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Does the Electronic Health Record Improve the Timeliness Review and Notification of Medical Laboratory and X-ray Test Results?

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Abstract

The medical community struggles with timeliness issues throughout the different

healthcare environments in many areas of patient care. The demands of meeting patient

care needs is great everywhere. One area that can lead to extreme adverse outcomes and

affects patient safety is failure to review and follow-up on medical test results timely.   In

addition the lack of timely follow-up and treatment can lead to medico-legal implications

for all healthcare professionals involved in the patients care. Some timeliness issues have

been attributed to understaffed healthcare institutions, lack of trained staff, and in many

instances inefficient and insufficient processes. This is an important issue to improve and

is very complex in nature.   This study will examine the timeliness review of diagnostic

test results and if the electronic health record has improved the process. Procedures will

be reviewed and any adjustments will be made depending on the outcome of the analysis.

Table of Contents

Introduction

Hospitals, outpatient clinics, occupational health centers, skilled nursing facilities,

etc. should all be concerned with the importance of timely review of test results. Every

medical institution should ensure that their organization process reviews, documents and

communicates test results in a timely manner. Failure to follow-up timely on even one

result can have serious consequences to the patient, provider and institution. Callen,

Westbrook, Georgiou, and Li (2011) identified this as a major problem in ambulatory

settings and called it a critical safety issue. The impact of not following up timely leads

to missed and delayed diagnosis that affects the health of the patient. When a diagnosis

is delayed or even missed the patient does not get the care necessary at that time. With

this in mind it not only impacts the patient but can have medico-legal consequences on

health care professionals and the institution they work for. To effectively manage test

results the providers must review, document, and communicate with the patient in a

timely manner. Whatever help is necessary to get the results in the providers hands and

then verification that follow-up has happened must be made a priority. This process

affects everyone involved in the patients care not just the provider.

Chen, Eder, Elder, Hickner (2010) did a review of 11 outpatient clinics looking at

the follow-up of abnormal test results that included 105 pap smears, 82 mammograms, 61

INRs and 96 PSAs. Through a chart audit review they discovered the biggest failure was

in documenting that any follow-up care happened in 34% of the abnormal results. Even

more astounding with that same group is that 49% of the patients that did receive care did

not receive it timely. Delay in treatment can be as devastating as not receiving any care

in some diagnosis. These are pretty scary figures and are not out of the norm.

The testing process has many layers within an organization. These multiple layers have to communicate well. This includes the clinicians, patients, office staff, laboratory staff and radiology staff. Each group involved has complex steps that can breakdown anywhere along the way of managing the test result process. The system is fragmented and challenging and needs to be fixed. First, it needs to be recognized as an issue among clinicians, staff and the institutions. There isn't one person that can control all the variables in the process. Development of good policies and procedures will be vital to having an effective system for managing test results. Outlining expectations for each group involved in processing test results will help to decrease any failures along the way.

The Agency for Healthcare Research and Quality developed a patient fact sheet titled "20 tips to help prevent medical errors" which included item 19 that basically states the patient should ask how and when they will receive results. Further stating that you should never assume that "no news is good news". This is a fact that many patients take for granted that if they don't hear anything from their provider that the test result must be normal. Everyone must remember that delays are common and that the patient may need to be more active in their own care. All results whether normal or abnormal should be communicated to the patient. Patients can help bridge the gap and encourage communications.

The Joint Commission in their hospital accreditation program set a national patient safety goal in January 2015 that included a goal to improve communications among caregivers directly addressing the reporting of tests on a timely basis. Texas Medical Liability Trust (2009) wrote an article "10 things that get physicians sued" and

item 5 was failure to order and follow up on indicated tests or delay in ordering such tests. Delays and failure to follow-up timely affect patients, families and caregivers.

Failure to follow-up and delays in communication regarding test results is one of the more problematic safety issues in healthcare. Will or can the implementation of an electronic health record (EHR) improve this process? Some institutions may be relying on the EHR but need to be sure to take an in-depth look at the process and follow it through to the end. The most important goal is to improve and positively impact patient safety. Every institution and health care organization needs to seriously look at how they review, document and communicate testing results both normal and abnormal to the patient. Timeliness is the key and ultimately providing quality follow-up care if necessary quickly. The EHR should be beneficial and helpful in meeting the needs of patient safety by systematically pushing and alerting clinicians of test results needing review and follow-up, but is only one step of the process.

Purpose of Study

The objective of this study is to determine if the use of an electronic health record has or can improve the timeliness of processing medical test results.

Limitations

This study was limited to the paper and electronic medical records at one occupational health clinic located in California. The review was focused on x-ray and laboratory results of employees that participated in physical examinations for Asbestos, Beryllium and Lead during the timeframe September 2013 to July 2016.

MY STRENGHTS IN THIS RESEARCH	MY WEAKNESSES IN THIS RESEARCH
- HIM and clinical knowledge - Access to paper and electronic records within my own organization that can be used for review - There are plenty of articles available on this subject to review and use for examples	- Lack of a well-defined project---- maybe it's too broad of a subject - Inability to access medical records outside of my own organization - Limits on time to research, review and write

Literature Review

The literature review consisted of five published papers reporting on their research of timely review and follow-up of laboratory or x-ray results. A number of the articles address the use of an electronic health record and the alert systems that are in place. The literature review was conducted by accessing various electronic medical journals and resource databases PubMed, CINAHL, and ClinicalKey. Keywords used were timely, follow-up, failure, abnormal, test, results, medical, laboratory and radiology. Articles were chosen based on free full text availability, outpatient based, published from 2008-2015, and included an audit or a survey as their sampling method.

Each literature review uncovered similar results although, each may have been looking at different types of medical tests or used different sample or survey methods the end result showed issues with the timely review and notification of test results.

Article one focused on how recommendations were communicated or written on an imaging report can effect a response or lack of response from the clinician.

Researchers reviewed 250 radiology reports that were flagged as abnormal imaging alerts

in an EHR as their method. Even though the reports were flagged as abnormal the

clinician ignored the alert in 92 cases. They discovered when a radiology report

recommended further imaging versus using a narrative with an expression of doubt

(unable to exclude, or possibly, unlikely etc.) these were the ones that were susceptible to

lack of timely follow-up. Timely follow-up for this research was defined as patient

notification, a follow-up test or consultation, documentation addressing the results in the

medical record, additional testing or treatments recommendation within 4 weeks of the

study. Other comments of importance from this study were verbal communications result

in a timely follow-up when compared with electronic communications; there is

information overload associated with the electronic record leading to clinicians missing

test results.

The second research group on the chart below used an anonymous survey method

to sample physicians in an academic medical center to understand what their perceptions

were regarding lack of timely follow-up of abnormal tests. Their response was that they

perceive there is a lack of timely follow up and that there are times that patients are

harmed as a result. They recommend an automated reminder system be put into place to

help remind the clinician to check the test results. The clinicians also thought it wasn't

always clear who was responsible for follow-up; was it the ordering clinician or the

primary care physician. This literature was interesting but unimpressive because it was

solely based on clinician perception of what was happening not documented proof.

The most impressive research was article three on the chart below. The

researchers studied imaging alert notifications in an outpatient setting of a Veterans

Affairs (VA) facility. This VA facility used a well-integrated electronic health record with automated notifications alerting clinicians of results. The researchers hoped that the alert notifications would reduce issues regarding timely follow-up and notification of abnormal results. After review of 1196 abnormal imaging reports with multiple alerts and verbal communications with clinicians the researchers found 92 results did not have timely follow-up.

Research article four was also looking at a VA outpatient facility. They conducted a focus group approach to understand the barriers and possible changes that may help develop a more effective management of test results product. Prior to conducting the focus group they examined 2500 alerts of abnormal test results. They discovered that 18.1% of abnormal imaging results and 10.2% of abnormal laboratory results were not acknowledged. The results of the focus group determined that there are still challenges with a state of the art EHR that has electronic communications and alerts. There are organizational, personnel and workflow factors as well as improvements needed to technology to improve this problem.

In the last article the researcher used multiple methods that included observations, interviews, surveys and chart audits to assess eight family practice offices. This group concluded that the documentation of abnormal results with a follow-up plan was done more often in the EHR (64%) than in a paper record (40%). Although, there is greater documentation in the EHR than in paper they still fell short of documenting and following up with patients regarding abnormal results.

Table 1: Article Comparison			
Author(s), Title, Year	**Purpose**	**Survey Method**	**Results**
1. **Al-Mutairi, Meyer, Chang, Singh**, *Lack of Timely Follow-up of Abnormal Imaging Results and Radiologists' Recommendations,* 2015	Timely follow-up of abnormal imaging results. Do different types of communication influence follow-up on findings?	• Retrospective review of radiology reports. • Used chi-square analyses and IBM SPSS Statistics 21 Software.	• 250 patient reports with recommendations for further imaging needs were reviewed. • 92 were lacking documentation of timely follow-up within 4 weeks. (37%)
2. **Moore, Saigh, Trikha, Lin**, *Timely Follow-Up of Abnormal Outpatient Test Results: Perceived Barriers……*2008	To assess physician perceptions regarding delays in the follow-up of test results and the consequences of the delay	• Anonymous survey of physicians. Questionnaire was multiple choice • Responses were calculated using statistical analyses using Stata version 9.2	• Response rate to the survey was 66%. • Of the 66 % that responded 80% stated that a few times per year they have seen abnormal results that did not have timely follow-up.
3. **Arora, Espadas, Khan, Mani, Petersen, Singh, Sittig, Thomas**, *Timely Follow-up of Abnormal Diagnostic Imaging Test Results in and Outpatient Setting: Are EMR's Achieving Their Potential?* 2009	Timely follow-up of abnormal test results is a challenge. Group hypothesized that an EMR could facilitate notification thereby, eliminating the problem.	• Used tracking software to determine if electronic alert was acknowledged by provider. • Then a review of records and contact to providers was used to determine if timely follow-up actions were taken.	• 1196 studies generated alerts to provider. • 217 (18.1%) were not acknowledged and in 131 (11%) had no evidence of follow-up action. • A call was placed by investigators to the clinician asking if it was their intention to not follow-up on 111 of the 131 cases • After 4 weeks there were still 92 alerts that lacked timely follow-up.

4. **Esquivel, Hysong, Sawhney, Singh, Singh, Sittig, Wilson**, *Understanding the Management of Electronic Test Result Notifications in the Outpatient Setting,* 2011	To understand barriers, facilitators, and potential interventions for safe and effective management of abnormal test results via electronic alerts.	• Qualitative study • 6-8 member focus groups (n=44) • Group consisted of primary care providers, diagnostic services and information technology • Thematic analysis used	• Users receive large number of alerts unrelated to abnormal test results • Some users not proficient with EHR use.
5. **Elder, Flach, Gallimore, McEwen, Pallerla**, *The Management of Test Results in Primary Care: Does and EMR Make a Difference?* 2010	Does the use of an electronic medical record make a difference in the management of test results in primary care?	• Observations • Interviews • Chart Audits • Chi-squared analyses using SPSS v17 was used	• 461 test results analyzed • 274 were managed by an EHR and 80% has documentation of patient notification. 64% follow-up documented • 187 were managed by paper and 66% had documentation of patient notification. 40% documented follow-up.

Based on the literature reviewed, personal experience, and other non-research based articles, healthcare has a serious widespread issue with the timely review, documentation and notification of test results.   The implementation of an EHR is helpful in getting the information to the clinician but there is still the human factor that has to act upon the information received. We can't solely rely on the use of technology and clinicians alone to work through this issue. There has to be a multidisciplinary approach working with clinicians, office staff, laboratory and radiology personnel with the integration of technology to develop a workflow process to make a positive impact on

this patient safety issue.   A recommendation from one of the research groups was to

encourage patients to call and inquire about results.   Patients can't sit back thinking that

since they haven't heard anything that it means everything is good. Every medical

organization needs to review their workflow practices and identify tools and key

personnel that can track all of their results normal and abnormal to completion. This is

key to good patient care, patient satisfaction and patient safety.

Methodology

A retrospective review of paper medical records and the electronic health record

were reviewed for clinician review, documentation and follow-up notification to patient

of x-ray and laboratory test results. Twenty-five paper medical records were reviewed

from the years 2013-2014 and twenty-five electronic health records were reviewed from

2015-2016. The type of records reviewed were occupational medicine physical

examinations from the employees working at a federal funded site during the timeframes

of 2013 through 2016. The type of physical examinations were of employees that have

been exposed to asbestos, beryllium and lead in the workplace. The employees know

about the exposures and are trained in the proper use of personal protective equipment

(PPE) and are expected to use it when working in these environments. The employer is

not purposely exposing employees but it's the nature of the job. Medical surveillance is

another way the employer is able to protect the employee by monitoring their physical

health. Just like PPE is used to protect the employee so does medical surveillance.

Although, medical surveillance is a great way to monitor an individual's health and

exposures the employee has the right to decline all testing and the examination. The

employer is required to offer the employee the testing and exam but again the employee

can chose not to have any of it or may choose to accept certain portions of the encounter.

Some employees are very suspicious of the employer and fear that they might lose their

job if something is discovered during the exam. Of course this is not the case and the

healthcare organization does their best to try and explain but in many instances is not

successful in changing the employees mind.

These specific examination types were chosen because the components or services

associated with that type of exam include a chest x-ray and multiple types of laboratory

testing as part of the patient's physical examination. The chest x-ray is a standard service

associated with beryllium and asbestos exposure and is offered to help detect any

problems before someone has actual symptoms. There is standard laboratory testing that

is done, CBC, Chem 12 but in addition for beryllium examinations a Lymphocyte

Proliferation Test (LPT) is provided. A LPT is done to see if a patient has developed a

sensitivity to beryllium. Employees working in a beryllium area need to be sure they are

wearing the correct personal protective equipment (PPE). If their LPT is non-normal it is

basically telling them they have a sensitivity to it and in the future could develop a long

term problem with their lungs if they continue to work unprotected in that environment.

Just as the beryllium program has some special testing so does the lead and asbestos

programs. All of these tests help the employer monitor an employee's health when the

employee works in hazardous areas.   All of this is done to affect patient (employee)

safety.

A standardized data collection tool was developed using excel to record the presence

or absence of specified data, date the test was taken, date the test results were received,

and the date the test results were provided to the employee. The importance of getting the

results back to the patient timely is extremely important due to the importance of the

monitoring program and the employees working environment. The data collection

instrument below was used to collect the data.

The components collected were:

- Record ID

- Type of test either imaging or a lab

- Date of test

- Was it in paper format or EHR

- Date results received

- Date results were provided to a clinician

- Date results reviewed

- Date patient informed

The data collection tool was collated and the results were analyzed using excel. All

findings were documented. All personal health information was removed from the final

document to protect patient confidentiality. Current procedures were also reviewed for

clarity of expectations. Conclusions and recommendations for future changes will be

made based on the findings. The research question is "Does the electronic health record

improve the timeliness of review, documentation and notification of medical test

results?"

Date	Activity
Week 1 & 2	Get project approved
Week 3 & 4	Develop data collection tool, test tool
Week 5 & 7	Review 25 paper medical records and 25 electronic health records using data collection tool
Week 8	Analyze data using excel
Week 9 & 10	Write up results and conclusions of study

Timely review, documentation and follow-up of medical test results is a common

safety problem. There are many breakdowns in the communication of test results

especially in the paper world. With the increasing utilization of the electronic health

record there should be a workflow process that can be developed using technology and a

multidisciplinary approach that can have a positive impact on this patient safety issue.

The importance of this study and as others discussed in the literature review we should be

able to improve this highly visible and comprehensive patient care issue. The results of

this study will help this occupational health clinic improve their notification of test results

process and ultimately improve patient safety and to safely monitor their employees'

health successfully. In this study the use of the words employee and patient are one of

the same.

The data was collected using a report of employees/patients that were participants

in the beryllium, lead or asbestos programs during the timeframe of 9/2013-7/2016. Each

of the programs have a roster of employees that belong in that program. In this roster of

programs each employee is assigned an anniversary date for their next examination. If

the employee is supposed to be monitored annually their anniversary date reflects this

timeframe. With the Lead program employees have blood tests every 6 months to

monitor their lead levels.   This allows the employer to make sure the employees are

monitored timely and action is taken quickly if the clinician sees a problem.   A random

selection from the report was made of 25 records during the time 9/2013-12/2014 that

represented the paper record process and another 25 records were selected from the time

1/2015-7/2016 that represented the electronic record process. The fields that were

collected from the record were; record number, test type (I=imaging, L=lab), type of

record (P=paper, E=EHR), test date, received date, date result provided to clinician, date

clinician reviewed results, and the date the employee/patient was notified of their test

result.

For this project the research question is regarding timeliness. What is timely

review of a test result? Is it 2, 5 or 30 days? In most of the literature reviews researchers

determined timely follow-up as 30 days. Although, each organization has the opportunity

to determine what is appropriate for their facility there needs to be an expectation that has

been put into policy.   JCAHO state a record should be complete in 30 or less days but

Medicare has a 14 day window. In this particular occupational health environment they

have a regulation from Department of Energy (DOE) that requires that the LPT results

notification to the employee be provided within 10 working days of receipt of that result.

Timely follow-up for this study is defined as documentation of notification to patient

within 10 days of receipt of the test result in the department. Although, DOE requires 10

working days, for this study we used 10 calendar days.

Results and Discussion

All 25 paper records and all 25 electronic records selected were found to have the

test results for review. Each test was present, reviewed and documented by the clinician,

and the patient was notified.

Paper Record Results

The paper record review resulted in 16 of the 25 tests reviewed had notification to

the patient within 10 days of receiving the results. A compliance rate of 64%. Of the 9

paper records that were over the 10 day notification 6 were 16 days or less before the

patient was notified and the last 3 ranged from 42-82 days before notification went to the

patient. The last 3 results that were way beyond being considered timely were regular

laboratory results CBC, Chem 12 etc. Per the departments process in the average exam

process is staged requiring two visits. The first visit consists of any laboratory testing

and medical testing (e.g. ekg, spiro, vitals, audiogram) that is part of the medical

surveillance program. The second visit is the physical examination with the provider.

This part of the exam is scheduled 5 to 10 days later in an effort to have all test results

present for the provider to review with the patient.   After research it was discovered that

the 3 results that were considered delayed was due to patients that had cancelled and/or

missed their appointments multiple times, therefore exceeding the 10 day process.

Fig. 1. Paper Record Results

Test Type (I=Imaging, L=Lab)	# of Days Between Test Taken & Test Received	# of Days From Receipt to Provider Documentation	# of Days From Receipt to Patient Notification
L	1	0	0
L	1	1	1
L	18	0	1
L	25	2	3
I	4	2	3
I	4	3	4
L	20	2	4
I	9	4	4
I	8	6	6
I	15	5	6
L	20	6	6
L	23	6	7
L	1	7	7
L	23	7	8
I	4	6	9
I	4	5	10
L	15	8	11
L	16	8	11
I	3	11	12
L	15	7	12
L	1	14	14
I	3	16	16
L	1	42	42
L	1	54	54
L	1	82	82

EHR Results

The EHR review resulted in 24 of the 25 tests reviewed the patient was notified within 10 days of receiving the results. The EHR had a compliance rate of 96%. There was 1 instance that the test results took 26 days before the patient received notification. This was a laboratory CBC and Chem 12 result and the patients physical examination appointment was scheduled too far out to meet the 10 day notification requirement, therefore causing the delay.

Fig 2. EHR Results

Test Type (I=Imaging, L=Lab)	# of Days Between Test Taken & Test Received	# of Days From Receipt to Provider Documentation	# of Days From Receipt & Patient Notification
I	1	0	0
I	3	0	0
I	1	1	1
L	14	1	1
L	15	1	1
L	20	1	1
L	21	1	1
I	5	2	2
L	6	2	2
L	14	2	2
L	19	2	2
L	3	3	3
I	7	3	3
L	19	0	3
L	19	3	3
L	2	4	4
L	19	4	4

I	2	5	5
L	3	5	5
I	1	6	6
I	1	6	6
I	5	6	6
I	4	1	8
L	13	10	10
L	2	26	26

In the majority of the medical testing at this clinic is performed on well adult physical examinations. There is some urgent care medical treatment where x-rays to assess fractures are performed. While there is little risk of placing patients in immediate danger with this patient population and scope of practice, it is important that there be timely review and communication of testing results. While the use of the EHR seems to allow for greater timeliness there is still at least 1 outstanding test out of the 25 reviewed. In both the EHR and paper chart the issue that stands out is when a patient's physical examination appointment is further out due to patient request or other circumstance. This is an area the clinic will need to address and work with staff to develop a process that ensures timely review and communication of testing results.

Fig. 3 Average number of days to notification
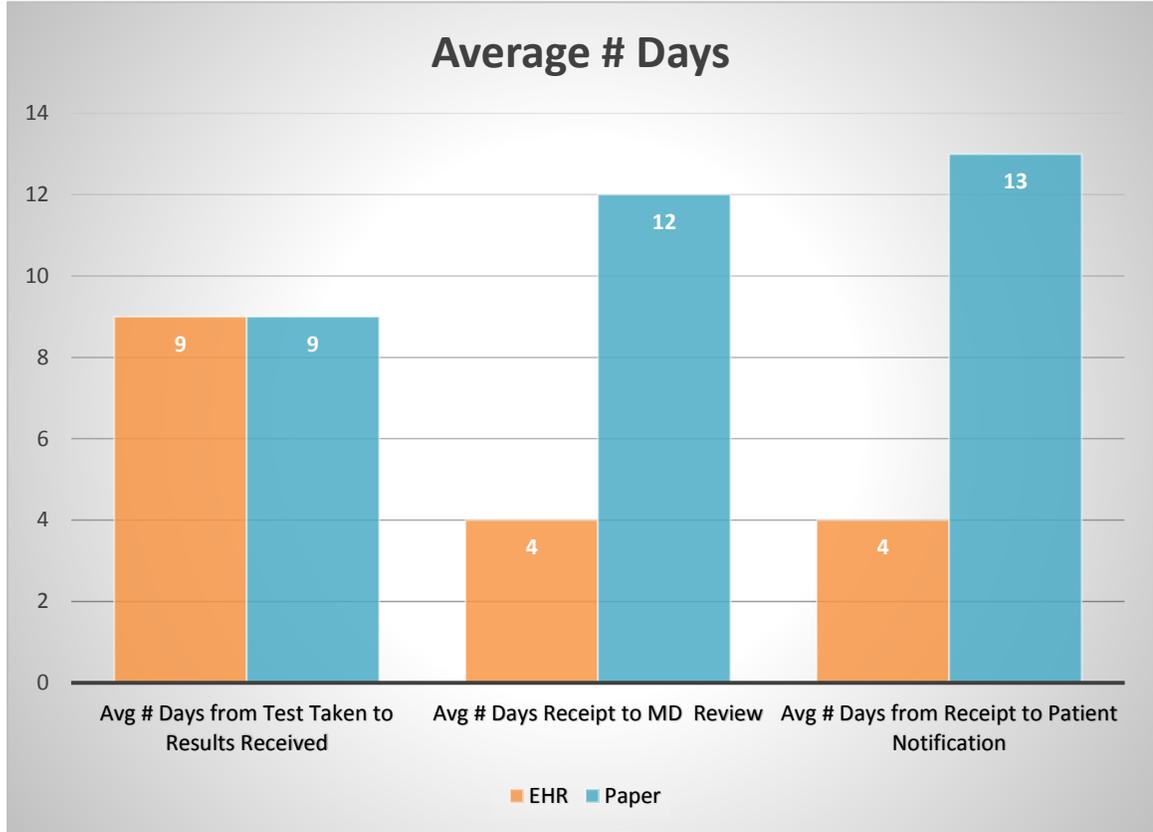
Staff Discussions

      Discussions were held with the HIM and Clinical staff to discuss the positives and

negatives working with an EHR versus the paper record. HIM staff communicated

feeling vulnerable with the EHR. They couldn't explain why they felt this way but were

concerned they were missing something. They felt it was harder to track the record to

completion whereas tracking the paper record seemed simpler. Many of the HIM staff

communicated concern regarding their jobs because they heard that with the

implementation of an EHR staffing could be reduced.

The Clinical staff found it difficult to find history in the EHR and felt it was much simpler to pick up a paper record and thumb through the pages. They did express that it was great to always be able to access the record.

Conclusion and Recommendations

Timely review, documentation and notification to a patient regarding medical test results is an important process in any healthcare environment. Failure to review test results and follow-up with the patient can negatively impact the quality of patient care. In some instances it can and has led to adverse outcomes. Failure to review and follow-up with a treatment plan not only impacts the patient's safety but may lead medico-legal implications for the healthcare professional.   In this particular organization the risks may be lower because testing is of a healthy population but it still can be a safety issue that affects the patients' health due to the exposure risks of their workplace. Timeliness can help to reduce the risk of further exposure if someone is found to be sensitive to workplace exposures. Reminding the patient's about the importance of using the right PPE will further reduce their risk.

The research question in this study was "Does the Electronic Health Record Improve the Timeliness of Review and Notification of Medical Laboratory and X-ray Test Results?"

The retrospective chart review in this occupational health facility provided enough data to demonstrate that the EHR has improved the timely review and notification of test results. Although the results indicate that using the EHR this clinic has achieved a 96% compliance in meeting their 10 day turnaround there still remains an area that needs

improvement. The paper record results indicated a 64% compliance meeting the 10 day

requirement and has the same issue regarding delays as the EHR. The delay is something

this clinic needs to address going forward because it will continue to happen if they don't

implement a process or procedure to improve it.

There are multiple steps and multiple people involved in the management of test

results. This is an extremely important function to get right. The impacts can be

catastrophic if not managed well. The steps for this clinic are the patient has their blood

drawn or x-ray taken in house, the test is sent to an off-site laboratory for blood work and

to an off-site radiologist for x-ray readings. The test results come back by either fax,

snail mail, email or through an interface to the electronic health record. The HIM group

is the first to be notified results are available. HIM scans the results to the EHR and

depending on the patient's appointment will either task the provider to review or wait

until the patient's physical examination. The wait is the problem! This is the established

process for a patient that is going to be coming in for a physical examination. Sometimes

the exam is scheduled more than 10 days out or in many cases the patient may cancel or

miss their appointment. Since this is the patient's place of employment they tend to put

their work first and may cancel because of a meeting or other work priority. This

becomes the turning point to determine who and how the test results are tracked. A

simple fix could be at the time the HIM group is scanning the results to the record to then

look and see when the scheduled exam is and if it's further than 10 days task the provider

to review. If a patient cancels, the scheduler can look to see if the patient has pending

test results and task the provider to review.

This study is significant to this occupational health facility as well as other primary care or urgent care type of facilities. Depending on HIM's role in other clinics they can be a key to managing test results successfully. In this facility HIM is actively involved in both the front end and back end of the office environment. They are schedulers, receptionists, coders, and provide chart analysis.

The literature reviews establish this problem is shared by many. As with any problem if everyone works to improve it there can be improvement. This is an important problem that affects patient safety and needs to be addressed. An initiative should be established to clarify roles and responsibilities between HIM staff and clinicians. A process and or procedure should be written to outline the process to appropriately meet required timeliness of test result reporting. A follow-up review of electronic health record results is recommended after implementing a revised process. A multi-disciplinary approach is imperative to creating a successful process that ensures test results are received, reviewed, documented and patient notification is done timely. The electronic health record is one more piece of the approach to make timely notification successful.

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