

RESULTS

Survey Results

Subjects were asked to estimate the amount of paper received in their practice. Only one subject reported receiving more than 25% of all lab results on paper **(Figure 4)** and none reported receiving more than 25% of imaging reports on paper **(Figure 5).** In contrast, provider documentation such as consult notes, letters and operative reports received from outside sources were thought to be received on paper more than 25% of the time by 8 of 11 subjects **(Figure 6).**

Next, subjects were asked to estimate the extent to which paper is used for a variety of ambulatory tasks and processes. **Figures 7–13** show the responses. Less than 25% use of paper was reported for many common ambulatory workflow processes such as

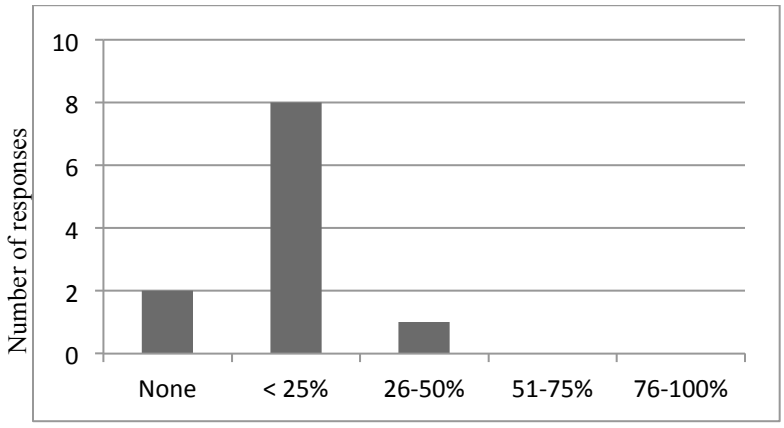


Figure 4. Lab results received on paper
% of time paper is used vs. number of responses

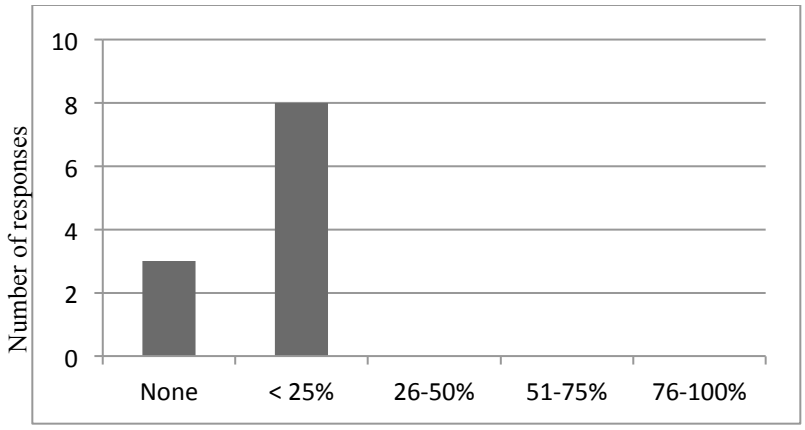


Figure 5. Imaging reports received on paper
% of time paper is used vs. number of responses

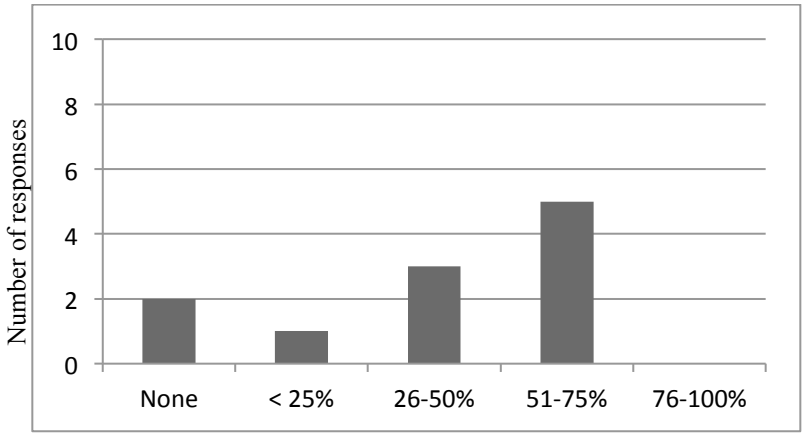


Figure 6. Provider documentation received on paper
% of time paper is used vs. number of responses

documenting notes, prescribing medications, and communicating with other providers. However, two subjects each order labs and imaging tests mostly on paper and one or two subjects make referrals or transmit information to a hospital on paper >50% of the time, illustrating some variability in the current workflow for these processes.

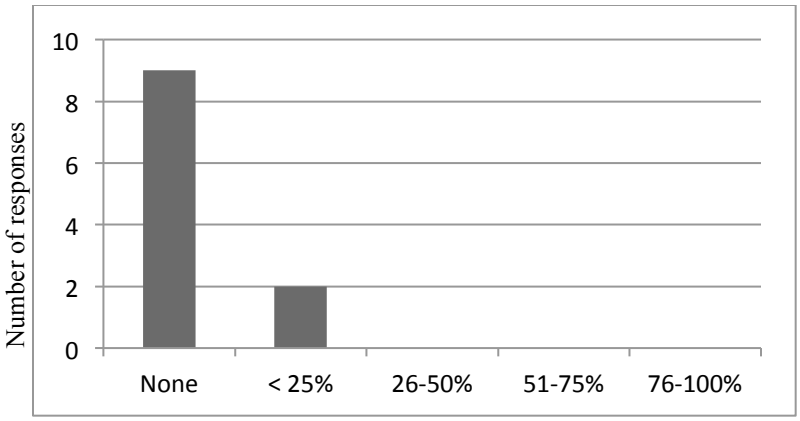


Figure 7. Paper used for documentation of provider notes
% of time paper is used vs. number of responses

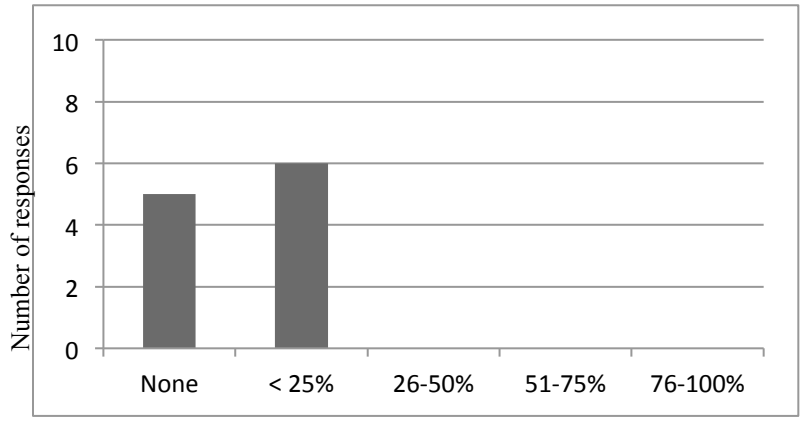


Figure 8. Paper used for prescribing medication
% of time paper is used vs. number of responses

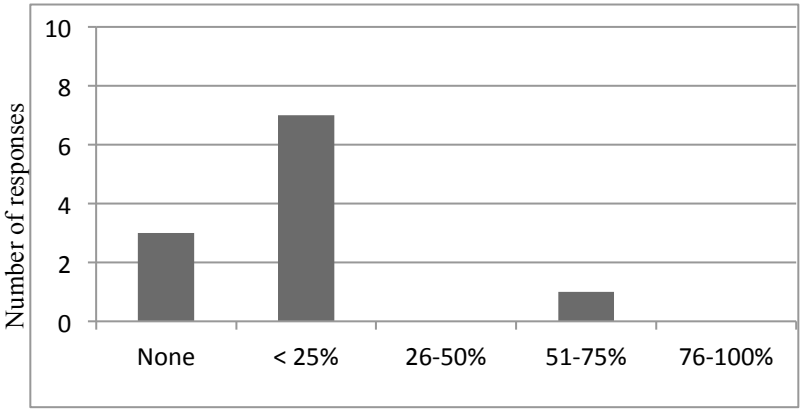


Figure 9. Paper used for communication with other providers
% of time paper is used vs. number of responses

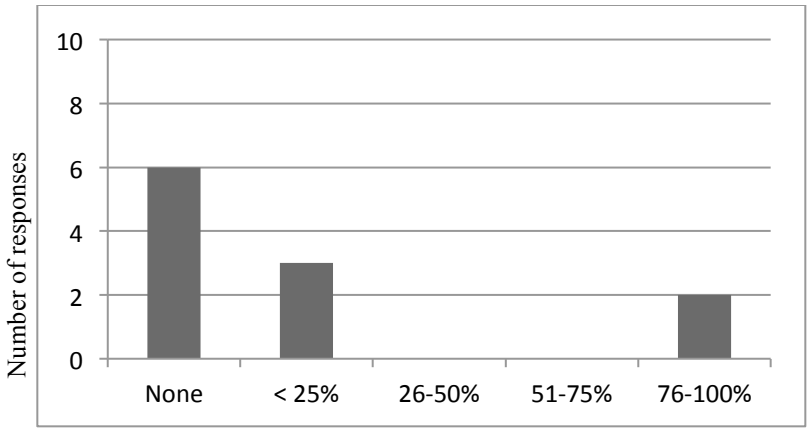


Figure 10. Paper used for ordering labs
% of time paper is used vs. number of responses

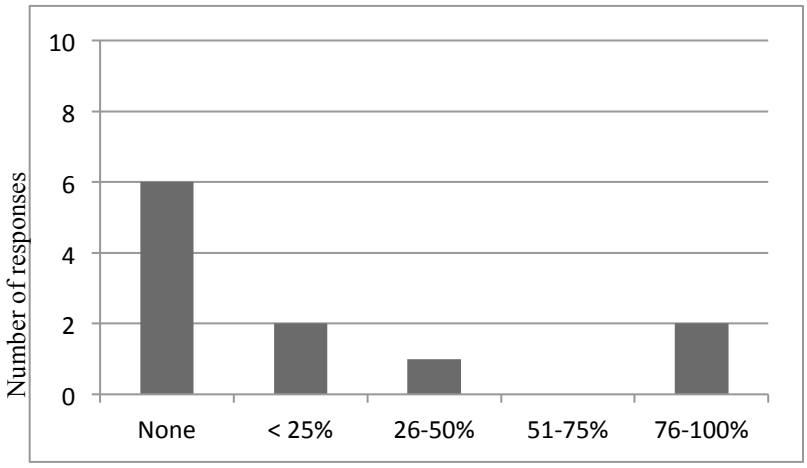


Figure 11. Paper used for ordering imaging tests
% of time paper is used vs. number of responses

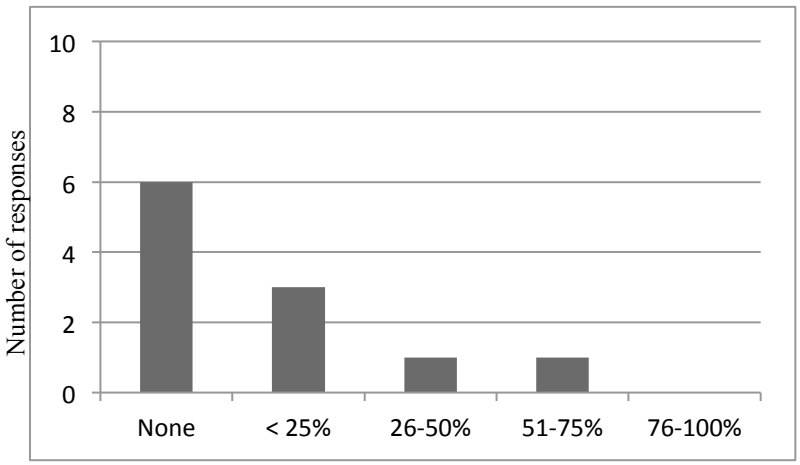


Figure 12. Paper used for referrals
% of time paper is used vs. number of responses

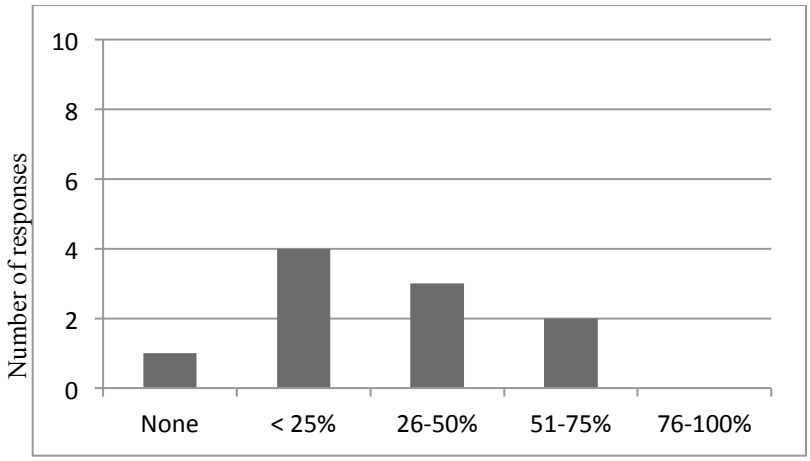


Figure 13. Paper used for transmitting information to a hospital
% of time paper is used vs. number of responses

We asked subjects to compare the ease of finding information in the electronic record (i.e. information where the EHR is the primary source) versus information in scanned documents (i.e. where a paper document is the primary source) **(Figure 14).** Six of 11 providers found it slightly or much harder to find information in the scanned documents although 3 of 11 found it easier to locate information in scanned documents.

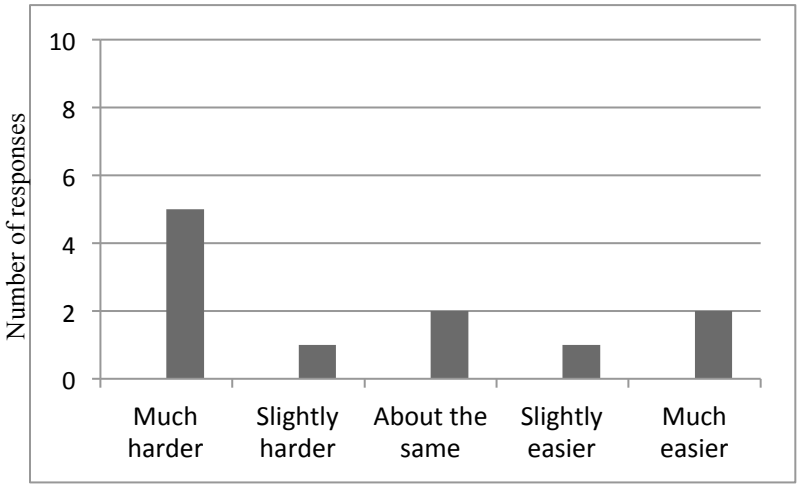


Figure 14. Perceptions about the ease of finding information in scanned paper documents compared to finding information in the EHR
Response given vs. number of responses

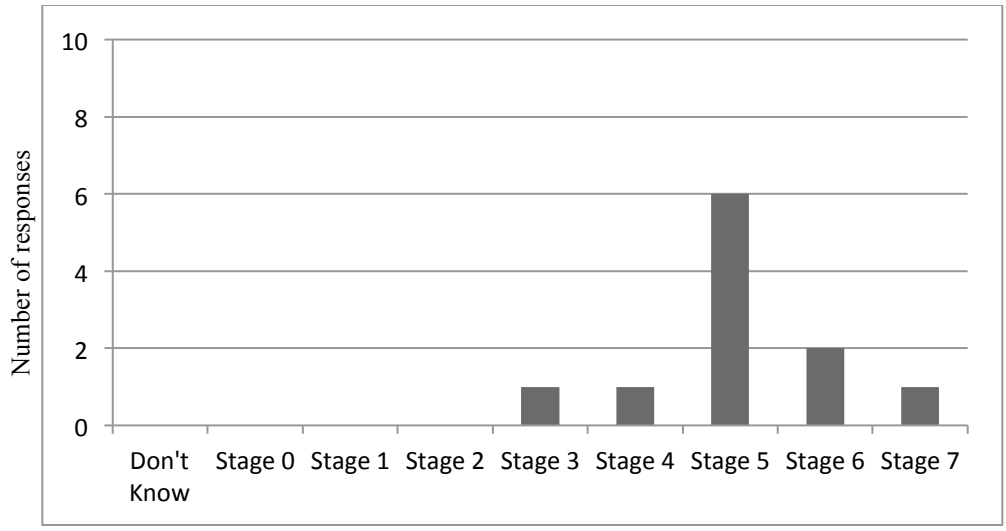


Figure 15. Self-assessment of HIMSS Analytics Stage
Response given vs. number of responses

Finally, subjects were asked to self-assess their practice's current status compared to the HIMSS Analytics Ambulatory EHR Adoption Stages shown previously. Nine of the 11 providers (82%) in this study rated their ambulatory environment at HIMSS Stage 5 or higher **(Figure 15).** This may reflect a higher degree of sophistication of EHR adoption compared to the HIMSS Analytics 2014 report; only 15.7 % of those respondents were at Stage 5 or higher. (4) However, it is difficult to directly compare this informal self-assessment with the HIMSS administered analysis

Interview Results

Transcripts of the eleven interviews were initially coded based upon the categories of paper-based workarounds described by Saleem et al. (7) Many of the same human-technology integration factors noted by Saleem emerged from the interviews. However, compared to Saleem, our respondents were more likely to cite examples coded in the Sensorimotor Preferences, Task Specificity and Trust categories. There were no examples of Security issues with the EHR leading to paper persistence. Representative quotes are

included in **Table 4**, and a complete reference to the coded segments from the interview transcripts is included in Appendix A – D.

Twenty-one statements were made in the interviews supporting the theme that sensorimotor preferences lead to the persistence of paper use. These references support the ideas, for example, that paper is both familiar and easier to read or work with than the EHR, or that patients prefer to have a paper record or instructions to take home. In addition, at least one person felt that using paper provides a better interaction with the patient.

Eighteen statements supported the theme that paper is used for task specific purposes. Further analysis of these task specificity references led to the development of specific use cases which are further explored and discussed under Use Cases and **Table 6** below.

Subjects made thirteen statements which supported the theme that paper use persists because paper workflows are trusted more than the EHR by providers. Subjects noted examples such as trusting that lab results will be reviewed or trusting that imaging studies were pre-certified as required.

Seven statements were made supporting the theme that paper use is more efficient than the EHR. These were references to examples of more efficient workflow for patients, staff or providers using paper rather than the EHR.

Seven statements were made supporting the theme that paper use persists because the task is easier on paper, or because patients, staff or providers don't have the needed computer skills or knowledge to use the EHR.

Seven statements referred to examples where paper acts as a memory aid or convenient reminder of old or existing information for patients, staff or providers. Six statements supported the theme of paper persistence due to paper's ability to act as an alert or cue, either as an internal reminder within the practice, or as an alert to new information in the form of external communication.

Six statements supported the theme of data organization. We found examples where providers used paper to make a summary of all data available and examples where paper was used in support of patient care to organize just a subset of the data available.

Four statements supported the theme of paper persistence due to the need to organize longitudinal data across multiple time points in a way that the EHR did not allow. Four statements were made that supported the theme of task complexity; these were references to examples where paper made a complex task easier than using the EHR.

We found no examples of statements in the interviews supporting the theme of security as a reason for paper persistence; there were no examples where paper was used to circumvent the security requirements of the EHR or that paper was more secure.

Category	References	Definition	Example
Sensorimotor Preferences	21	Paper is familiar to patients, staff and/or providers and is the preferred sensory input.	"I do know that [names physician colleague]… was having them print out huge reams of labs and former notes for each patient so that he'd have something, a warm folder, to hold onto as he entered the room." "I can't read EKGs on the computer unless I print them. That's just the way I was brought up, interacting with paper."
Task specificity	18	Paper is required to complete tasks that are specific to a patient, provider or department.	"…a whole other class of things that we print out – we do print out – there is a chronic illness registry form that goes over their last values of cholesterol and HbA1Cs for diabetics and graphs them out and it's very pretty, and we do that for people when they come in for an annual visit."
Trust	13	Paper workflow and processes are trusted more than their electronic counterparts.	"When I got every lab test on a piece of paper on my desk, I knew they were all there." "…it may be lack of trust again – but they print out you know every x-ray that needs to be pre-certified and ordered – it's all done on paper."
Efficiency	7	Paper documents improve workflow by making it more efficient for patients, staff or providers.	"Whereas if I have a stack of papers, I can just flip through them and just slash my signature across it in nanoseconds." "…to jot down Zyrtec and give it to the patient takes just a couple seconds, instead of saying 'Hold on, let me log in.' and then I have to print it off, and it takes longer…"

Category	References	Definition	Example(s)
Knowledge/skill/ ease of use	7	Paper is used because patients, staff or providers don't have the knowledge, training or skill to use the EHR, or because the task is easier on paper.	"It might be the culture of the way she does it, or it may be that she doesn't feel trained enough in the EHR to do it that way." "…which is why we print out the medication list before the patient comes in – because it just does make things a little easier."
Memory	7	Paper acts as a convenient reminder of existing or old information.	"We can print it from our EHR, and even when they give us these forms to fill out, we'll fill it out then clip a copy of the EHR immunization record onto it, kind of as a reminder." "So for example for every mammogram that's ordered, it comes out as a printed form, and they keep them and make sure that they've booked them."
Awareness	6	Paper acts as an alert or cue to bring new information to the attention of staff or providers.	"I have that document and I'm less likely to miss something if it's buried in some tab somewhere in the record." "…it's a cue that allows them to know what to ask for so that the lab people can pull up the right thing"
Data organization	6	Paper meets a need for better data layout or different data views than those available in the EHR.	"I have a form…and for example with [retired physician's] charts, as I'm going through them, I'm writing down "Pneumonia vaccine, the problem lists, the dates of surgeries…" we would scan that in. Let's say they come in in a year instead of me looking through his four hundred pages of scribbled records, I can look at the one page that I took all my notes on."

Category	References	Definition	Example
Longitudinal data processes	4	Paper lets the user organize data across multiple time points in ways that are superior to the EHR.	"If there's a patient that I'm following an aneurysm on, I'll go back through all their imaging studies with the date and the size, so that I can make a… sort of track it better in my head if I want to know how quickly an aneurysm's growing. Something like that I will write down so that I can see it in one place."
Task complexity	4	Paper makes a complex task or workflow easier.	"It's hard for me to access those, … because you have to click into the visit, scroll down, hit the discharge summary tab, bring it up, … it's much easier for me to click print, print it out and use that."
Security	0	Paper allows users to circumvent the EHR security requirements.	

Table 4. Examples of statements supporting the paper based workaround categories

Interviews were also coded using the iterative grounded theory process previously described. Three additional major themes were identified: Extra Work, Use Cases, and Information Chaos.

Extra Work – A Lean Category of Waste. Not surprisingly, one of the themes which emerged from analysis of the persistence of paper in an ambulatory EHR environment is that extra work is created by the persistence of paper **(Table 5).** *Lean* methodology may be used to evaluate and categorize eight types of waste in any workflow process, including extra work (13). The persistence of paper in these practices was frequently cited as a source of extra work.

Category	References	Definition
Extra Work	24	Paper creates extra work for the provider or staff which is outside of the EHR workflow and/or is required to complete a task.
Example(s)		
"We scan almost all of the paper that comes in, so office notes from other places, lab results from other places, certainly x-ray results from other places, all get scanned in. The thing I find fascinating is that what used to be a one page letter is now a five page office note. So it creates a lot of storage difficulties for the system as well as a lot of work for the scanning people." "… well maybe the patient signs [the intake questionnaire]. I'm not sure why they scan them, because it's redundant information, things that have been abstracted into the record already, so it doesn't really have much utility." "There are some practices that might fax me something twice or even three times. If I'm reviewing it all in one setting, I will say – I've seen this before and I will pull it out so it doesn't get scanned. It's not uncommon to get the duplicates."		

Table 5. Examples of statements supporting the Extra Work theme.

Use Case	References	Definition	Example(s)
Transitions of Care	26	Paper is used for patient transitions of care to or from a setting outside the current provider's EHR system; paper is used by providers to communicate patient information.	"… if the patient is referred outside, typically a package is put together with the most recent clinic notes that is then either faxed or mailed to the receiving provider." "I'd say 90 plus percent of the new patients that come in will bring some form of paper records, either inches thick or just a couple of pages. Some goes directly to me, some gets sent to medical records. That gets scanned in and then I'm not sure what happens to it after that."
Form completion	15	Paper forms are used as required by an outside healthcare or governmental agency.	"There are a number of colleges that insist you must fill out our form; no other form will be accepted."
External test results	11	Paper is used to receive lab, imaging and other results from outside the current provider's EHR system.	"Yes, the documents that are scanned are pathology reports, outside imaging, outside clinic notes and outside labs."
Order Entry	8	Paper is used for some instances of order entry workflow.	"Orders get printed – because we don't have a bidirectional interface, all orders get printed and it's just more paper for the front desk to deal with."
Patient Education	7	Paper is used for patient educational or informational purposes.	"I always give everybody a handout at the end of the visit which lists changes in their meds, consultations, and the labs I ordered."

Table 6. Examples of statements supporting Task Specific Use Cases related to paper persistence

Use Cases for Persistent Paper. The frequent references to paper used for specific tasks prompted us to examine these task specific use cases – i.e. the use of paper related to a specific clinical or non-clinical workflow **(Table 6).** The most frequently cited use cases related to specific tasks were transitions of care, form completion, external test results, special instances of order entry and patient education.

Information Chaos. The final theme developed based on grounded theory analysis of the interview transcripts is Information Chaos. Information chaos has been defined as various combinations of information overload, information underload, information scatter, information conflict and erroneous information. (14) Subjects cited numerous examples where the persistence of paper and practicing in a hybrid paper-electronic environment introduced a higher degree of information chaos **(Table 7).**

Category	References	Definition
Information Chaos	23	Paper causes Information over-load, information under-load, information scatter, information conflict or erroneous information.
Examples		
"When it's written to me there's always that delay. So say I get it today and the patient's coming in tomorrow, it may be in scanning 'Limbo', so I'm searching all over the place." "For practices like ours, where most of our consults are from outside Epic, it's a major deal. And to have the volume of paper that's floating around the office, it's not good. When we were on Centricity, basically that piece of paper went for scanning same day, so it showed up in our InBasket quickly, and then it was available to everybody, even before I signed it, if it was needed. You know, there's that scramble – "Oh, I know I saw it somewhere two days ago, where is it?" if it hasn't been scanned yet." "Because that's a genuine patient safety issue. If you have some notes in paper, some notes in the computer, some written orders, some entered orders …"		

Table 7. Examples of statements supporting the Information Chaos theme.

DISCUSSION

The persistent use of paper as an unintended consequence of EHR implementation has been studied in a number of healthcare settings. (7-10) The current study in three ambulatory practice regions in Maine confirmed the persistent presence of paper following ambulatory EHR implementation. In the survey, we found that providers still receive significant amounts of documentation from outside providers on paper, even more frequently than laboratory or imaging studies. Corresponding to this, we found that providers also use paper most often for transmitting information to other providers such as referrals and, especially, to hospitals. These tasks correspond with the use case of transitions of care which we discovered in interviews. The frequency with which paper is used to communicate between clinicians during transitions of care emphasizes the degree of improvement that could take place if this use case were addressed adequately. We will explore some strategies below to reduce or eliminate the use of paper for transitions of care.

The semi-structured interviews confirmed the presence of several previously reported categories of paper-based workarounds related to human interaction with the EHR. (7) Analysis of these practices revealed some differences compared to the previous studies by Saleem et al **(Table 8).** For example, subjects in this study were more likely to note sensorimotor preferences, task specificity and trust as among the key reasons for paper persistence. Evaluating each of the workaround categories more thoroughly should help identify tactics to mitigate the potential negative impact of paper persistence.

a.

Current Study	#
Sensorimotor preferences	21
Task specificity	18
Trust	13
Efficiency	7
Knowledge/skill/ease of use	7
Memory	7
Awareness	6
Data organization	6
Longitudinal data processes	4
Task complexity	4
Security	0

b.

Saleem et al	#
Efficiency	20
Knowledge/skill/ease of use	20
Memory	17
Sensorimotor preferences	15
Awareness	12
Task specificity	12
Task Complexity	9
Data Organization	9
Longitudinal data processes	9
Trust	1
Security	1

Table 8. Number of interview references to paper-based workaround themes
a. current study b. Saleem et al (7)

We will address some of the most commonly cited reasons for paper persistence and develop some strategies for consideration.

Sensorimotor preferences. Karsh et al reviewed twelve Health Information Technology fallacies, including the "paperless" fallacy. (15) They assert that paper provides "…sophisticated cognitive artifacts that support memory, forecasting and planning, communication, coordination and education [are] all essential to safe quality patient care." Viewed in this manner, it is not surprising that many clinicians have sensorimotor preferences for paper. The challenge, according to Karsh, is for Health Information Technology to provide similar support.

Task specificity and use cases for the persistence of paper. Based on an analysis of task specificity, we also developed standard use cases from these interviews. The primary use cases for which paper persisted in the workflow included transitions of care, form

completion, reviewing external test results, order entry tasks and patient education. Each of these uses cases presents unique challenges.

Transitions of care between providers and healthcare settings have been identified as a significant source of error and patient harm (18) and we know from our survey that the subjects in this study receive and send more paper for transitions of care than for most other purposes. In addition, Meaningful Use Stage 2 criteria require that an eligible provider must provide a summary of care record for more than 50% of care transitions and more than 10% of these summary of care records must be transmitted electronically to the recipient using certified electronic health record technology. (19)

Electronic transmission of these records thus far has focused on the Continuity of Care Document or CCD. The development of the CCD is worth further explanation. The CCD is an implementation guide for sharing Continuity of Care Record patient summary data which uses the HL7 Version 3 Clinical Document Architecture (CDA), Release 2. (20) The Consolidated-CDA (C-CDA) implementation guide serves to further harmonize the disparate CDA implementation guides developed by several standards development organizations. (21) The CCD is a clinical summary document which must be capable of including data elements known as the "Common Meaningful Use Data Set". These comprise: Patient name, sex, date of birth, race, ethnicity, preferred language, smoking status, problems, medications, medication allergies, laboratory tests, laboratory values/results, vital signs, care plan fields including goals and instructions, procedures and care team members. (21)

At the time of these interviews in mid-2014, with Stage 2 of Meaningful Use already well underway, the CCD seems to have made negligible impact on how clinicians communicate. Typical quotes from study participants include the following:

"We may be sending [CCDs] out, but I'm not seeing them coming in. When people transfer here it's just a big old [paper] document. [A CCD is] not something we're using clinically"

"…and two different times the neonatologist called me asking, trying to do a handoff and I asked "Can you send me a CCD?" - and he said 'what is CCD?' – it's not available."

It also seems likely from these interviews that the content of the CCD may not adequately support provider communication associated with these transition of care use cases. Many providers expressed a need to include provider generated text-based documentation for communication with other providers during transitions of care, particularly in the case of a referral to or from an external provider:

"I will say 'Please send … the most recent office note, their problem list, their med list, their EKG, their Echo and anything else I thought was pertinent"

"Generally we try to send office notes, so the most frequent notes, or any imaging studies."

"[We receive] consultation notes from people that are not on our system…"

"We have … to send along that cardiology consult note also."

"The discharge summary also gives me the sense of comfort that I'm addressing all the follow up points."

As Bill Hersh recently noted in a discussion of EHR interoperability: "…there will always be a need for documents and the narrative text within to explain the patient's story…" (22) In the absence of document level interoperability, it appears that paper may persist in the EHR environment for some time because it meets a unique need for clinician communication across disparate EHR systems.

If clinician to clinician communication at the document level comprises much of the persistent paper entering an ambulatory practice, what are the options? The Office of the National Coordinator for Health Information Technology (ONC) recently published a draft ten year roadmap for health information technology interoperability. (23) The provider interoperability goals for 2014-2017 are limited to the ability to: "Send, receive, find and use the common meaningful use data set for all patients." The goals for 2017-2020 are extended to expanded sources and to: "Increased granular access to specific health information when/where needed." The JASON Report Task Force (JTF) (24) was formed in response to ONC's recommendations and to press for expanding interoperability. Among the JTF recommendations is the adoption of public APIs (Application Programming Interfaces) "…to enable data and document level (emphasis added) access to clinical and financial systems, using current internet standards."

There are existing Consolidated CDA (C-CDA) templates for the clinical documents currently being exchanged on paper, such as operative notes, consultation reports and physician progress notes. (25) The ONC Implementation and Testing Division

recommends that providers exchange summary of care documents in the C-CDA format appropriate for the specific transition of care use case. In one example given by ONC in their implementation guide, a primary care provider would send a C-CDA templated Continuity of Care Document (CCD) to an orthopedic specialist with a consult request; in turn the Orthopedist would communicate back to the primary care provider with a C-CDA templated Consult Note. (21) However, these templated C-CDA documents are not yet in common use or being exchanged electronically. Indeed, a recent study demonstrated that even exchanging the minimal data set in the CCD may incur errors due to barriers to seamless interoperability. (26)

Another potential source for exchanging electronic health records are health information exchanges or HIEs. However, the clinical utilization of HIEs by clinicians has lagged; a 2013 study reported that only ten percent of ambulatory practices and thirty percent of hospitals participated in an HIE. (27) This appears to be borne out by this statement from one physician:

> *"I will tell the resident to attending that is receiving the patient – 'All of my patient notes, all of the lab work is available on Maine HealthInfoNet, the health information exchange', and they say 'What's that? Oh, that sounds like a good idea. I hadn't heard of that'. I find that very highly frustrating."*

It is also notable that the Jason Task Force commented in 2014 that "At present, HIEs are largely seen as replacements for fax machines."(24)

Form completion is the second use case that we propose for persistence of paper. Standards for insurance, disability, school and work related "forms" would be required in order to decrease the amount of paper forms used. Another potential strategy which is largely untapped is the implementation of the Integrating the Healthcare Enterprise (IHE) Retrieve Form for Data Capture (RFD) standards. (28) These standards provide a method for gathering required data from the EHR and form completion.

The degree to which paper persists in the third use case, external text results, i.e. for reporting lab and imaging results, is particularly dependent on the local environment as demonstrated in our survey. The number of potential external systems from which each ambulatory practice frequently receives results, and the number and type of interfaces vary significantly. Optimizing these results interfaces could reduce paper utilization.

The final use case is patient education. Adoption of patient on-line EHR portals should help minimize the need to print patient instructions. There are meaningful use measures for eligible providers which require a minimum level of patient enrollment for access to patient portals and electronic communication with patients. (19) There is also a growing consumer movement to integrate patient data directly into the EHR. (29)

Trust. Trust was a frequently expressed sentiment in this study. These providers at times seem to feel more confident seeing and handling paper documents and reports.

Paper-based workarounds and human-computer interaction. The remaining workaround categories which this study confirmed: efficiency, knowledge/skills/ease of use, memory, awareness, data organization and longitudinal data processes could all be

addressed by improvements in the human-computer interface. There is significant literature on improving human-computer interactions and human factors research. (16,17) However, Declerck et al note that many EHR implementations fail or are sub-optimally used by clinicians, and that the persistence of a "shadow" paper chart is common.

The National Institute of Standards and Technology (NIST) recently published a guide entitled "Integrating Electronic Health Records into Clinical Workflow: An Application of Human Factors Modeling Methods to Ambulatory Care." (17) NIST recommends a User-Centered Design (UCD) process to improve EHR workflow for clinicians. Their workflow analysis used two human factors modeling methods: process mapping and goal-means decomposition to define the end-user's needs and identify clinical activities that require more relevant and flexible EHR design to support them. Goals-means decomposition is a method used to manage conflicting goals. It visually displays the means for achieving goals in a concept map which is derived from a functional analysis of the workflow by discussion with the subject matter experts (clinicians). In the analysis of EHR design, there may be conflict between the goals of patient care, billing and reimbursement and provider experience.

The NIST study's insights identified numerous opportunities to improve clinician workflow in the ambulatory care environment through enhanced EHR functionality. The EHR enhancements recommended by NIST mirror many of the current findings from the current study of paper persistence:

- Support for remembering tasks to accomplish during a subsequent patient visit (Awareness, Memory)

- Redacting and summarizing laboratory results (Data Organization)
- Drafting predicted orders a day before a patient visit to reduce the time to complete the orders during the visit (Efficiency)
- Supporting moving from initial working diagnoses to formal diagnoses (Efficiency)
- Supporting dropping or delaying tasks under high workload conditions (Efficiency)
- Supporting different views of a progress note based upon role (Task specificity)
- Distinguishing new documentation in a progress note from copied information from a different progress note (Task complexity)
- Supporting communication with specialist physicians about referrals and consultations (Transitions of care use case)
- Tracking scheduled consults and review of laboratory results (Awareness, Longitudinal data processes)

This suggests that enhancing EHR usability is a key strategy for eliminating persistent paper. If the EHR better meets the needs of clinicians for efficiency, ease of use, memory, awareness, data organization and longitudinal data processes, the need for paper-based workarounds should diminish.

Extra work associated with the persistence of paper. Several providers noted that their current workflow for handling paper documents they receive and the document scanning process created extra work. Workflow associated with processing and scanning any remaining persistent paper should be evaluated for efficiency. The MaineHealth system,

for example, is currently scanning more than 3.5 million documents annually [private communication] and is re-evaluating scanning workflow from a process improvement perspective.

Information chaos in the electronic age. The implementation and use of an EHR has been described as a complex socio-technical challenge, (30) and information chaos in the ambulatory environment has been reported to have negative implications for physician performance and patient safety. (14) We identified numerous examples quoted which support the conclusion that paper persistence increases information chaos. It is also conceivable that the subjects' trust issues with the EHR are related to this information chaos. Efforts to optimize EHR adoption should focus on the totality of the local healthcare information environment.. The Safety Assurance Factors for EHR Resilience (SAFER) guidelines were recently developed to help optimize the safety and use of electronic health records. (31) There are nine SAFER guidelines covering specific areas of implementation and use, including test results reporting and follow-up and clinician communication. Until or unless paper is eliminated from the healthcare environment, it may be prudent to consider adopting the same guidelines and standards for the complete environment of healthcare information, not just the electronic health record implementation.

Limitations and Future Work

The current study is limited by the small number of interviews conducted and the small number of practice settings. However, findings in this study are consistent with most other studies performed with one notable exception. We did not find specific evidence of

safety issues in this study, although it is known that the persistence of paper may have a negative impact on quality and patient safety. The Controlled Risk Insurance Company (CRICO) a medical liability insurer, recently reported on EHR-related problems leading to medical malpractice claims. They found that of the 147 liability cases in 2013 which were due to EHR related errors, 16% were due to the presence of 'hybrid" EHR-paper systems. (32) They noted that this was the second most common EHR issue which caused errors, and it was particularly problematic when the paper and electronic records are inconsistent.

A larger cohort would also have allowed for analysis of any gender or age related differences. Although there is no evidence at this point that gender or age have an effect on paper persistence, such a correlation would be likely and might affect strategies for decreasing paper use. In addition, the initial plan was to conduct field research through observational studies within the practices to further confirm the survey and interview findings. Time constraints caused us to postpone the observational plan.

Another potential area for future study might be to perform economic and clinical analyses before and after the implementation of paper-minimization tactics. This could help demonstrate the economic value and effect on safety of plans to achieve reduction in paper use

SUMMARY AND CONCLUSIONS

What we knew prior to this study

- EHR Implementation is a complex socio-technical process.
- There are unintended consequences to EHR Implementation, including paper persistence.
- Paper persists after EHR implementation for a variety of reasons including lack of interoperability and user preferences.
- Information chaos can have negative implications for physician performance and patient safety.

What this study added

- Paper persistence in the ambulatory EHR environment can lead to deleterious effects including extra work and information chaos.
- There are specific use cases which require or promote the persistent use of paper in the ambulatory EHR environment.
- Specific tasks which require document exchange for clinician communication during transitions of care are not well supported by the current level of adoption of interoperability standards such as the Continuity of Care Document (CCD).
- Implementation and electronic exchange of additional documents using C-CDA templates could potentially eliminate much of the paper currently used for text-based clinician communication.
- Incorporation of human factors research in EHR design and implementation may reduce users' preferences to retain paper in the EHR environment.

- Additional research is needed to confirm the efficacy and value of the proposed strategies to eliminate paper.

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Appendix A: Paper Based Work-Arounds - Categories and Coded Transcript Segments

Sensori-motor Preferences

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 3 references coded [2.07% Coverage]

Reference 1 - 0.88% Coverage

I always give everybody a handout at the end of the visit which lists changes in their meds, consultations, and the labs I ordered. **I find clinically, it's much better that way.** [subtopic: patients prefer paper]

Reference 2 - 0.80% Coverage

especially if it's really dense with labs, **I 'll print it on paper so I can just carry it in the room with me.** [subtopic: providers prefer paper]

Reference 3 - 0.39% Coverage

it looks nicer to the patient than me staring at the computer [subtopic: patients prefer paper]

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 3 references coded [2.42% Coverage]

Reference 1 - 1.40% Coverage

a whole other class of things that we print out – we do print out – **there is a chronic illness registry form that goes over their last values of cholesterol and HbA1Cs for diabetics and graphs them out and it's very pretty,** and we do that for people when they come in for an annual visit. [subtopic: patients prefer paper]

Reference 2 - 0.48% Coverage

Similarly, a lot of people have trouble doing med rec off a computer screen. [subtopic providers prefer paper]

Reference 3 - 0.53% Coverage

people have difficulty reading things off a screen. They prefer to read them on paper. [subtopic: providers prefer paper]

<Internals\\Interview Transcripts\\LE Semi-structured-interview> - § 1 reference coded [1.56% Coverage]

Reference 1 - 1.56% Coverage

I do know that (names physician colleague) for a long time, and I don't know if he's [still] doing this, was having them print out huge reams of labs and former notes for each patient **so that he'd have something, a warm folder, to hold onto as he entered the room.** [subtopic: providers prefer paper]

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 2 references coded [1.89% Coverage]

Reference 1 - 0.96% Coverage

We still do the appointment, **they schedule a follow up, they print them an appointment card** – probably more of a generational thing [subtopic: patients prefer paper]

Reference 2 - 0.92% Coverage

I think there is some value to something that is clear and concise and it's not 7 pages long.

Or 8 and ½ by 11 – **you can pop it right in your pocket and there you go.** [subtopic: providers prefer paper]

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 3 references coded [2.42% Coverage]

Reference 1 - 0.77% Coverage

For those elderly folks, that's where the challenge comes. **They like to have it in their hands right now when they leave.** [subtopic: patients prefer paper]

Reference 2 - 0.98% Coverage

I think **our triage nurse will still write down the initial documentation** – they take a message off – they'll write it down and then they'll transfer it over to Epic. [subtopic: staff prefers paper]

Reference 3 - 0.67% Coverage

I think some patients just like… like an advanced directive – **they just like having it in their hands [**subtopic: patients prefer paper]

<Internals\\Interview Transcripts\\JM SemiStructuredInterview> - § 1 reference coded [0.98% Coverage]

Reference 1 - 0.98% Coverage

One of the paper things I do every day is I print someone's labs, anticipating that when I see someone, **they'll want a copy themselves.** [subtopic: patients prefer paper]

<Internals\\Interview Transcripts\\LL_Semi-structured interview> - § 1 reference coded [0.76% Coverage]

Reference 1 - 0.76% Coverage

We've had some specialists using the system who **wanted everything printed out for them to have in their hand before the patient visit.** [subtopic: providers prefer paper]

<Internals\\Interview Transcripts\\NY_Semi-structured Interview> - § 2 references coded [2.60% Coverage]

Reference 1 - 1.96% Coverage

I will print that out in the room to look at in paper form, because **I find that it's hard for me to access those, especially the ones from Maine Med [teriary referral center] because you have to click into the visit, scroll down, hit the discharge summary tab, bring it up, then I can't read it or memorize it, it's much easier for me to click print, print it out and use that.** [subtopic: providers prefer paper]

Reference 2 - 0.64% Coverage

I can't read EKGs on the computer unless I print them. That's just the way I was brought up, interacting with paper, [subtopic: providers prefer paper]

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 4 references coded [4.61% Coverage]

Reference 1 - 0.83% Coverage

Personally, **there is some benefit to being able to underline and scribble on stuff as that comes in.** [subtopic: providers prefer paper]

Reference 2 - 2.66% Coverage

Do you have any preference for any other workflow where you really just like to use paper?

The big long reports like the neuropsychology reports that are 13 pages long – that I'd kind of like to have on paper so that I can scribble on it, make notes in the margins and highlight the important stuff so that if I do need to look at it in the scanned record, I can have it annotated more easily. [subtopic: providers prefer paper]

Reference 3 - 1.11% Coverage

Some people have said **when I have a long document, I want to print it out so it's easier to read** – do you agree?

I would agree with that. [subtopic: providers prefer paper]

<Internals\\Interview Transcripts\\RH SemiStructuredInterview> - § 1 reference coded [1.67% Coverage]

Reference 1 - 1.67% Coverage

Oh, absolutely, I think there's a lot of variation provider to provider in how things are being done. And **it's an ongoing challenge to try to wean people away from that need to have that piece of paper in front of them** – there's no question. [subtopic: providers prefer paper]

Task Specificity

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 1 reference coded [0.71% Coverage]

Reference 1 - 0.71% Coverage

we have **a lot of orders that go to like [the] pharmacy for equipment, DME, that sort of thing, and some things like syringes, needles**, just don't go well by SureScripts.

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 2 references coded [2.06% Coverage]

Reference 1 - 0.66% Coverage

Now they want to actually see **proof that patients are actually testing their sugars**. So we are retaining them [paper patient logs] and scanning them all.

Reference 2 - 1.40% Coverage

a whole other class of things that we print out – we do print out – **there is a chronic illness registry form that goes over their last values of cholesterol and HbA1Cs for diabetics and graphs them out and it's very pretty,** and we do that for people when they come in for an annual visit.

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 1 reference coded [0.78% Coverage]

Reference 1 - 0.78% Coverage

Do you use paper during an office visit – do you write things down for patients?

Yeah, **so if I want them to take over the counter medication.** [I write it down on paper]

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 5 references coded [3.57% Coverage]

Reference 1 - 0.72% Coverage

We receive a fair amount of paper – most basic stuff- prior authorizations, **stuff that needs to be hand written for Medicare** takes up a big chunk

Reference 2 - 0.80% Coverage

I'll print that out [lab and imaging results] so I can have it in the room for med reconciliation with the patient.

Reference 3 - 0.98% Coverage

I think **our triage nurse will still write down the initial documentation** – they take a message off – they'll write it down and then they'll transfer it over to Epic.

Reference 4 - 0.30% Coverage

You're always going to have forms and Medicare requirements.

Reference 5 - 0.78% Coverage

right now **those [prescriptions] get manually taken off a phone prescription line, entered in, and then a lot of those have to get signed and manually faxed**.

<Internals\\Interview Transcripts\\JM SemiStructuredInterview> - § 8 references coded [7.85% Coverage]

Reference 1 - 1.32% Coverage

We'll have to print that and fax it the old fashioned way [to a medical supply company] rather than sending it electronically. So that's an example of something the second thing I clicked on will require printing and faxing.

Reference 2 - 0.37% Coverage

This lady needs opiates, and so **opiates are printed and signed.**

Reference 3 - 0.90% Coverage

So this is paper handouts, because **we're now required for part of our meaningful use and quality improvement is to show that we give patients information**.

Reference 4 - 1.28% Coverage

For example you can log onto GoodRx and find out where the cheapest medication is locally which pharmacy has generic medications for the best price. But **that has to be printed as a coupon, there's no electronic coupon.**

Reference 5 - 0.72% Coverage

These are referrals to physical therapy – most of the referrals ot physical therapy we can do on the computer, but not all.

Reference 6 - 0.75% Coverage

so this is a request from, **an assisted living facility – they still are faxing us requests for medication changes**.

Reference 7 - 1.00% Coverage

So **this is a signature for a hearing aid, this is a signature for oxygen, this is a signature for a medication change**. So those things are scanned after I've signed them.

Reference 8 - 1.53% Coverage

These forms are from away, are from companies outside of the building. The only real paperwork we get from patients are work related paper – so M1 forms for worker's compensation, FMLA paperwork or other worker's compensation paperwork that has to be filled out.

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 1 reference coded [0.65% Coverage]

Reference 1 - 0.65% Coverage

because the lab even if I call **for an add-on – "Can you fax me that paper?" they still want that order.**

Trust

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 1 reference coded [0.66% Coverage]

Reference 1 - 0.66% Coverage

Now they want to actually see **proof that patients are actually testing their sugars**. So we are retaining them [paper patient logs] and scanning them all.

<Internals\\Interview Transcripts\\LE Semi-structured-interview> - § 1 reference coded [0.72% Coverage]

Reference 1 - 0.72% Coverage

I think **they're [referring physicians] going to get something in the mail rather than just relying on my notes being there** and accessible.

<Internals\\Interview Transcripts\\JW Semi-structured-interview> - § 7 references coded [8.04% Coverage]

Reference 1 - 0.79% Coverage

But **something that's hard to transcribe, like a [printed] detailed operative report – I would want to keep that.**

Reference 2 - 0.84% Coverage

you don't want information being dumped into the EMR that you don't know about before you've had a chance to check it.

Reference 3 - 1.02% Coverage

when I got every lab test on a piece of paper on my desk, I knew they were all there. And it's the trust that that's going to happen in the EMR.

Reference 4 - 1.19% Coverage

How far do you think this practice or this region is on that continuum of trust in general?
With the EMR? Not very far, because there have been too many issues.

Reference 5 - 0.98% Coverage

it may be lack of trust again – but they print out you know every xray that needs to be pre-certified and ordered – it's all done on paper.

Reference 6 - 1.44% Coverage

And I think that's because either they aren't comfortable with the way the work lists are or **they are afraid they are going to lose stuff,** [subtopic: information scatter] **and not do it in a timely fashion**.

Reference 7 - 1.79% Coverage

it might be the culture of the way she does it, or **it may be that she doesn't feel trained enough in the EMR to do it that way** [subtopic: staff or providers may not have needed computer skills]
– or that **she doesn't trust that the EMR does it properly.**

<Internals\\Interview Transcripts\\NY Semi-structured Interview> - § 3 references coded [1.92% Coverage]

Reference 1 - 0.51% Coverage

some things are missed through the [abstraction] process, so we still have our providers reviewing the outside records.

Reference 2 - 0.49% Coverage

it [the printed discharge summary] also gives me the sense of comfort that I'm addressing all the follow up points

Reference 3 - 0.92% Coverage

I have that document [printed discharge summary] and I'm less likely to miss something if it's buried in some tab somewhere in the record.

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 1 reference coded [0.65% Coverage]

Reference 1 - 0.65% Coverage

because the lab even if I call **for an add-on – "Can you fax me that paper?" they still want that order.**

Efficiency

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 2 references coded [2.75% Coverage]

Reference 1 - 1.47% Coverage

print out everyone's med list the night before they come in, handing it to them when they check in, and **using whatever time is available between check in and when I actually walk in the room**, so they can review it and the medical assistants will go over it and make sure it's accurate. [subtopic: efficient use of patient and staff time]

Reference 2 - 1.28% Coverage

If you're printing those med lists and having them review that beforehand, I would assume that's a workflow that your MA could conceivably do with the patient right in front of them –**so printing that paper out is….**

Time saving. [subtopic: efficient use of patient and staff time]

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 3 references coded [4.36% Coverage]

Reference 1 - 1.35% Coverage

to jot down Zyrtec and give it to the patient takes just a couple seconds, instead of saying "Hold on, let me log in." and then I have to print it off, and **it takes longer to queue the printer than it does for me to actually write it and hand it to the patient.** [subtopic: efficient use of provider time]

Reference 2 - 1.78% Coverage

instead of me looking through his four hundred pages of scribbled records, I can look at the one page that I took all my notes on. I would hand abstract it and then scan it in so we could always refer to it. I would know if they say " I had a colonoscopy" and I could say, I looked through all of the old records and it's missing. [subtopic: efficient use of provider time]

Reference 3 - 1.23% Coverage

it just seems like a more efficient use of time to have the patient fill that out rather than have the MA standing in front of the computer saying "Now tell me about your next medication or your last operation that you had." [subtopic: efficient use of patient and staff time]

<Internals\\Interview Transcripts\\NY Semi-structured Interview> - § 2 references coded [3.10% Coverage]

Reference 1 - 2.41% Coverage

You showed me the patient history form that you have your office fill out. I would assume, and maybe you can agree or disagree with me, is that your office is still doing that because it's faster or more efficient than having the MA stand in front of the computer and ask those questions.

The advantage is that the patient can do it while waiting for me, potentially in the waiting room or even before the visit – **if the patient does do that, it can save time.** You just glance through it and then make some updates. [subtopic: efficient use of provider time]

Reference 2 - 0.69% Coverage

Whereas **if I have a stack of papers, I can just flip through them and just slash my signature across it in nanoseconds. [subtopic: efficient use of provider time]**

Knowledge, Skill, Ease of Use

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 1 reference coded [1.22% Coverage]

Reference 1 - 1.22% Coverage

when I have the patient in a room or coming to the office within the hour, **it's just simpler to print the form to paper.** I'll use the internet to print the form so I get the current version, but we just put it to paper then scan it when the patient leaves [subtopic: paper simplifies some tasks]

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 2 references coded [2.78% Coverage]

Reference 1 - 2.06% Coverage

are there processes or workflow that you think are better on paper than in the computer?

There is nothing that I think is better; [done on paper versus the computerized record] there are a lot of things I think are easier. The classic example is the anticoagulation workflow, in the past, my medical assistant would write in a new value on a flow sheet, I would say "Same" and hand it back. Now it is 17 clicks for no change. [subtopic; paper simplifies some tasks]

Reference 2 - 0.72% Coverage

which is why we print out the medication list before the patient comes in – because it just does make things a little easier. [subtopic: paper simplifies some tasks]

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 2 references coded [2.63% Coverage]

Reference 1 - 0.92% Coverage

I think there is some value to something that is clear and concise and it's not 7 pages long.

Or 8 and ½ by 11 – **you can pop it right in your pocket and there you go.**

Reference 2 - 1.70% Coverage

I've thought about doing it here in the office on some sort of tablet – I floated that idea, but we get a lot of people who are not computer savvy, and we get people who can't read, can't write and it makes it very awkward if you ask them to fill out a form – **it's easier for us to say – "You can take this and bring it home."** [subtopic: patients may not have needed computer skills]

<Internals\\Interview Transcripts\\JW Semi-structured-interview> - § 2 references coded [3.35% Coverage]

Reference 1 - 1.97% Coverage

it's not something that I do frequently, so it's not worth it to me to do that, because then the next time I did it, I'd have to try to remember how to do it – and **it's a lot easier just to write it on the post it** [subtopic: staff or providers may not have needed computer skills]

Reference 2 - 1.38% Coverage

> it might be the culture of the way she does it, or **it may be that she doesn't feel trained enough in the EMR to do it that way** [subtopic: staff or providers may not have needed computer skills]

Memory

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 1 reference coded [2.74% Coverage]

Reference 1 - 2.74% Coverage

We do that just for new patients, so they get a 6 page form mailed to them, which goes through past medical history, and some review of systems, and they are expected to fill that out before their first visit. Most of the time I will take the papers and go over with them with the patient. The form is designed to go through the past history – I don't slavishly go through it section by section, but most of the topics come up in conversation in the course of a new patient visit. And anything that doesn't, **it just serves as a reminder for me just to make sure I ask eventually.** [subtopic: paper is a useful reminder for providers]

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 2 references coded [2.23% Coverage]

Reference 1 - 0.96% Coverage

We still do the appointment, **they schedule a follow up, they print them an appointment card** – probably more of a generational thing [subtopic: paper is a useful reminder for patients]

Reference 2 - 1.27% Coverage

it's not like they're going to take their whole note to the grocery store and say **"Let me find the…he said it started with a Z… was it 5 mg or was it 10?"** So if I hand it to them, they walk right over to the pharmacy and they grab it. [subtopic: paper is a useful reminder for patients]

<Internals\\Interview Transcripts\\JW Semi-structured-interview> - § 2 references coded [5.34% Coverage]

Reference 1 - 2.18% Coverage

do you find that useful or helpful that they're printed?

I don't do anything with them when they're printed, the secretaries deliver them to the patients. And **I think some of them find it useful to remind them to schedule stuff** – they keep a pile of it. [subtopic: paper is a useful reminder for staff]

Reference 2 - 3.17% Coverage

So for example for every mammogram that's ordered, it comes out as a printed form, and **they keep them and make sure that they've booked them.** Every CT scan has to get pre-certified, it's printed out on a paper form and that form goes from person to person until it's booked – scheduled. And that to me is a failure of the EMR or their comfort level with it – cause that shouldn't have to happen. [subtopic: paper is a useful reminder for staff]

<Internals\\Interview Transcripts\\LL Semi-structured interview> - § 1 reference coded [1.02% Coverage]

Reference 1 - 1.02% Coverage

we can print it form our EMR, and even when they give us these forms to fill out, we'll fill it out then clip a copy of the EMR immunization record onto it, **kind of as a reminder.** [subtopic: paper is a useful reminder for staff]

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 1 reference coded [1.11% Coverage]

Reference 1 - 1.11% Coverage

those are just notes to myself, messages from patients from the phone or things like that. Most of what I do is in the computer. [subtopic: paper is a useful reminder for providers]

Awareness

<Internals\\Interview Transcripts\\LE Semi-structured-interview> - § 3 references coded [6.75% Coverage]

Reference 1 - 2.14% Coverage

they do give me a face sheet for each encounter, which is just simply patient demographics.

They give you a paper face sheet?
Yes.
Ok, and do you know why they do that?

I think it's[They give me a paper face sheet] mainly to let me know that there's someone in a room – it goes in the bucket outside the door where the big fat paper chart used to go. [subtopic: internal reminder]

Reference 2 - 2.57% Coverage

if the patient is referred outside, typically a package is put together with the most recent clinic notes that is then either faxed or mailed to the receiving provider. I'm not sure that there is any distinction between a provider that's in the system versus one that's out. So if I send something to Maine Medical, I think **they're [referring physicians] going to get something in the mail rather than just relying on my notes being there** and accessible. [subtopic: external communications]

Reference 3 - 2.03% Coverage

I don't know why they're [the patient] given [lab orders on] paper if we electronically put in an order. They should be able to go to the lab and say "I'm here for my X." You know, maybe **it's a cue that allows them to know what to ask for so that the lab people can pull up the right thing** for that particular visit they have, not some other lost lab or… [subtopic: external communication]

<Internals\\Interview Transcripts\\NY Semi-structured Interview> - § 2 references coded [2.58% Coverage]

Reference 1 - 0.95% Coverage

we wanted to use it [handwritten patient history form] as a document to confirm that we were addressing a complete review of systems legally in the chart – and this does it if they fill it out. [subtopic: internal reminder]

Reference 2 - 1.62% Coverage

it [the printed discharge summary] also gives me the sense of comfort that I'm addressing all the follow up points because there are actions needed after discharge. **I have that document [printed discharge summary] and I'm less likely to miss something if it's buried in some tab somewhere in the record.** [subtopic: internal reminder]

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 1 reference coded [1.06% Coverage]

Reference 1 - 1.06% Coverage

Sometimes I think it [a printed order] serves as a reminder, if you find that, like "Oh, man I've got to go do that" kind of thing. [subtopic: internal reminder]

Data Organization

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 1 reference coded [1.98% Coverage]

Reference 1 - 1.98% Coverage

I print them out so that I can read it more easily, or I print out a series of a patient's HbA1Cs so I can refer to it in the exam room with them – does that sound like anything you would do?

Rarely, once in a while. Especially when you get these patients with their new PDFs , especially if it's really dense with labs, **I 'll print it on paper so I can just carry it in the room with me.** [subtopic: having a subset of data available]

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 1 reference coded [2.89% Coverage]

Reference 1 - 2.89% Coverage

I have a form – actually have a paper form, and for example with Don Weaver's charts, as I'm going through them, I'm writing down "Pneumonia vaccine, the problem lists, the dates of surgeries…" we would scan that in. Let's say they come in in a year **instead of me looking through his four hundred pages of scribbled records, I can look at the one page that I took all my notes on.** I would hand abstract it and then scan it in so we could always refer to it. I would know if they say " I had a colonoscopy" and I could say, I looked through all of the old records and it's missing. [subtopic: making a summary]

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 1 reference coded [0.80% Coverage]

Reference 1 - 0.80% Coverage

I'll print that out [lab and imaging results] so I can have it in the room for med reconciliation with the patient. [subtopic: having a subset of data available]

<Internals\\Interview Transcripts\\JW Semi-structured-interview> - § 1 reference coded [0.79% Coverage]

Reference 1 - 0.79% Coverage

But **something that's hard to transcribe, like a [printed] detailed operative report – I would want to keep that.**

<Internals\\Interview Transcripts\\NY Semi-structured Interview> - § 2 references coded [2.87%

Coverage]

Reference 1 - 1.96% Coverage

I will print that out in the room to look at in paper form, because **I find that it's hard for me to access those, especially the ones from Maine Med [teriary referral center] because you have to click into the visit, scroll down, hit the discharge summary tab, bring it up, then I can't read it or memorize it, it's much easier for me to click print, print it out and use that.** [subtopic; having a subset of data available]

Reference 2 - 0.92% Coverage

I have that document [printed discharge summary] and I'm less likely to miss something if it's buried in some tab somewhere in the record. [subtopic: having a subset of data available]

Longitudinal Data Processes

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 2 references coded [1.72% Coverage]

Reference 1 - 0.33% Coverage

I will occasionally print out lab results, because we can trend lab results

Reference 2 - 1.40% Coverage

a whole other class of things that we print out – we do print out – **there is a chronic illness registry form that goes over their last values of cholesterol and HbA1Cs for diabetics and graphs them out and it's very pretty,** and we do that for people when they come in for an annual visit.

<Internals\\Interview Transcripts\\LE Semi-structured-interview> - § 1 reference coded [3.07% Coverage]

Reference 1 - 3.07% Coverage

PSA – **so I'll write down the PSA history,** and the reason I do that is because the PSA values have not all been brought across from Meditech. There are some historic labs that still don't live in Epic now. And when they do live in Epic, they are a mix of different lab categories. So there's diagnostic, there's screening, and there are a couple of other things and it's a hodge podge that I can't make show up on a single line. It's easier to just write down the date and the number and have it on that face sheet that I then recycle **to show to the patient – here's what 's been going on.**

<Internals\\Interview Transcripts\\JW Semi-structured-interview> - § 1 reference coded [2.25%

Coverage]

Reference 1 - 2.25% Coverage

If there's a patient that I'm following an aneurysm on, I'll go back through all their imaging studies with the date and the size, so that I can make a… sort of track it better in my head if I want to know how quickly an aneurysm's growing. **Something like that I will write down so that I can see it in one place.**

Task Complexity

<Internals\\Interview Transcripts\\JM SemiStructuredInterview> - § 1 reference coded [1.06% Coverage]

Reference 1 - 1.06% Coverage

In some cases if the computer has only so many characters – if I write for CPAP and and **I have to be very careful about the instructions**, I might have to write it on a prescription.

<Internals\\Interview Transcripts\\NY Semi-structured Interview> - § 2 references coded [2.89% Coverage]

Reference 1 - 1.96% Coverage

I will print that out in the room to look at in paper form, because **I find that it's hard for me to access those, especially the ones from Maine Med [teriary referral center] because you have to click into the visit, scroll down, hit the discharge summary tab, bring it up, then I can't read it or memorize it, it's much easier for me to click print, print it out and use that.**

Reference 2 - 0.94% Coverage

If I have a complicated consultation note that is very in depth or has a very complicated treatment plan, sometimes I'll just print those because I can just read them more easily and I can digest it a little bit better.

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 1 reference coded [2.66% Coverage]

Reference 1 - 2.66% Coverage

Do you have any preference for any other workflow where you really just like to use paper?

The big long reports like the neuropsychology reports that are 13 pages long – that I'd kind of like to have on paper so that I can scribble on it, make notes in the margins and highlight the

important stuff so that if I do need to look at it in the scanned record, I can have it annotated more easily.

Appendix B- Extra Work - Categories and Coded Transcript Segments

Extra Work - Paper creates extra work for the provider or staff which is outside of the EHR workflow and/or is required to complete a task.

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 1 reference coded [0.57% Coverage]

Reference 1 - 0.57% Coverage

We get xrays on paper, we get some lab data on paper, which is usually almost always a duplicate of lab data we already get by interface.

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 2 references coded [2.23% Coverage]

Reference 1 - 0.56% Coverage

We go through reams and reams of paper printing after visit summaries, probably a third of which are disposed within 15 minutes.

Reference 2 - 1.67% Coverage

We scan almost all of the paper that comes in, so office notes from other places, lab results from other places, certainly xray results from other places, all get scanned in. The thing I find fascinating is that what used to be a one page letter is now a five page office note. So it creates a lot of storage difficulties for the system as well as a lot of work for the scanning people.

<Internals\\Interview Transcripts\\LE Semi-structured-interview> - § 3 references coded [2.86% Coverage]

Reference 1 - 1.10% Coverage

the patient signs [the intake questionnaire] I'm not sure why they scan them, because it's redundant information, things that have been abstracted into the record already, so it doesn't really have much utility.

Reference 2 - 1.22% Coverage

I know we keep [printed ultrasound reports] and there may be a radiology folder for the images stapled to maybe a face sheet, but I don't refer to those because I include all the information from the ultrasound in my procedure note.

Reference 3 - 0.53% Coverage

I don't know why [the patients are] given [lab orders on] paper if we electronically put in an order.

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 4 references coded [2.20% Coverage]

Reference 1 - 0.28% Coverage

That's labs, but we're still getting [faxed] duplicates of labs.

Reference 2 - 0.52% Coverage

We get duplicate [faxed] discharge summaries, ER visits, it's like every time someone touches it, it gets sent again.

Reference 3 - 0.53% Coverage

I hope we don't just get Epic stuff [from a pathology interface] – I would get multiple [faxed] pages for each lab result

Reference 4 - 0.87% Coverage

And then they have you do [paper disability forms] again and again – there's a 60 day and 90 day – so you're doing the same thing over again. I don't know how you like repeating the same work, but…

<Internals\\Interview Transcripts\\JW Semi-structured-interview> - § 1 reference coded [0.80% Coverage]

Reference 1 - 0.80% Coverage

they're receiving something electronically and **they're receiving it on paper and so they're acknowledging it twice**

<Internals\\Interview Transcripts\\LL Semi-structured interview> - § 2 references coded [1.04% Coverage]

Reference 1 - 0.44% Coverage

that [printing an electronic immunization record] strikes me as a little bit redundant or wasteful.

Reference 2 - 0.61% Coverage

No, they scan it and then it shows up on my desktop as a task, and I'll type reviewed on it and acknowledge it after it's been scanned.

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 5 references coded [4.72% Coverage]

Reference 1 - 0.86% Coverage

What about paper that you generate form the EMR?

Oh tons of paper – the After Visit Summary sheets are a solid 6 to 10 pages apiece.

Reference 2 - 0.80% Coverage

But the face sheet and the **three pages of baloney that print out before you get to what you need.**

Reference 3 - 0.65% Coverage

because the lab even if I call **for an add-on – "Can you fax me that paper?" they still want that order.**

Reference 4 - 0.71% Coverage

There's nothing wrong with having these orders printed out and giving them to the patient, but it is a bit redundant.

Reference 5 - 1.71% Coverage

That's what they do in the lab all day long. Patients come in with a piece of paper or electronic orders, either way they sit there and type away the order, with your name as the ordering provider – as a written order. Getting rid of that technology barrier would help them a lot.

<Internals\\Interview Transcripts\\RH SemiStructuredInterview> - § 6 references coded [8.69% Coverage]

Reference 1 - 3.23% Coverage

I will, if I get a bolus at once, I will see the same piece of paper frequently more than once. There are some practices that might fax me something twice or even three times. [subtopic: information overload] If I'm reviewing it all in one setting, I will say – I've seen this before and I will pull it out so it doesn't get scanned. It's not uncommon to get the duplicates – if it comes to me on different days, **I'll say – Did I see this, I don't know, and so then it might also get put in the scan pile. It's a highly inefficient system in that regard.**

Reference 2 - 0.47% Coverage

Sometime [a lab result] does [come electronically] and sometime I get paper also

Reference 3 - 0.56% Coverage

there are certain document types that when they get scanned, they also then come to my InBasket.

Reference 4 - 1.80% Coverage

a discharge summary comes to me from an outside institution, I initial it, it goes to my scanner, it gets scanned in as a discharge summary, but **because it's a discharge summary document type, those come to my InBasket as well, so I'm seeing it a second time in my InBasket.**

Reference 5 - 1.88% Coverage

Well that's sort of like the hundreds of little slips that printed out every day from the urology urinalysis machine that they were told they had to scan in, even though all those results get entered discretely. It's the same machine and finally got the regulatory person to say "No, those don't all need to be scanned in."

Reference 6 - 0.75% Coverage

We've found **a fair amount of Epic documentation that's been re-scanned in by someone, and obviously there's literally no reason.**

Appendix C – Use Cases - Categories and Coded Transcript Segments

Transitions of Care - Paper is used for patient transitions of care to or from a setting outside the current provider's EHR system; paper is used by providers to communicate patient information.

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 3 references coded [3.27% Coverage]

Reference 1 - 2.28% Coverage

So, if you see a new patient transferred from another practice…

A lot of times we still get a chunk of paper – it's a question of which is more miserable, the big chunk of paper or the massive PDF that has to be dissected. Because when you get a big PDF, that's a nuisance because all your labs and your colonoscopies and everything else are all there in a big file [subtopic: information overload] **and you have to break it down into multiple files and link it to everything for it to make sense clinically**. That's a lot of my time actually.

Reference 2 - 0.53% Coverage

I go through a hundred fifty pages [when a new patient's records are sent] and mark which pages I want the staff to separate.

Reference 3 - 0.46% Coverage

When people transfer here it's just a big old [paper] document. [A CCD is] not something we're using clinically.

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 4 references coded [3.50% Coverage]

Reference 1 - 0.76% Coverage

a number of our patients go to see people from different systems, and as a result of that we end up getting EMR generated notes, on paper, over the fax machine with regularity.

Reference 2 - 0.36% Coverage

we were printing out lots of paper to send to consulting physicians who wanted it.

Reference 3 - 1.60% Coverage

I've seldom had anyone come back [from spending the winter in Florida] with a disk, **most of them come back with paper**. Most of them will come back with something similar to what I

send them out with- there is a very nice summary report in our current record that goes through medications, problem list, allergies, things like that, and a couple of office notes.

Reference 4 - 0.78% Coverage

Is that a manual process on the part of your office to do that [transition of care]?

yes, they have to sit down, open the patient's chart, print the report and hand it over

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 2 references coded [2.58% Coverage]

Reference 1 - 1.12% Coverage

People will bring, especially from Florida, if something big happened when they're in Florida during the winter, **they'll bring in those [paper] records, they'll hand carry them back in** and say "I had heart surgery over the winter or I had kidney stones."

Reference 2 - 1.46% Coverage

you mentioned the person coming from Florida, that must happen where someone comes in completely new, **do they bring you stacks of paper, do they bring you discs or nothing?**

All those things. I had a patient the other day who hadn't been seen in twenty years, you just start from scratch, you're just rebuilding at that point

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 3 references coded [3.76% Coverage]

Reference 1 - 2.30% Coverage

We were just talking about the issue of transferring information from the hospital labor and delivery unit to your practice – can you tell me again how that works?

Currently the pediatricians will page us and tell us "We're discharging a kiddo…" so we know generally if we get the call we know what's going on, and **then we get paperwork**, which is generally a face sheet that comes, and a consent that is faxed or mailed over – and then we scan that into Epic.

Reference 2 - 0.62% Coverage

the rest of it is mostly consult reports from outside the system, so that the other big piece of it [the paper we receive].

Reference 3 - 0.84% Coverage

Sometimes they will, and we'll find it most often with our patients from Florida or from away, where **they'll bring in the report from the cardiologist they saw in Florida**

<Internals\\Interview Transcripts\\JM SemiStructuredInterview> - § 2 references coded [1.75% Coverage]

Reference 1 - 1.04% Coverage

if you need more specialized care, either at Mid Coast Hospital or Lewiston or Portland, we would get a report that medical records would intercept and scan into the computer.

Reference 2 - 0.71% Coverage

If they were seen at Midcoast emergency room, they are very good about **faxing us the information within 24 hours or less.**

<Internals\\Interview Transcripts\\JW Semi-structured-interview> - § 1 reference coded [1.15% Coverage]

Reference 1 - 1.15% Coverage

a patient will come with a bunch of medical records that will get scanned in – like if they have old op notes from Florida or something – those will get scanned in.

<Internals\\Interview Transcripts\\LL Semi-structured interview> - § 1 reference coded [0.49% Coverage]

Reference 1 - 0.49% Coverage

trying to do a handoff and I asked "Can you send me a CCD?" and he said **"what is CCD?" – it's not available.**

<Internals\\Interview Transcripts\\NY Semi-structured Interview> - § 3 references coded [1.90% Coverage]

Reference 1 - 0.94% Coverage

another thing where records are obviously going to be on paper is **a patient who is transferring from a PCP from another state or who is not on the system – that's a huge amount of paper that's being dealt with and managed**.

Reference 2 - 0.50% Coverage

This [printed] packet is a new patient packet, it's labs and records from Arizona where the patient had his last PCP.

Reference 3 - 0.46% Coverage

a lot of institutions around us are still using paper, and it doesn't really interface well with the record.

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 1 reference coded [0.83% Coverage]

Reference 1 - 0.83% Coverage

Other paper that comes in… you mentioned child development services?

Yeah the CDS and just other specialty reports and referrals

<Internals\\Interview Transcripts\\RH SemiStructuredInterview> - § 5 references coded [5.48% Coverage]

Reference 1 - 0.94% Coverage

So we end up dealing with a lot of paper floating through our practices with regards to consultation reports and lab studies that are done by outside providers.

Reference 2 - 0.82% Coverage

It's the [printed] radiology studies that are ordered elsewhere or by outside providers. **It's the discharge summaries from outside hospitals,**

Reference 3 - 1.80% Coverage

a discharge summary comes to me from an outside institution, I initial it, it goes to my scanner, it gets scanned in as a discharge summary, but **because it's a discharge summary document type, those come to my InBasket as well, so I'm seeing it a second time in my InBasket.**

Reference 4 - 1.13% Coverage

Obviously there's a lot of [paper] information flying back and forth, and there are a lot of transitions of care documents because they're dealing with a lot of non-Epic providers as well. The

Reference 5 - 0.80% Coverage

within Home Health, a quick analysis could identify how many Maine Medical Center discharge summaries are they scanning in? There's a lot

Form Completion - Paper forms are used as required by an outside healthcare or governmental agency.

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 2 references coded [2.26% Coverage]

Reference 1 - 1.38% Coverage

We use the MaineCare well child form for physicals for kids, I do Coast Guard physicals, I do DOT physicals which now have to be entered into a database, but I think that's done by hand. **Every college kid who comes in here has their own college form that you have to fill out**. Over the next month or so we'll be doing a lot of those.

Reference 2 - 0.88% Coverage

I'm left with a 90% completed MaineCare form, but I'm a half hour late, so I rush off to the next patient, and weeks later that form is on my desk, 90% complete, it just needs a signature, a couple extra lines…

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 1 reference coded [0.40% Coverage]

Reference 1 - 0.40% Coverage

More and more big employers are very sticky about FMLA forms and we do a fair amount of that.

<Internals\\Interview Transcripts\\LE Semi-structured-interview> - § 1 reference coded [0.45% Coverage]

Reference 1 - 0.45% Coverage

There are consent forms for procedures – that's the only other thing [that is printed].

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 2 references coded [0.95% Coverage]

Reference 1 - 0.50% Coverage

Here we have two cancer registry forms, a change of diagnosis form, a VA application – those are all paper forms.

Reference 2 - 0.45% Coverage

I would say yes – **disability forms, insurance forms – those would be the biggest bane of my existence.**

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 1 reference coded [0.30% Coverage]

Reference 1 - 0.30% Coverage

You're always going to have forms and Medicare requirements.

<Internals\\Interview Transcripts\\JM SemiStructuredInterview> - § 2 references coded [1.78% Coverage]

Reference 1 - 1.53% Coverage

These forms are from away, are from companies outside of the building. The only real paperwork we get from patients are work related paper – so M1 forms for worker's compensation, FMLA paperwork or other worker's compensation paperwork that has to be filled out.

Reference 2 - 0.25% Coverage

"No, it has to be filled out on this form."

<Internals\\Interview Transcripts\\LL Semi-structured interview> - § 3 references coded [1.08% Coverage]

Reference 1 - 0.39% Coverage

the forms for school, camp and sports physicals that a multitude flow through every day.

Reference 2 - 0.23% Coverage

physical exam forms that people bring in to fill in.

Reference 3 - 0.46% Coverage

there are a number of colleges that insist you must fill out our form, no other form will be accepted.

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 1 reference coded [0.84% Coverage]

Reference 1 - 0.84% Coverage

Are you seeing a lot of forms that you have to fill out.

I'd say that's probably by far the biggest source of paper that goes out.

<Internals\\Interview Transcripts\\RH SemiStructuredInterview> - § 2 references coded [1.29% Coverage]

Reference 1 - 0.50% Coverage

Gobs of you know – it's the forms, it's the home health forms that have to be signed.

Reference 2 - 0.79% Coverage

are there things that patients bring to your office that you have to deal with on paper?

Yes – well there's the [paper] forms

External Test Results – Paper is used to receive lab, imaging and other results from outside the current provider's EHR system.

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 2 references coded [1.04% Coverage]

Reference 1 - 0.22% Coverage

We get xrays on paper, we get some lab data on paper,

Reference 2 - 0.82% Coverage

Radiology reports – you're only getting those on paper?

They may be coming by fax – fax or paper, but they're coming in as some type of analog document, put it that way, there's no interface.

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 2 references coded [1.27% Coverage]

Reference 1 - 0.52% Coverage

We still don't get cardio-pulmonary testing – so EKGs, stress tests, pulmonary function tests still come over on paper

Reference 2 - 0.76% Coverage

We scan almost all of the paper that comes in, so office notes from other places, lab results from other places, certainly xray results from other places, all get scanned in.

<Internals\\Interview Transcripts\\LE Semi-structured-interview> - § 1 reference coded [0.60% Coverage]

Reference 1 - 0.60% Coverage

Yes, the documents that are scanned are pathology reports, outside imaging, outside clinic notes and outside labs.

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 1 reference coded [0.97% Coverage]

Reference 1 - 0.97% Coverage

the rest of it is mostly consult reports from outside the system, so that the other big piece of it [the paper we receive]. **Radiology reports, pathology that comes**, and then there's miscellaneous.

<Internals\\Interview Transcripts\\JM SemiStructuredInterview> - § 1 reference coded [1.04% Coverage]

Reference 1 - 1.04% Coverage

those places will have wellness fairs and people will bring in their own cholesterol, blood pressure, body mass index, waist circumference, they'll bring all that stuff with them.

<Internals\\Interview Transcripts\\NY Semi-structured Interview> - § 2 references coded [0.82% Coverage]

Reference 1 - 0.54% Coverage

outside notes and consultations and **labs coming from other hospitals** that I need to sign and then scan into the medical record

Reference 2 - 0.28% Coverage

Echocardiograms and things like this still come to me in paper form

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 1 reference coded [0.77% Coverage]

Reference 1 - 0.77% Coverage

Most of the dictated reports are electronic, but some aren't, like cardiology reports, echo-cardiograms and things like that.

<Internals\\Interview Transcripts\\RH SemiStructuredInterview> - § 1 reference coded [0.51% Coverage]

Reference 1 - 0.51% Coverage

It's the [printed] radiology studies that are ordered elsewhere or by outside providers.

Order Entry - Paper is used for some instances of order entry workflow.

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 3 references coded [1.50% Coverage]

Reference 1 - 0.50% Coverage

The lab interface is one way – we don't order through the interface. We put orders in eCW and they get printed or faxed.

Reference 2 - 0.29% Coverage

My medical assistants frequently have to print the lab orders to paper

Reference 3 - 0.71% Coverage

we have **a lot of orders that go to like [the] Pharmacy for equipment, DME, that sort of thing, and some things like syringes, needles**, just don't go well by SureScripts

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 1 reference coded [0.65% Coverage]

Reference 1 - 0.65% Coverage

Orders get printed – because we don't have a bidirectional interface, all orders get printed and it's just more paper for the front desk to deal with.

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 1 reference coded [0.78% Coverage]

Reference 1 - 0.78% Coverage

right now **those [prescriptions] get manually taken off a phone prescription line, entered in, and then a lot of those have to get signed and manually faxed**.

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 3 references coded [2.90% Coverage]

Reference 1 - 0.38% Coverage

There are still some faxed over refill requests from pharmacies

Reference 2 - 1.59% Coverage

The orders are still printing. Does that serve any purpose that you're aware of?

My impression is that they have to have that to get the test done, because the lab even if I call **for an add-on – "Can you fax me that paper?" they still want that order.**

Reference 3 - 0.92% Coverage

Are you currently doing any of that [refill requests] on paper?

We get the paper, but then we put the information in and send it electronically

Patient Education - Paper is used for patient educational or informational purposes.

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 2 references coded [1.13% Coverage]

Reference 1 - 0.73% Coverage

I always give everybody a handout at the end of the visit which lists changes in their meds, consultations, and the labs I ordered. **I find clinically, it's much better that way**

Reference 2 - 0.39% Coverage

I do print handouts, but not that often, may be a few handouts a week, which isn't much really.

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 2 references coded [1.21% Coverage]

Reference 1 - 0.56% Coverage

We go through reams and reams of paper printing after visit summaries, probably a third of which are disposed within 15 minutes.

Reference 2 - 0.65% Coverage

the after visit summary includes patient instructions, which is nice, because we used to print those out separately and now they're part of the summary

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 1 reference coded [0.34% Coverage]

Reference 1 - 0.34% Coverage

We've talked about – I draw a lot of pictures, so I give those to the patient.

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 1 reference coded [0.55% Coverage]

Reference 1 - 0.55% Coverage

The after visit summary [is printed] – we get a lot of feedback from patients that there's a lot of trees there.

<Internals\\Interview Transcripts\\JM SemiStructuredInterview> - § 1 reference coded [0.90% Coverage]

Reference 1 - 0.90% Coverage

So this is paper handouts, because **we're now required for part of our meaningful use and quality improvement is to show that we give patients information**.

Appendix D – Information Chaos - Categories and Coded Transcript Segments

Information Chaos - Paper causes Information over-load, information under-load, information scatter, information conflict or erroneous information.

<Internals\\Interview Transcripts\\BP Semi Structured Interview> - § 3 references coded [7.09% Coverage]

Reference 1 - 2.31% Coverage

We talked a bit earlier about the paper you receive - you're receiving pathology reports on paper – and what else are you receiving on paper from the hospital?

We get xrays on paper, we get some lab data on paper, which is usually almost always a duplicate of lab data we already get by interface. [subtopic: information overload] Any of the dictations, discharge summaries, H&Ps, consults. Some consultations come over on paper from Cancer Care. I think we get Cancer Care progress notes, but not from anybody else because they're different.

Reference 2 - 1.83% Coverage

A lot of times we still get a chunk of paper – it's a question of which is more miserable, the big chunk of paper or the massive PDF that has to be dissected. Because when you get a big PDF, that's a nuisance because all your labs and your colonoscopies and everything else are all there in a big file [subtopic: information overload] **and you have to break it down into multiple files and link it to everything for it to make sense clinically**

Reference 3 - 2.95% Coverage

If there was an electronic equivalent in other words, do you still see some use for paper where it has some value?

It's pretty rare, I'm sure there's an exception, but I can't think of any right now. I'm a bit of an outlier here in that I tend to squawk quite a bit **when the staff put paper on my desk because I'm afraid of it getting lost** [subtopic: information scatter] - my desk looks much worse than this one, and I really keep hammering to the staff, that whatever comes in the office on paper, at least scan it in so that it's in one place in the EMR and it won't get lost, and it can be tracked. Whereas bits of paper on my desk, I worry about them getting lost or just "cubby-holed" for a while.

<Internals\\Interview Transcripts\\DK SemiStructuredInterview> - § 1 reference coded [7.60% Coverage]

Reference 1 - 7.60% Coverage

So paper has changed - as more and more providers have electronic records, rather than getting nice letters saying "I saw your patient, here's what I think…" **we are now getting copies of 4 and 5 page office visit notes that suffer greatly from note bloat that have a lot of garbage**, [subtopic information overload] where actually what I want to see is the last three lines. That's been a dramatic change over the past 5 years. So no longer do we get chatty letters back and forth, now we just get copies of office notes, most of which is garbage.

Are those notes coming from providers on a different EMR?

Yes, those are from providers on a different EMR. We have finally trained everyone who is on the same EMR that they don't have to send me the note, they can just send me a link to the note, and that's finally worked out. Now we're in an area where we're surrounded by hospitals that are not part of the MaineHealth system, so a number of our patients go to see people from different systems, and as a result of that we end up getting EMR generated notes, on paper, over the fax machine with regularity. And like I said, they tend to be a lot longer. We also, for what it's worth, one thing that the EMR has done is that the outlying hospitals now identify me as the PCP, so I get copies of everything. Whereas in the past I would have to call up for chest xray reports or lab results or things like that. Now it's just with the click of a key, it's automatically sent to me anyways. **So on the one hand, I'm getting more information than I used to, on the other hand, the information may not be as useful as when I asked for it myself.** [subtopic: information underload] So we still get at least as much paper, if not more, than before.

<Internals\\Interview Transcripts\\ES Semistructured Interview> - § 1 reference coded [2.98% Coverage]

Reference 1 - 2.98% Coverage

I tend to get duplicates, but at this point **I would rather get duplicates than to not get things**. [subtopic: information overload] For a while we were just not getting anything.

You're getting duplicates because you're getting stuff from Meditech and Epic – is that what it is?

I think that's what they determined.

How are you getting them?

Right now it's by fax – we have a new EMR and so we're working with the technical people. Between Athena and the hospital, we're working on getting discrete data. Once the discrete data starts coming in, then we can abandon the fax. **That's labs, but we're still getting [faxed] duplicates of labs.**

<Internals\\Interview Transcripts\\JL SemiStructuredInterview> - § 3 references coded [11.56% Coverage]

Reference 1 - 6.44% Coverage

What percentage of all the external information that you assimilate during the course of a day – how much of it is on paper, versus a consult note that you see from say, a surgeon within the system?

A quarter is about right. It's a significant chunk of stuff. Most of the Maine Medical Partners stuff is variable, depending on whether that practice has it (Epic) or not.

[Discussion of MMP and Epic]

If that number was 2% instead of 25% would that be a big win for you?

I think so, because one of the other challenges we have is – when it comes right into Epic, I can look at it real quickly, and then I can retrieve it much more quickly, because it's right in … I can use the filters and find it. **When it's written to me there's always that delay. So say I get it today and the patient's coming in tomorrow, it may be in scanning "Limbo", so I'm searching all over the place.** [subtopic: information scatter]

Would you say it's more difficult to find things that are scanned in versus things that are created "natively" within the system?

Yes, the filter capability is better when it's in the system. I can just search by provider; I can search by date, that sort of thing. **It's much harder to do that assuming it's scanned in correctly and it's scanned in quickly.**

Reference 2 - 3.72% Coverage

Do you have a patient history intake form on paper that you have them fill out?

Yes, a new patient – the original one does get scanned.

Have you given any thought to that process – conceivably that could all be done in the computer, but does it save time for your staff and MAs to have the patient fill that out beforehand?

It would probably, if they were doing it [pre-visit history] online, and we could see it before the visit, and know it was done, they we could very quickly see it in Epic – yeah the form is done and go ahead and schedule the visit. Versus **"I don't know, where is it – they said they sent it – we don't have it"**, that sort of thing. [subtopic; information scatter] It would save time looking and hunting.

Reference 3 - 1.39% Coverage

I think less paperwork, because paperwork can always be not attended to urgently. I think that's always been… we learn - **you look at it, it sits on your desk, and you may not realize there's something in there that's important to somebody – you don't get to it because it's paper.**

<Internals\\Interview Transcripts\\JM SemiStructuredInterview> - § 1 reference coded [3.65% Coverage]

Reference 1 - 3.65% Coverage

For example the cardiopulmonary outpatient department is not well connected to the ambulatory departments. So **if I get an echocardiogram as an outpatient or pulmonary function test as an outpatient or even a stress test as an outpatient, the report will get filed [on paper] in the Meditech system, but I won't know about it,** [subtopic: information underload] **I'll have to remember to look.** So we're stuck relying on either a scheduled follow up that the patient has so I will then know to look, or the patient has called – "You know that stress test from three weeks ago – can you tell me if I'm going to live or how I did?"

<Internals\\Interview Transcripts\\JW Semi-structured-interview> - § 2 references coded [5.72% Coverage]

Reference 1 - 2.20% Coverage

they're receiving something electronically and **they're receiving it on paper and so they're acknowledging it twice** [subtopic: information overload]**– and people are very cautious about missing something.** So I think… that's their primary goal is not to miss something, even if it means that they're more inefficient.

Reference 2 - 3.52% Coverage

I do think the outside referral thing should be looked at – because there's a lot of paper there. And I think that for the front desk they're… and **it may be lack of trust again** – but they print out you know every xray that needs to be pre-certified and ordered – it's all done on paper. And I think that's because either they aren't comfortable with the way the work lists are or **they are afraid they are going to lose stuff,** [subtopic: information scatter] **and not do it in a timely fashion**.

<Internals\\Interview Transcripts\\LL Semi-structured interview> - § 1 reference coded [0.66% Coverage]

Reference 1 - 0.66% Coverage

Because that's a genuine patient safety issue. If you have some notes in paper, some notes in the computer, some written orders, some entered orders

<Internals\\Interview Transcripts\\RR SemiStructured Interview> - § 4 references coded [5.88% Coverage]

Reference 1 - 1.39% Coverage

Do you find it a hassle to deal with that becasuse it comes in on paper – would it be ideal if it was all electronic?

I feel like I would be more organized if it was all electronic. [subtopic: information scatter]

Reference 2 - 1.77% Coverage

I know there are papers that I have put my hands on, that I have signed and seen –I have no idea where they go. [subtopic: information scatter] Like in the scan pile, nobody can find it and track it down. I feel like record relocation was a whole smoother when everything was computerized.

Reference 3 - 1.95% Coverage

For me that's a particular concern. Say it's [a] patient who went to see the cardiologist, and I am seeing them in follow up. Maybe the report's sitting on her desk for two weeks and **I don't know where it is and I can't access it.** [subtopic: information scatter] I think for seamless care it was better.

Reference 4 - 0.78% Coverage

the face sheet and the **three pages of baloney that print out before you get to what you need.** [subtopic: information overload]

<Internals\\Interview Transcripts\\RH SemiStructuredInterview> - § 8 references coded [17.86% Coverage]

Reference 1 - 3.74% Coverage

I want to primarily focus on the ambulatory setting – you talked about consults and lab reports, can you think of other paper that you receive in your practice?

Gobs of you know – it's the forms, it's the home health forms that have to be signed. It's the [printed] radiology studies that are ordered elsewhere or by outside providers. **It's the discharge summaries from outside hospitals,** it's the nursing home and rehab facility discharge papers. Having been away now for a week and a half, **there's going to be a two inch stack of paper waiting for me in the office today.** [subtopic: information overload] That's pretty common.

Reference 2 - 3.22% Coverage

I will, if I get a bolus at once, I will see the same piece of paper frequently more than once. There are some practices that might fax me something twice or even three times. [subtopic: information overload] If I'm reviewing it all in one setting, I will say – I've seen this before and I

will pull it out so it doesn't get scanned. It's not uncommon to get the duplicates – if it comes to me on different days, **I'll say – Did I see this, I don't know, and so then it might also get put in the scan pile. It's a highly inefficient system in that regard.**

Reference 3 - 1.22% Coverage

Everything that comes from within Maine Medical Center or the NorDx lab is going to come to you electronically?

That is true, but it doesn't mean that I don't also – I might not also get it on paper.

Reference 4 - 1.34% Coverage

I'm not always quite certain – similarly with some radiology reports, **it'll come to my InBasket, I'll be cc'd as the primary care doctor and I'll see the paper in my stack sometimes. I haven't been able to figure out why that is.**

Reference 5 - 1.80% Coverage

a discharge summary comes to me from an outside institution, I initial it, it goes to my scanner, it gets scanned in as a discharge summary, but **because it's a discharge summary document type, those come to my InBasket as well, so I'm seeing it a second time in my InBasket.** [subtopic: information overload]

Reference 6 - 2.63% Coverage

our new providers in particular have stacks and stacks of old records from outside practices. **A lot of those are print outs from outside EMRs.** And I think **one of their onerous tasks is they go through those stacks, and cull out the core useful stuff** [subtopic: information scatter] ie the med list, the problem list, the immunization list, maybe last physical, last few office notes, any pertinent consultation notes, last colonoscopy, last mammogram.

Reference 7 - 3.15% Coverage

For practices like ours, where most of our consults are from outside Epic, it's a major deal. And **to have the volume of paper that's floating around the office, it's not good**. When we were on Centricity, basically that piece of paper went for scanning same day, so it showed up in our InBasket quickly, and then it was available to everybody, even before I signed it, if it was needed. You know, there's that scramble – **"Oh, I know I saw it somewhere two days ago, where is it?"** [subtopic: information scatter] if it hasn't been scanned yet.

Reference 8 - 0.75% Coverage

We've found **a fair amount of Epic documentation that's been re-scanned in by someone, and obviously there's literally no reason.**