Walden University
ScholarWorks

Walden Dissertations and Doctoral Studies

Walden Dissertations and Doctoral Studies Collection

2020

Impact of Integrated Laboratory Data Transfer Portals on Patient Results and Reports

Charmane Latrece Richie
Walden University

Follow this and additional works at: https://scholarworks.waldenu.edu/dissertations

 Part of the Health and Medical Administration Commons

This Dissertation is brought to you for free and open access by the Walden Dissertations and Doctoral Studies Collection at ScholarWorks. It has been accepted for inclusion in Walden Dissertations and Doctoral Studies by an authorized administrator of ScholarWorks. For more information, please contact ScholarWorks@waldenu.edu.

Walden University

College of Health Professions

This is to certify that the doctoral study by

Charmane Richie

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Rabeh Hijazi, Committee Chairperson, Health Sciences Faculty
Dr. Matt Frederiksen-England, Committee Member, Health Sciences Faculty
Dr. Suzanne Richins, University Reviewer, Health Sciences Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2020

Abstract

Impact of Integrated Laboratory Data Transfer Portals on Patient Results and Reports

by

Charmane Latrece Richie

MBA, Western Governors University, 2015

BS, Arkansas State University, 2010

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

Walden University

December 2020

Abstract

An operational problem exists in which some healthcare organizations cannot maintain a suitable supporting data transfer system, which impacts the integrated laboratory data transfer portals designed to receive and send secure patient laboratory results and reports. This quantitative study examined whether an association exists between patient reporting turnaround times and specific test code nomenclatures used when comparing an older referral laboratory interface (RLI) laboratory information system (LIS) to the newer electronic orders and resulting (EOR) system using the Covance expanded laboratory management services (ELMS) NexGEN database from 2016-2020. The Donabedian model served as the framework for this study. The sampling population for the study consisted of 3 different intercompany referral labs that converted from the RLI model to the EOR model to transfer the patient's laboratory results from system to system. Multiple linear regression was used to address the association between each referral lab to determine if the lab met the established turnaround time. Unique test codes were created for the EOR and the RLI systems, and these test codes helped track the number of successful and unsuccessful data transmissions. The results showed that out of the 3 selected labs, 2 showed an improvement in the resulting time needed to transfer the patient data from system to system. The results of this study contribute to positive social change by providing information on minimizing human error due to automation and linking LISs to preserve the quality of data and patient care being provided. Linking LISs can help ensures the delivery of quality results and improves the patient treatment outcomes.

Impact of Integrated Laboratory Data Transfer Portals on Patient Results and Reports

by

Charmane Latrece Richie

MBA, Western Governors University, 2015

BS, Arkansas State University, 2010

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Healthcare Administration

Walden University

December 2020

Dedication

In loving memory of my parents, Frederick (Keith) and Janice Marie Williams-Richie, and my grandmother Hattie Mae Williams, and last but not least, my dearest Aunties Claudette Richie and Patricia Britton. I want to dedicate my dissertation work to my family and closest friends. To my darling sisters, Tina, Ebony, and Carla, and my dearest cousins, Jermaine, Cherronda, Tewanna, and Donald, who continued to support me throughout this entire process. I will always appreciate the love and motivational pep talks provided. To my grandfather, Dr. (Bishop) Johnny Williams, and my uncles, Jerry, Larrie, Howard, and Perry: may your encouraging words continue to guide and lead me through my gloomiest days. I dedicate this work and give special thanks to my significant other Johnny and my loving son Jamaal for being there for me throughout the entire doctorate program. All of you have been my biggest cheerleaders who I love dearly.

Acknowledgments

To the almighty God and the lord, my savior Jesus Christ: I could do nothing without you guiding and leading me in this life and the next.

To my fellow classmates, thanks again for sharing your bright ideas and knowledge throughout the years.

To my instructors Dr. Hijazi and Dr. Frederiksen-England, I truly appreciate the guidance and moral support throughout the capstone phase. Without your detailed feedback, I would not have completed this task, so I will forever and always be grateful.

Last but not least, to my uncle and auntie (Rev. Carl and Helen Williams) who I will always remember as my second set of parents, who I love dearly since they were there for me and my siblings in our mother's final days.

Table of Contents

List of Tables

List of Figures

Section 1: Foundation of the Study and Literature Review

Introduction

Digital healthcare is on the rise, and technology is continually evolving within healthcare organizations. Digital technology is used to deliver patient laboratory results to attending providers, so healthcare administrators help implement upgraded laboratory information systems (LISs). Data system upgrades provide healthcare providers the means to manage patient laboratory results when using secure servers (Baehl et al., 2016). Experts believe technology advancements are one of the keys to improving human error rates because automation and linking LIS systems helps to preserve the quality of care provided to the patients by ensuring the delivery of quality data (Wu et al., 2017). Healthcare providers must continue to find secure ways to deliver patient laboratory results if the providers want to continue to see a rise in the quality of patient care because the yielded results play a vital role in diagnosis. Technology advancements continue to aid in healthcare laboratory reform because the data captured are used to treat and diagnose clinical patients (Freeman et al., 2014). This section includes the problem statement, along with additional indications to support the study's overall literature review that are aligned with the study's purpose, the hypotheses, and the study's research questions.

Problem Statement

An operational problem exists in which healthcare organizations are unable to maintain a suitable supporting data transfer system, which impacts the integrated laboratory data transfer portals designed to receive and send secure patient laboratory

results and reports (Baehl et al., 2016; Covance, 2017; Gegg, 2017). Patient results are attached to specific assay tests conducted by each referral lab, and these assay tests have established turnaround times (TATs) to report the patient results. These data portals create operational laboratory interface issues because patient laboratory results are not adequately crossing over with the older integrated database system (Baehl et al., 2016; Covance, 2017; Gegg, 2017). According to Covance (2017), data transfer and quality errors have been observed since 2016 through 2020 from the older supporting LIS known as the referral laboratory interface (RLI) system. The RLI system adversely affects patient TATs for assay test delivery services offered to the organization's external clients. Additionally, RLI data transfer gaps have contributed to delays in reporting patient laboratory results per the assay tests established TAT (McClain, 2016). These delays impacted providers' ability to effectively treat and diagnose patients enrolled in the organization's clinical trial studies (McClain, 2016), which is one of many reasons healthcare administrators are continuously tasked with implementing upgraded systems.

Mourtzikou and Stamouli (2017) emphasized the need to reproduce accurate, pertinent, and consistent results provided by the clinical laboratories. Laboratory TAT depends on an integrated laboratory information system's ability to receive accurate and reproducible patient laboratory results, and this is captured by using the specific test codes designed to measure each assay test's established TAT (Gegg, 2017). Prior studies have not involved researchers comparing an association between lab reporting times and test code nomenclatures among the older RLI system and the newer electronic orders and resulting (EOR) system. EOR consists of a newly integrated supporting LIS system that

has distinct test codes to differentiate between this system and the older RLI system. EOR was introduced to close the data transfer gaps identified within the RLI system (Baehl et al., 2016). Researchers have found support for the existence of a gap in supports and the need to explore the association of patient results being reported within the testing labs established assay test TAT, essentially, when evaluating the TAT for the test codes provided by the integrated LISs (Baehl et al. 2016; Petrides et al., 2017; Yaroslavtsev & Matukhina, 2019).

Purpose

The purpose of this quantitative study was to determine if an association exists between patient reporting TATs and the specific test code nomenclatures used when comparing the older RLI LIS to the newer EOR system by using the Covance's (2020) expanded laboratory management services (ELMS) NexGEN database for 2016–2020. Each supporting LIS has a specific test code classifications design, and the EOR group uses the electronic direct ship (ED) and the electronic referral (ER) groups that use ED test (EDT) codes and ER test (ERT) codes for the EOR projects. Whereas the RLI group uses the direct ship sample-outside source *OD* and the outside referral labs-outside source *OR* groups that use direct ship sample test codes-outside source *ODT* and outside referral labs test codes-outside source *ORT* test codes for the RLI projects. These test code classifications help measure the overall TATs for each LIS system. A laboratory information management system (LIMS) is an electronic system that provides an organization with a way to manage patient laboratory data linked with specific demographic and clinical features (Brusniak et al., 2019). The study's dependent

variables were EOR system and RLI system. The independent variables were test code nomenclature and the patients reporting TAT that may be used to layout the association between the RLI system TAT compared to the patient results presented under the newer EOR system.

Research Questions and Hypotheses

The study was guided by the following research questions and corresponding hypotheses:

RQ1: Is there an association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020?

$H_0$1: There is no statistically significant association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

$H_1$1: There is a statistically significant association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

RQ2: Is there an association between the TAT met reporting metric based on the test code nomenclature, designed for the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020?

$H_0$2: There is no statistically significant association between the TAT met reporting metric based on the test code nomenclature, designed for the newer

EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

$H_1$2: There is a statistically significant association between the TAT met reporting metric based on the test code nomenclature, designed for the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

Theoretical Foundation of the Study

The Donabedian model was the framework for this study. The Donabedian model can be used to help apply a theoretical outline to form a strategic plan to effectively monitor and manage healthcare structure, process, and future outcomes (Sund, Iwarsson, & Brandt, 2015). Donabedian's concepts applied to the EOR system help to support the study because the organization has the means to build a cohesive external laboratory data transfer system that's aligned with the internal and external integrated LISs, because the older RLI LIS presented limitations that caused patient results to be delayed daily. The Donabedian model was the foundation for measuring the redundancies observed through the use of the older RLI LIS versus the newer EOR LIS. The RLI and EOR system has unique test code variables for each LIS to map the study's overall framework that illustrates each LIS structural set up for data transfers from system to system. A three-part methodology process was applied to assess the chosen referral labs data transfer structure, and this set up can be used to determine if the patient results were received on time. The data set-up process was monitored using the selected test code variables to track the EOR and RLI assay tests TATs. In return, the selected test code variables

helped to reveal the study's significance by the patient's laboratory results reported under the newer EOR LIS versus the patient laboratory results reported under the older RLI LIS because the patient laboratory results can help to determine whether TATs were met for both LISs.

The study had several objects to address, such as how staffing would be affected because the EOR project had aggressive delivery timelines to meet if the appropriate resources were not committed and prioritized. The EOR project created adapting service connections to enable a seamless transition to the new EOR data management system. Items of concern to address were deploying transformation and messaging technologies that had never been used in the organization. Under this project, the EOR team had to work with the external referral lab entities, and the selected laboratories had to be vetted and qualified by additional internal organizations (e.g., legal, quality assurance [QA]; McClain, 2016). The rollout of the EOR set up within the intercompany labs required that lab qualifications and laboratory systems were vetted by the Covance QA department (Covance, 2017a). The extent of changes required on the external labs systems and their ability to deliver these changes may affect the EOR timelines if the system-to-system data transfers are not monitored closely.

Nature of the Study

The nature of the study was to perform a quantitative correlational study using secondary data from the EOR and RLI LISs captured TATs exerted from each referral lab. A quantitative secondary data set was used, and the selected test code variables were categorized to determine if the results yielded met the required TATs. The EOR and RLI

secondary data sets may have given the study merit because the presented test codes help predict positive and negative outcomes when measuring the organization's integrated LIS systems. Multiple linear regression principles can be applied to address the research questions with selected quantitative data sets that have unique test codes created for the EOR versus the RLI LIS systems designed to transfer patient results. The test codes may also assist in tracking the number of successful and unsuccessful data transmissions due to compatible and incompatible LIS systems while using the ANOVA method to measure these anomalies.

Literature Search Strategy

The literature review for this study contains peer-reviewed articles and other sources focused on linking LIS and LIMS in the healthcare realm throughout the world. In the literature review, I searched for historical background checks for interlinking database systems from a host of healthcare providers and how they receive their patient's laboratory results and the significance of receiving these results on time. In the literature review, the selected articles present examples formed around upgraded database systems. Upgraded systems help to demonstrate how technology has continued to progress when dealing with healthcare reform. Technology and linking LIS systems continue to play significant roles in healthcare because technology advancements allow administrators to create structured platforms designed for secure database platforms. It is an essential task when granting secure server access to countless organizations, clients, and patients while trying to protect the organization's protected health information. Technology advancements are essential for an organization to thrive, especially when planning system

upgrades. Healthcare administrators must focus on security and linking database systems. In return, the organization prospers, and these security entities provide the means to cultivate within each department. Multiple healthcare directories were used for this literature review. Various articles were examined from the last 4 years—2015 through 2019. Older references were used as comparison guides to present past viewpoints. The databases included ACM Digital Library, Education Resources Information Center, Library and Information Science Abstracts, Library Literature & Information Science, ScienceDirect, Google Scholar, and the Walden Online Library. Key search terms included *digital health/information technology, information systems, LIS, LIMS, technology reform,* and *hospital and physician integrated database systems.*

Literature Review Related to Key Variables and/or Concepts

The literature review demonstrates how technology has progressed over time, and the significance of healthcare organizations having linking LISs. Technology advancements are essential for an organization to thrive, especially when planning system upgrades for the integrated healthcare facilities. Healthcare administrators must focus on linking database systems to receive and send secure patient laboratory results to treat and diagnose effectively. In return, the healthcare organization prospers, and these types of system implementations provide the means to cultivate within each department.

Literature Review Summary

The primary reasoning for implementing the EOR system was to have a linear system to system feed between the integrated companies due to multiple healthcare systems joining as one. Hence, the organization had bidirectional ways to send and

receive orders while transferring patient results. Still, the rationale for implementing EOR was to enhance the organization's overall system functionality to replace the older RLI database (McClain, 2016). RLI was meant to be a short-term solution because the organization did not plan to retain a flexible process designed to perform data integrations with the integrated and external referral labs (McClain, 2016). In return, the RLI system presented a host of data transfer issues that caused patient laboratory results to be delayed. These issues were due to the lack of visibility to the patient's laboratory results, along with a proliferation of errors observed from non-confirmatory data transfers and other data quality issues that adversely affected the services offered to the clients (Covance, 2017b). The EOR system's implementation was designed to build a cohesive extended/external laboratory LIS that established an integrated data transfer portal within the integrated CLS.

Healthcare organizations must have compatible LISs, so they can receive and send patient laboratory results in a timely fashion. The process is a joint effort, and this viewpoint is extended to the integrated organizations (Irizarry et al., 2017). Linking LISs is essential to complete a system-to-system data transfer for patients' laboratory results, and this is a task that cannot be completed without compatible LISs. These features are critical to evaluate because patient laboratory results help give providers the means to make clinical diagnoses quicker. Healthcare organizations must have the capabilities to provide secure servers while implementing database upgrades, so the patient results are processed within the established TATs. Hunter et al. (2017) found the outcomes of delivering patient data while measuring the present indirect dissimilarities for IT and

laboratory users. The sociotechnical methods point out the need for information technologies when evaluating research for healthcare studies. Linking LISs also helps identify the importance of linking systems needed for integrated companies to support automated workflow analysis. Linking LISs will also help reduce human error due to automation. However, integrated laboratory systems can improve an external lab's overall efficiency and quality of results observed daily during these system-to-system transfers of patient laboratory results. In return, the organization has the capabilities to offer more services through the integrated expanded network of laboratory services. According to Irizarry, Shoemake et al., (2017), researchers have recognized the relevance of LISs achieved through the collected data obtained for studies of this nature. Linking LISs is significant because this feature can push the organization to be one of the leading market providers for any unique, integrated third-party testing that is managing solutions for any clinical trial prerequisites (Covance, 2017).

A LIMS is an electronic system that provides an organization a way to manage patient laboratory results in which data are linked by specific demographic and test code parameters (Mi-Youn et al., 2019). Regulated LIMS platforms allow organizations to compute workflow analyses to reproduce reliable results more swiftly while improving overall efficiency. LIMS is a system designed as a tracking function to manage patient laboratory results (Mi-Youn et al., 2019). The integrated systems administrators for the EOR project continuously track the patient laboratory results received (LIMS, 2016). However, linking LIMSs also helps providers to diagnose patients quicker, but linking LIMS also helps project managers effectively manage study setups (LIMS Project, 2016).

The organization must have the capabilities to provide secure servers, so the results are processed in a timely fashion without having increased service fees tied to the data transfers. Lippi, Mattiuzzi, Bovo, and Favaloro (2017) showed the clinical and strategic needs for an organization's LISs need to be aligned to authenticate the patient data received. Wu et al. (2017) believed health information technology is the key to improving error rates while preserving quality care.

Experts believe health information technology is one of the keys to improving laboratory errors presented from manual data entries. Eliminating human error helps preserve the quality of care provided to the clients and the patient's results, especially when using the applied principles associated with health information technology (Wu et al., 2017). LIMS is an electronic system that provides an organization a way to manage patient data linked by specific demographical parameters (Blackford et al., 2013). Using regulated LIMS allows each organization to computerize workflow analysis to produce reliable results more swiftly while improving its overall efficiency.

LIMS is designed as a tracking function used to manage sample results (Blackford et al., 2013). The integrated systems administrators chose a LIS system known as the EOR system. LIS systems help identify the importance of system technology to support workflow automation to reduce the human error rates while integrating laboratory systems to improve each lab's overall efficiency and quality of results observed day-to-day. Linking LIS systems help provide more flexible and cost-effective result deliverables to the clients for unique testing not offered in-house. In return, the organization has the capabilities to offer more services through the expanded network of

laboratory services. The linking LIS systems will play a major part in pushing the organization to be one of the leading market providers for any unique, integrated third-party testing to manage solutions for any clinical trial needs.

Furthermore, the EOR project will include removing duplicate accessioning by implementing these system upgrades; the organization will continue to see improved connectivity with the Extended Laboratory Networks (ELN) due to the linking LIS system. The linking LIS systems will continue to enhance the healthcare's integrated structural capabilities allowing the transfer of extensive patient data on time while capturing additional resulting parameters such as images, chromatographs, complex laboratory reports while continuing to eliminate the errors presented from the manual result entry team.

Articles were selected to present examples formed around technology due to the demonstrations presented on how technology has continued to progress when dealing with healthcare reform. Technology continues to play a significant role in healthcare reform since technology advancements give administrators the means to create structured platforms designed to implement secure server applications. When granting secure server access to countless organizations, clients, and patients, safety checks should be established to protect the organization's protected health information. Technology advancements are a must for an organization to thrive along with implementing secure server apparatuses, especially when implementing linking LIS systems. In return, the organization prospers if these types of security apparatuses are in place since they help empower the organization and its affiliated units if realistic, achievable data transfer

goals are set, so the company has the means and knowledge to cultivate within the appropriate departments.

Gaps in the Literature Review

The secondary data sets can be retrieved from the Covance-ELMS NexGEN system (Covance, 2020). The Expanded Laboratory Management Services (ELMS) produces the data since it manages the test codes designed for the EOR and RLI LIS systems (Covance, 2020). The pros, cons, and gaps can be identified for both LIS systems since the organizations are now operating as integrated units for studies utilizing the older RLI system versus the newer EOR system. The troubleshooting structure can be designed to note the successful and unsuccessful TAT's when comparing the test codes associated with the older versus the newer LIS systems. Although this is an internal study being conducted, data from other sources cannot track the organizational success rate. EOR can be burdensome for some referral labs specializing in testing, such as the Anatomic pathology (APH) testing, because some access is limited to only authorized officials (Covance 2020). Numerous workarounds had to be created to accommodate various testing reflex scenarios, and the lab must be thorough in every set up to ensure the patient data flowed correctly. Preexisting studies could not be modified without an entire re-build of the study set-up, and this is a lengthier process to adjust at times. However, the literature review studies imply that laboratories tend to upgrade their LIS only every 10 to 20 years because it is a huge responsibility (Lopez, 2015). The essential point was to select the most appropriate LIS, one of the most problematic tasks to complete (Braga et al., 2015). As a final point, LIS retains data transfer issues explicitly linked to each

referral lab. Hence, it is imperative to maintain manageable data logs to have viable traceability, and this can be complex when trying to connect each lab's LIS systems (Lukić, 2017).

Definitions

Assay Testing: Assay testing is performed with a laboratory analysis were testing is performed to determine: The presence of a substance and the amount of that substance.

Electronic Orders and Resulting (EOR): system consists of a newly integrated supporting LIS system brought forth that has distinct test codes created to differentiate between this system and the organization's older RLI system.

Laboratory Information Management System (LIMS): is an electronic system that provides an organization with a way to manage patient laboratory data linked with specific demographical and clinically based features (Mi-Youn et al, 2019).

Laboratory Information System (LIS): is a software system that records, manages, and stores data for clinical laboratories. According to Wu et al., (2017), linking (LIS) systems helps ensure the delivery of quality results and improve patient treatment outcomes.

Referral Laboratory Information (RLI): system is the older supporting database system used for integrated organizations to send and receive secure patient laboratory results.

Test codes: Each assay being tested by the individual laboratories has specific test code created per the referral lab conducting the testing, so the organization can

distinguish between each test uploaded into the primary system were the patient results are stored.

Turnaround Times (TAT): The established timeframe for an external laboratory to have the patient laboratory results sent from their system to the organization's primary database system.

Assumptions

Assumptions made beforehand were how the EOR project would reduce the referral laboratory's process timelines to setup studies more quickly and efficiently. The faster setups will be due to the EOR set up since the organization will have the capabilities to generate relevant metrics and scorecard tactics to analyze referral lab feedback on improving the linking system to system data transfer process. Additional expectations to be addressed because it is assumed the selected data is applicable for the research being conducted, so the study's purpose should be aligned with the problem statements organizational issues per the carefully chosen research questions. The EOR system has allowed the organization to be more proactive in monitoring the patient's results crossing over from system to system. EOR has also permitted the organization to have the capabilities to conduct demo data transfers with mock patient samples before the arrival or testing of the live patient samples. EOR also decreased the amount of data transfer issues due to the proactive demo measures taken upfront. Transmission seems to be improved, but the CovELI EOR team confirmed the data transmission errors or more to troubleshoot than they did with RLI (Covance, 2020). In the beginning, there were quite a few pain points, and it was not very smooth, but that had to do with the different

computer systems that each referral lab had, and the assumptions and talking points are outlined below (Covance, 2017).

- The EOR project applies to new studies only
- Electronic data transfer of orders to Extended Lab Network (ELN) and results transferred back into both Zavacor and Envision
    - Enablement of data exchange within several intracompany referral Labs
- The organization should have the ability to transfer/accept associated large data files (images, etc.)
- The organization should be able to eliminate the CTX Esoteric testing that's resulted through RLI currently for the older study setups, interface development, and support processes
    - Build the Adapter to connect to Zavacor & EOR while eliminating the RLI LIS connection
- The technical solution for Sample Re-Labeling, accession format, and routing tag
    - Create Labeling modifications to enable extended labs to receive samples and return results without the need to pass through additional supporting labs that accession the samples (example LCLS labs - Burlington, NGI, Raritan)
- The technical solution for Shipping Manifest
    - Will not need to create manifest changes (packing slips) to include in the sample shipments since each lab will have a direct connection to each other's server and this will enable extended labs to receive samples and

return results without the need to pass through additional supporting LIS's such as LH-Cranford

Source system modifications in LabWare and Zavacor required for EOR use with the newer study setups, and these plans are summarized below (McClain, 2016).

- Should have an integrated platform to exchange data with LabCorp Extended labs as well as external sources through the creation of electronic orders and results
- All future Esoteric study setup performed in Zavacor & EOR
- CTX no longer required for Esoteric study setup, interface setup, and support
- Duplicate accessioning for newer studies should no longer be required for setup of Labs on the EOR platform for order/result exchange

Scope and Delimitations

Data transmitted from system to system can have error rates calculated, and the error rates can be measured using percentage analysis to categorize the patient results that were successfully transferred (Covance, 2020)**.** Even though it can be problematic to perform estimations with secondary data, the examiner cannot validate the data received's trustworthiness. Although the examiner can develop an understanding between the various types of data transfer errors presented to assist in identifying root cause action plans. The study had the potential to have more study set up limitations presented since the study's subjects could be selected from a more extensive testing group. Plus, the feasibility of the restrictions would have to be accurately measured due to the test code utilization for the different testing locations being used. The quality of data plays a vital role in the data outcomes presented within the integrated studies. Data management has a

critical role during research projects, mainly when the patient results are essential to diagnose and treat the patients. The patient data is vital to having linking (LIS) systems to ensure the proposed theories are well reinforced by the patient results received and transferred from each LIS.

Quantitative secondary data sets were used to analyze specific turnaround times captured from the EOR versus RLI test code results received. Measuring the patient's TATs can help the organizational ability to monitor a referral lab's performance by capturing accurate metrics, and these metrics values are beneficial on how to eliminate the slower turnaround times due to incompatible LIS systems. These data transfer errors helped design a statistical error percentage from the three selected referral labs, so the investigator can implement an asymmetrical scheme to categorize the types of data transfer errors presented from a system to a system point of view. The patient results presented from the specific test codes utilized for each LIS system is beneficial to track the number of successful and unsuccessful data transmissions due to incompatible LIS systems. Equivalent methodological strands will be applied to form a methodological systems review that's designed primarily to compare the patient results received from the older RLI system against the newer EOR system for the data transfer errors presented from both LIS. A secondary data set was used to establish the outcome of the study, and the test code selected variables were categorized to grade the results yielded. The selected data sets were chosen, so the research has merit and realistic data presented to predict positive and negative futuristic outcomes for the integrated healthcare data system platforms when comparing linking LIS systems.

Significance, Summary, and Conclusions

The significance of the study was to provide timely patient results, so the organization is demonstrating the need for the company to have extensive knowledge regarding linking LIS systems. This way, the organization can provide the internal and external groups with the ability to improve the operations safety patient reporting practices based on the met TAT presented. The study may also help improve the patients diagnosing time if the organization has the capabilities to result in the patient's results in an expedited manner. The patient's clinical results are vital, so the provider can adequately treat and diagnose the patients when using multiple data transfer platforms.

The study may help contribute towards improving the digital technology avenue with healthcare administrations since this notion consists of how organizations deliver patient's results securely to the attending providers. As a result, healthcare leaders need compatible data systems to transfer patient results from one system to another system on time. The study contributes a positive social change by providing health information and technological advancements within the healthcare administration profession, and this study can help to provide information on minimizing human errors due to utilizing automation and linking LIS systems that help to preserve the quality of data and patient care being provided to the patients. According to Wu et al. (2017), linking LIS systems helps ensure the delivery of quality results and improve patient treatment outcomes. Section one presented the study's overall purpose and the study's foundation that included an in-depth literature review. Part two covers the study's analysis, methodology, and the research design.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative study was to determine if an association exists between patient reporting TATs and the specific test code nomenclatures used when comparing the older RLI LIS to the newer EOR system using the Covance ELMS NexGEN database from 2016-2020 (Covance, 2020). Each supporting LIS has specific test code classifications, and the EOR group uses the ED and the ER groups that use EDT codes and ERT test codes for the EOR project. The RLI group uses the source OD and the source OR groups that use ODT test codes and ORT test codes for the RLI projects. These test code classifications help measure the overall TATs for each LIS. LIMS is an electronic system that provides an organization with a way to manage patient laboratory data linked with specific demographic and clinically based features (Mi-Youn et al., 2019). The study's independent variables were the EOR system and the RLI system. The dependent variables were test code nomenclature and patient reporting TATs that may be used to layout the association between the RLI systems TAT when compared to the patient results presented under the newer EOR system.

EOR improved the daily result transmission from system to system and allowed the organization to be more proactive in monitoring results crossing over from the extended referral laboratories. EOR has also allowed the organization to demonstrate and test the data being resulted by using dummy patient samples as test trial runs from system to system before the arrival of the real patient samples. EOR also helped to decrease the number of data transfer issues previously observed with the RLI system due to the

proactive measures taken upfront for setting up the data transfers from system to system for the external laboratories. Patient data transmission seems to be improved for patient results crossing over. Nonetheless, the EOR data flow process can be evaluated by the number of successful and unsuccessful data transmission errors received.

The organization identified several data transfer errors when the integrated companies merged, and there were numerous pain points. The data transfer transition was complex because each laboratory had different computer systems (Covance, 2017). Switching from RLI data processing to EOR data processing was beneficial because the EOR system has better functionality and has better processes built into its data system to handle more volume from the various intercompany and extended referral labs (Covance, 2020). Overall, EOR helped to lessen the amount of personnel needed to manage a study. The original setups used a project manager, a technical database person, and a data manager involved to use RLI (Covance, 2017). EOR took less time to manage a study set up while having less documentation to use, decreasing patient result TATs from system to system. In this section, I cover the study's analysis, methodology, and the research design, including the study's pros and cons.

Pros

Fewer individuals were needed to manage the study set up. EOR helped to decrease the patients resulting TATs and eliminate the manual resulting team.

Cons

The CovELI team was under pressure to get the EOR system up and running as a minimum viable product, which meant they had a lot of fixes and reworking to do along

the way. Duplicate documentation of project specific worksheets was not needed anymore because they were similar to the internal standard operating worksheets used in-house. Another organizational group within CCLS had to enter information into Centerlinx before samples were shipped. When samples were received at LabCorp using RLI, the project manager had to create a list for the staff before they could access samples. Samples would sometimes be at the accessioning area for days before they were shipped to the testing lab. This cause increased TATs. A learning curve was involved because interfaces used had to work with the system the lab had.

Research Design and Rationale

In this study, I employed a quantitative methodology correlational design using secondary data from the EOR and RLI LIS supporting database systems. TATs were measured from each referral lab LIS to grade the number of successful data transfers from system to system. A quantitative secondary data set was used to compare the selected test code variables to determine if the yielded results met the required TATs. The EOR and RLI secondary data sets gave the study merit because the presented test codes helped predict the positive and negative outcomes when measuring organizational metrics designed for the integrated LISs. Multiple linear regression principles were applied to address the research questions with the unique test codes created for the EOR versus RLI LISs to capture patient results for each assay test. The test codes assisted in tracking the number of successful and unsuccessful data transmissions due to compatible and incompatible LISs while using the ANOVA method to measure these anomalies. The means were statistically different because EOR has continued to improve the

organization's overall metrics for the timely delivery of the patient's laboratory results. In addition, there was no time or resource constraints to address in this study. The research concept was designed to parallel the study's overall objectives because it permits the researcher to define the subtleties on the importance of linking LIS systems extending through a specific period. In this study, I collected data between the years 2016 through 2020.

Methodology

Population and Sampling

The sampling population for my study consisted of three different intercompany referral labs that converted from the RLI model to the EOR model to transfer the patient's laboratory results from system to system. Data transfer and quality errors were observed from both systems between the years 2016 through 2020. Each of the referral labs was selected due to the testing complexity along with the volume of patient's laboratory results received on a day to day basis from system to system. In this study, the examiner will include at least 266 samples. G*Power assessment defines the minimum patient sample size. A customary size ratio 0.02 was used to account for the error of probability using a standard 0.90 formula statistical value with a 0.50 margin percentage error rate.

For this study, real-time participants were not used so the pre-collected secondary data can be retrieved from the Covance-ELMS NexGEN system (Covance, 2020). The sampling strategy that will be used includes a random sampling technique since the researcher is not mandated to acquire patient consent forms, because of the utilization of

pre-collected datasets per the guidelines established for the IRB submissions. The selected methodology was applied since the organization had ten intercompany referral labs that had switched from the older LIS to the newer supporting EOR LIS system. Although, the organization's legal team approved the use of this data set since it was officially obtained from the organizations Expanded Laboratory Management Services (ELMS) NexGen database. The pre-collected data was collected based on the criteria identified below to determine the sample selection criteria:

1. Each intercompany referral lab was based in the United States (US).
2. Each intercompany referral lab had utilized the RLI and the EOR LIS systems.
3. Each intercompany referral lab had data collected from the years 2016 through 2020.
4. Each intercompany referral lab had test codes created to identify each referral labs assay tests.
5. Each intercompany referral lab had inputs that state if the TAT were met for each LIS system.

EOR has improved the day to day laboratory result transmissions by forcing the ELMS team to open the lines of communication more. Implementing the EOR process has been not a perfect system to adopt and has taken a lot of education along the way. Although it has provided the organization with the demo/MVP process, it has helped identify LIS issues before testing live patient samples. Throughout the change, there have been many system limitations when working with other intercompany referral labs (when

trying to connect to a standard LIS that were not fleshed out before the go live processes which has slowed the growth and the day to day LIS activities.

Data Analysis

The study will use a quantitative methodology to obtain a correlation using secondary data from the EOR, and RLI LIS supporting database systems. The captured TAT was exerted from each of the three selected referral labs to compare results received by the selected test code variables from each database to determine if the results met the established TAT for each assay test from 2016 through 2020. The analyzed data will be cleaned to authenticate the data's validity. While cleaning the research will examine the selected data while completing the following analyzes:

1. Identify values for the chosen variables noted for this study.
    a. Analyze the specific lab performing the analysis.
    b. Analyze TAT Met vs. TAT Not Met.
    c. Total percentages on the TATs Met vs. TATs Not Met
2. Confirm the selected data exemplifies the study's inclusionary criteria. If the study criteria are not met, then the selected data will be removed, so it's not a biased study.
3. Check for missing data within the selected variables.
4. Pinpoint skip-patterns or non-confirmatory data.
5. Check for duplicate results.
6. Identify any skip-patterns or logic breakdowns.

The researcher will address all pertinent study issues concerning the selected data set, and then the researcher will conduct the data analysis. The data analysis will be aligned with the study's hypothesis and research questions listed below:

RQ1: Is there an association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020?

$H_0$1: There is no statistically significant association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

$H_1$1: There is a statistically significant association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

RQ2: Is there an association between the TAT met reporting metric based on the test code nomenclature, designed for the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020?

$H_0$2: There is no statistically significant association between the TAT met reporting metric based on the test code nomenclature, designed for the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

$H_1$2: There is a statistically significant association between the TAT met reporting metric based on the test code nomenclature, designed for the newer EOR system

and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

Quantitative secondary data sets used to analyze specific turnaround times captured from the EOR versus RLI test code results received. Measuring the patient's TATs can help the organizational ability to monitor a referral lab's performance by capturing accurate metrics, and these metrics values are beneficial on how to eliminate the slower turnaround times due to incompatible LIS systems. These data transfer errors will help design a statistical error percentage from the three selected referral labs, so the investigator can implement an asymmetrical scheme to categorize the types of data transfer errors presented from a system to a system point of view. The patient results presented from the specific test codes utilized for each LIS system is beneficial to track the number of successful and unsuccessful data transmissions due to incompatible LIS systems. Equivalent methodological strands will be applied to form a methodological systems review designed primarily to compare the patient results received from the older RLI system against the newer EOR system for the data transfer errors presented from both LIS. A secondary data set was used to establish the outcome of the study, and the test code selected variables will be categorized to grade the results yielded. The selected data sets are chosen, so the research has merit and realistic data presented to predict positive and negative futuristic outcomes for the integrated healthcare data system platforms when comparing linking LIS systems.

Business Justification

Covance does not employ a flexible, repeatable technology process for performing data integration with external referral labs, which causes extended timeframes for external lab setup, a lack of timely visibility concerning lab test results and vendor management information, and a proliferation of data errors and other data quality issues that adversely affect client services (McClain, 2016). The implementation will build a cohesive external lab architecture that is integrated with internal CLS systems. Business Drivers:

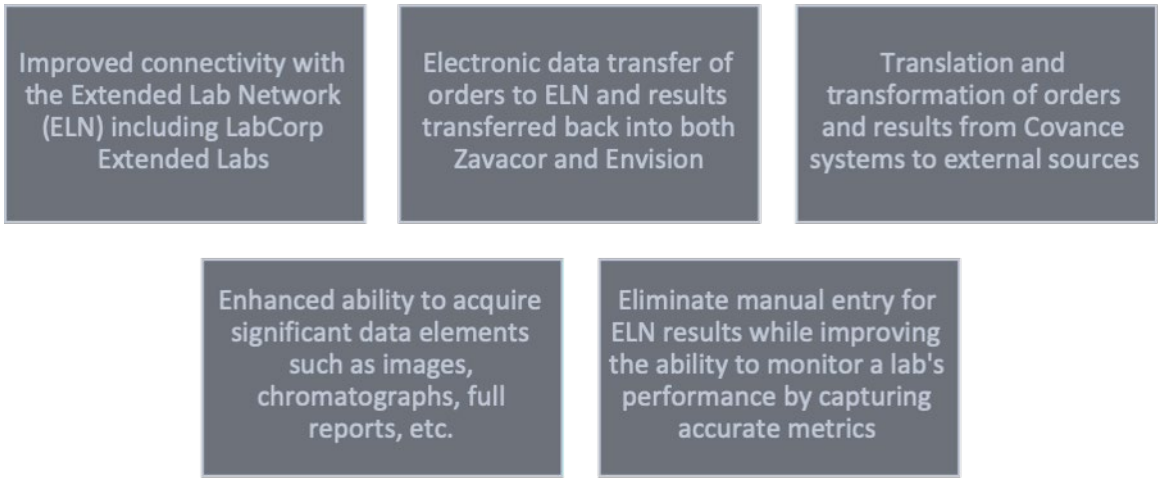

Figure 1. Extended data exchange (McClain, 2016).

A LIMS is an electronic system that provides an organization a way to manage patient results received with the test codes linked to the data systems being utilized by each organization. Using regulated LIMS systems allows each healthcare organization to computerize workflow analysis deemed necessary so reliable patient results can be

received more swiftly over time while improving the organization's overall efficiency. LIMS is designed as a tracking mechanism used to manage patient result outcomes, obtained from the organization's older RLI supporting database system when compared against the newer EOR system. These data systems help to support the organization's workflow automation to reduce human error while integrating the referral laboratory systems to improve each lab's overall efficiency and quality of results received and sent. The project timeline has four components.

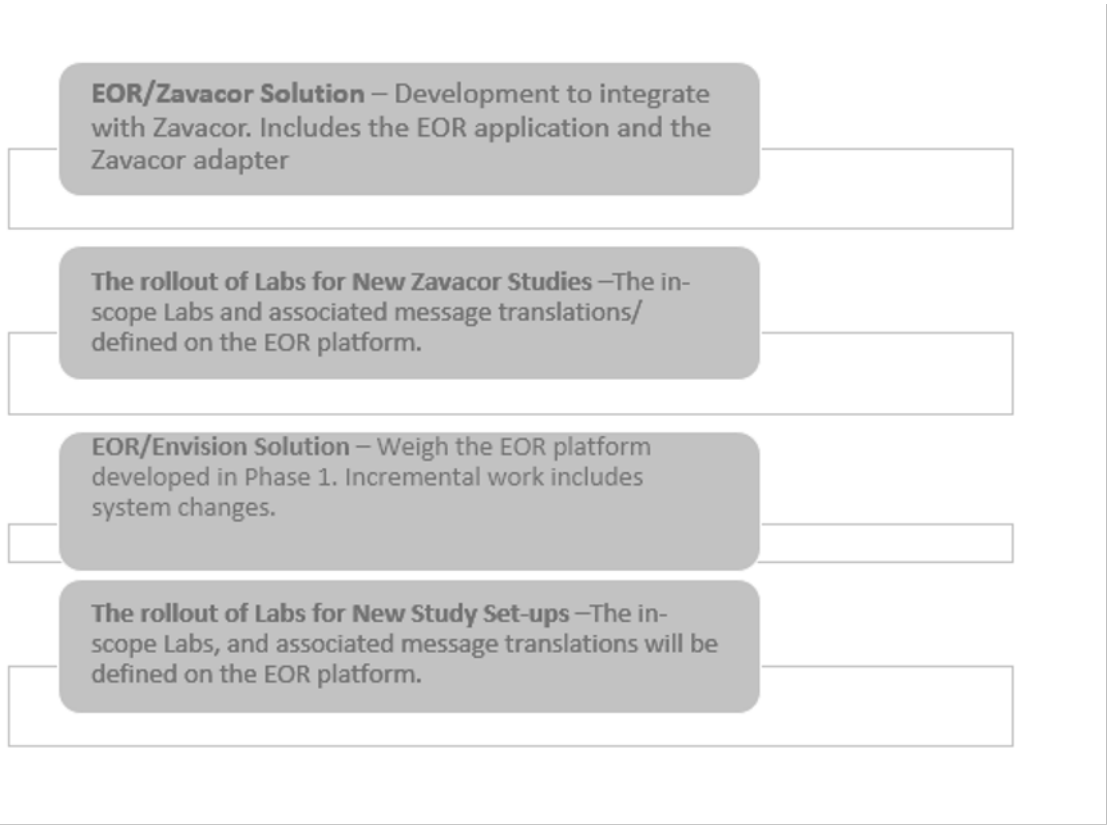

Figure 2. Project timeline (McClain, 2016; Covance 2019).

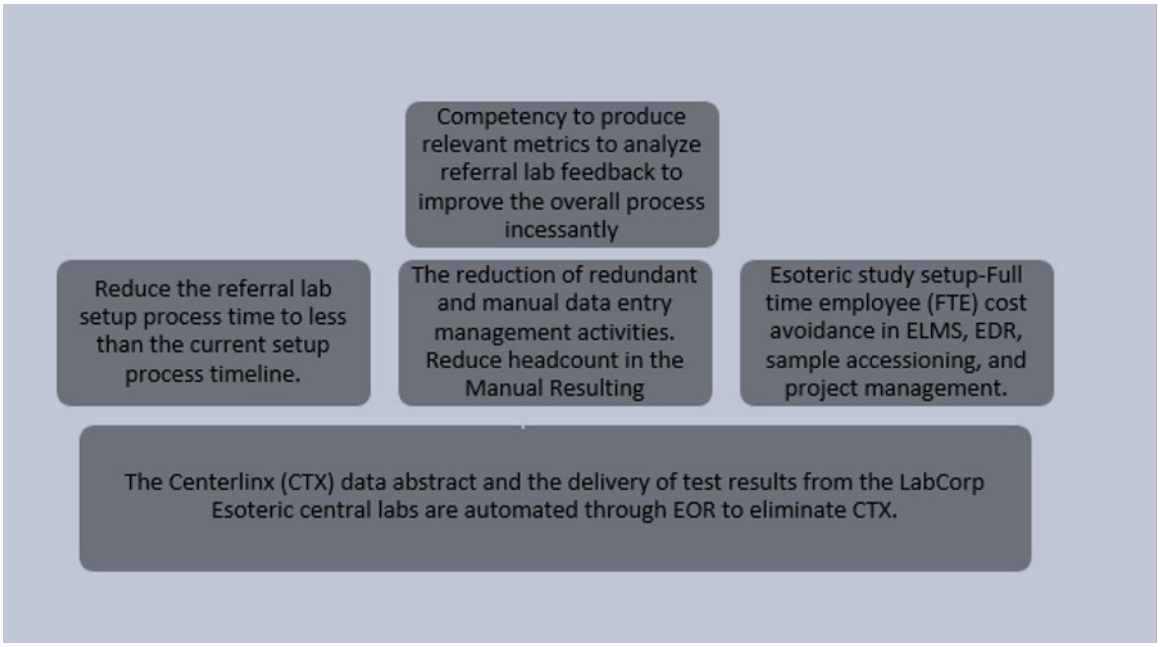

Figure 3. Critical success factors (McClain, 2016; Covance 2019).

Threats to Validity

Validity and reliability are two significant research concepts since they help express different research points of view. Reliability is considered the amount an instrument yields while maintaining consistent, reproducible results, and validity illustrates how well a test measures the actual sampled results. This study's collected data is aligned explicitly to validate the researcher's overall efficacy. The collection methods are explicitly aligned to verify the data being evaluated so the investigator can guarantee the validity of the research data produced. Validity is a broad view of how comprehensive the research is, along with the information collected throughout the study. The end conclusions are observed. These observations will present an exact representation for the produced singularities so that the extraneous factors cannot discredit the verified presented results (Burkholder, Cox, & Crawford, 2016).

Ethical Procedures

For this study, real-time participants were not used so the collected secondary data can be retrieved from the Covance-ELMS NexGEN system (Covance, 2020). The sampling strategy that will be used includes a random sampling technique since the researcher is not mandated to acquire patient consent forms, because of the utilization of pre-collected datasets per the guidelines established for the IRB submissions. The selected methodology was applied since the organization had ten intercompany referral labs that had switched from the older LIS to the newer supporting EOR LIS system. Although, the organization's legal team approved the use of this data set since it was officially obtained from the organizations Expanded Laboratory Management Services (ELMS) NexGen data base.

Summary

Healthcare officials must continue to make clinical assessments, and patient laboratory results will continue to be used as justifiable reasoning when creating strategical organizational database and corporate system care plans. LIS systems such as EOR have continued to provide the organization with the capabilities to produce and deliver secure patient laboratory results. In return, the system to system patient data transfer errors is reduced while providing the healthcare provider with the tools to diagnose the patients quicker if the organization keeps up with the day-to-day system upgrades needed. In return, the organization will continue to thrive while eliminating and decreasing the number of medical errors observed from human error. The EOR integration project's main objective was to provide integrated LIS systems for patients'

laboratory results received from the extended & external referral labs. By implementing these system upgrades, the organization will continue to see improved connectivity with the Extended Laboratory Networks (ELN) due to the linking LIS system. The linking LIS systems will continue to enhance the organizational integrated structural capabilities, which will allow the transfer of extensive patient laboratory results. Alternatively, the organization will eventually gain the ability to capture additional resulting parameters such as images, chromatographs, and complex laboratory reports, all while eliminating the errors presented from the manual resulting entry team.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this quantitative study was to determine if an association exists between patient reporting TATs and the specific test code nomenclature used when comparing the older RLI LIS to the newer EOR system using the Covance ELMS NexGEN database from 2016-2020 (Covance, 2020). Each supporting LIS has specific test code classifications, and the EOR group uses the ED and the ER groups that use EDT codes and ERT test codes for the EOR project. The research addressed all pertinent study issues concerning the selected data set, and then I conducted data analysis. The data analysis was aligned with the study's hypotheses and research questions listed below:

RQ1: Is there an association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020?

$H_0$1: There is no statistically significant association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

$H_1$1: There is a statistically significant association between the patients reporting times, measuring the TATs for the test codes, between the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

RQ2: Is there an association between the TAT met reporting metric based on the test code nomenclature, designed for the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020?

$H_0$2: There is no statistically significant association between the TAT met reporting metric based on the test code nomenclature, designed for the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

$H_1$2: There is a statistically significant association between the TAT met reporting metric based on the test code nomenclature, designed for the newer EOR system and the older RLI system using the Covance ELMS NexGEN database 2016-2020.

Descriptive Statistics

Data Collection of Secondary Data Set

At the beginning of this study, the talking points helped to illustrate the descriptive statistics within this study's analysis listed below. Data transmitted from system to system can have error rates, and the error rates can be measured using percentage analysis to categorize the successful transfer of patient results (Covance, 2020). It can be problematic to perform estimations with secondary data because an examiner cannot validate the trustworthiness of the data received. Additionally, the amount of data is limited because the EOR system is a newer platform with limited studies loaded. However, an examiner can develop an understanding between the various types of data transfer errors presented to assist in identifying root cause action plans. The study could have more study set up limitations presented because the study's subjects could be selected from a more extensive testing group. Plus, the restrictions' feasibility would have to be accurately measured due to the test code use for the different testing

locations. Based on the findings for both research questions, the association between the patients reporting times, measuring the TATs for the test codes, created for the newer EOR system and the older RLI system was statistically significant between the patients reporting times when measuring the lab's successful TATs applied to each test codes. These findings are noted in Table 1, and the statistics presented indicate the significance of the test code nomenclature used for each LIS.

Table 1

*ER OR *Met* LabName Crosstabulation*

LabName			Met		Total
			No	Yes	
LabCorp Burlington	ER OR	ER	6.7%	93.3%	100.0%
		OR	33.3%	66.7%	100.0%
	Total		29.7%	70.3%	100.0%
LabCorp Esoterix Coagulation Lab COACT	ER OR	ER		100.0%	100.0%
		OR	37.5%	62.5%	100.0%
	Total		10.1%	89.9%	100.0%
LabCorp Monogram Biosciences - 345 Oyster Point Blvd L9	ER OR	ER	100.0%		100.0%
		OR	50.9%	49.1%	100.0%
	Total		52.9%	47.1%	100.0%
Total	ER OR	ER	23.3%	76.7%	100.0%
		OR	47.9%	52.1%	100.0%
	Total		44.5%	55.5%	100.0%

Table 2

Chart Builder GGRAPH

Resources	Processor Time	00:00:01.56
	Elapsed Time	00:00:02.76

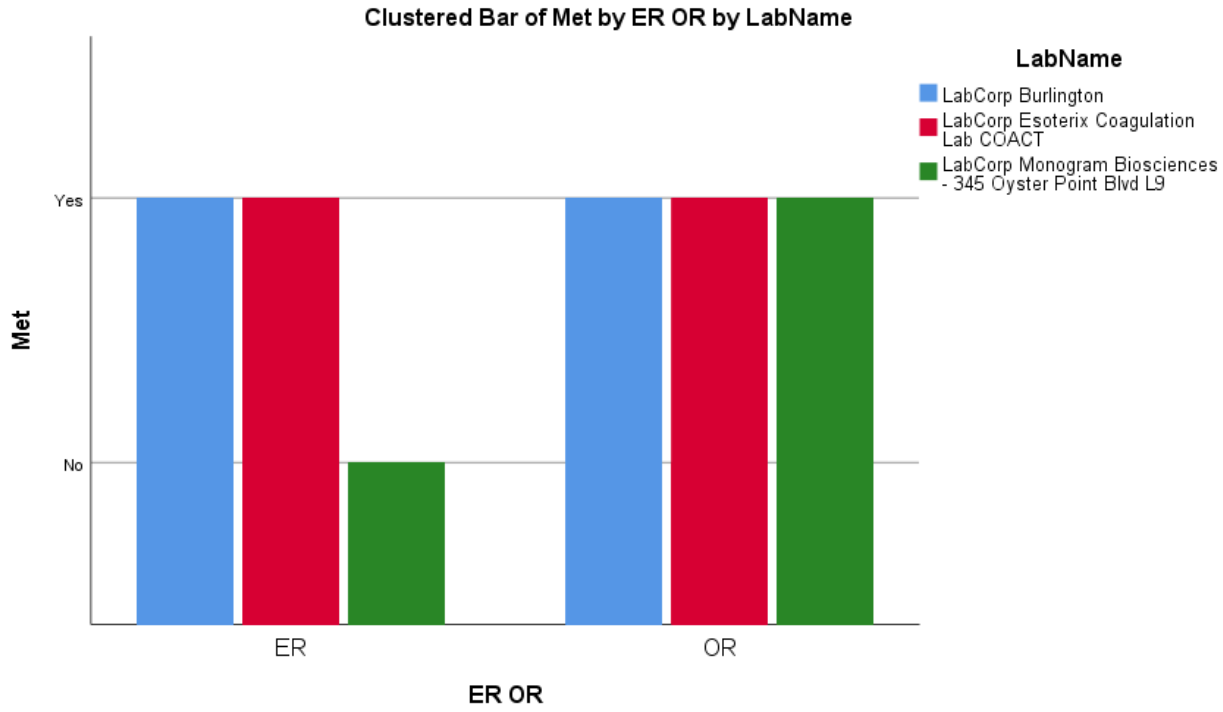

Figure 4. Clustered bar of met by ER OR by LabName.

Table 3

*LabName * Met Crosstabulation*

		Met		Total
		No	Yes	
LabName	LabCorp Burlington	29.7%	70.3%	100.0%
	LabCorp Esoterix Coagulation Lab COACT	10.1%	89.9%	100.0%
	LabCorp Monogram Biosciences - 345 Oyster Point Blvd L9	52.9%	47.1%	100.0%
Total		44.5%	55.5%	100.0%

Table 4

*ER OR * Met Crosstabulation*

		Met		
		No	Yes	Total
ER OR	ER	23.3%	76.7%	100.0%
	OR	47.9%	52.1%	100.0%
Total		44.5%	55.5%	100.0%

Table 5

Tables = ER OR by Met by LabName

LabName	TestCode	TAT Met? No	TAT Met? Yes	Total Caculated	Percent Met
LabCorp Burlington	ORT10131	32	64	96	66.7%
LabCorp Burlington	ERT362	1	14	15	93.3%
LabCorp Esoterix Coagulation Lab COACT	ORT13203	9	15	24	62.5%
LabCorp Esoterix Coagulation Lab COACT	ERT562	0	65	65	100.0%
LabCorp Monogram Biosciences - 345 Oyster Point Blvd L9	ORT10139	274	264	538	49.1%
LabCorp Monogram Biosciences - 345 Oyster Point Blvd L9	ERT970	23	0	23	0.0%

Multiple Regression Analysis

A multiple regression analysis was performed to review and analyze the selected research questions. To achieve this, each referral lab had the labs established TAT for each assay test cross-referenced with the chosen variable set identified for each LIS system. The selected variables were pulled from the Covance NexGen database. The collected data will help to illustrate the meaningful impact observed from the company

switching to the newer LIS system, and this will also help define the statistical significance linked to each referral lab TAT met or not met. The charts will demonstrate the relations formed between the predictor and response variables. Innovative collection techniques and a trustworthy data analysis can confirm if a study's research is justifiable. These practices can also establish the social change value presented due to the predicted outcomes and the researcher's justifications.

Table 6

Analysis of Variance Table-Response Met Number:

	Df	SumSq	Mean Sq	Fvalue	Pr(>F)
Lab	2	16.943	8.4715	39.3976	<2.2e-16***
ER.OR	1	0.012	0.0119	0.0554	0.814
Lab ER OR	2	8.687	4.3433	20.1991	2.846e-09***
Residuals	755	162.345	0.2150		

- I have included: The "met" number is 1 or 0 in each case; 1 indicates the desideratum was not met.
- The lab with the lowest total number of cases, Eso. Coag has only 89 patients, and this lab had the highest percentage "met," nearly 90%.
- The second-lowest number of cases had only somewhat more than the lab listed above, at 111 patients, and had a substantially lower percentage "met," at about 70%.
- The lab with the highest number of cases-has a higher rate than the other two, at 561, with only about 47% "met."
- Predictions of a percent "met" is not significantly improved by adding something to those percents for "ER" cases and for "OR" cases when the adjustments are the

same for all three labs, as one sees in the Anova table above, with a p-value of over 0.8 (thus not significant).

- However, the line in the table labeled Lab: ER.OR has presented two degrees of freedom, this indicating a highly statistically significant improvement in predicting the "met" percentage when the adjusted "ER" versus "OR" is done differently with the three selected referral labs.
- This the 70% noted above leaps to 93% in "ER" cases and fell to 67% in "OR" cases.
- The 47% noted above goes up a little bit, to 49%, in "OR" cases and falls to precisely 0% in the few "ER" cases (there were only 23 "ER" cases out of the 561).
- The 90% noted goes up to 100% in the "ER" cases and is only 62.5% in the 24 "OR" cases identified.

Summary

The results of this study confirmed the proposed hypothesis that switching to the newer EOR LIS was more beneficial to the organization. The applied concept was presented and illustrated through each lab's TAT. The results showed that out of the three selected labs, two showed an improvement in the resulting time needed to transfer the patient data from system to system.

Initially, the key objective was to point out the significant difference between the patients reporting times by measuring the TATs for the test codes created for the newer EOR system versus the older test codes designed for the company's RLI system. The

study measured the association between the TAT met and not met in addition to the findings. The generated data helps to describe the organizations that need to have compatible laboratory information systems (LIS) to receive and transfer patient data quickly. Linking LISs are essential since successful data transfers cannot be achieved without compatible LIS. Although the significance of the study includes providing patient results that will help further the knowledge regarding linking (LIS) systems so that the organization can improve its business operations based on each assay test established TATs. As a healthcare specialist, patient care is always a main priority, and updated LIS systems have allowed the company to grow from maintaining these systems. LIS help illustrate a clearer representation of the patient's laboratory results and this in return, it helps the physicians assertively do their jobs (Yaroslavtsev & Matukhina, 2019). LIS have become more customary to safeguard the organizations operating systems since updated LIS helps serve all patients using linked computer systems (Yaroslavtsev & Matukhina, 2019). The significance is physicians no longer have to rely on out-of-date LIS systems or the errors that come with manually resulted patient reports. As healthcare administrators, the main goal is patient care and these systems upgrades help the organization adequately track patient's laboratory results being ordered and their results.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this quantitative study was to determine if an association exists between patient reporting TATs and the specific test code nomenclatures used when comparing the older RLI LIS system to the newer EOR system using the Covance ELMS NexGEN database from 2016-2020 (Covance, 2020). Each supporting LIS has specific test code classifications designed, and the EOR group uses the ED and the ER groups that use EDT codes and ERT test codes for the EOR project. The findings indicate it is beneficial for the company to integrate the newer LIS system because the overall results illustrate the significance of the EOR platform, and these findings for each referral lab are described as percentage rates in Table 7.

Table 7

TABLES = ER OR by Met by LabName

LabName	TestCode	TAT Met? No	TAT Met? Yes	Total Calculated	Percent Met
LabCorp Burlington	ORT10131	32	64	96	66.7%
LabCorp Burlington	ERT362	1	14	15	93.3%
LabCorp Esoterix Coagulation Lab COACT	ORT13203	9	15	24	62.5%
LabCorp Esoterix Coagulation Lab COACT	ERT562	0	65	65	100.0%
LabCorp Monogram Biosciences - 345 Oyster Point Blvd L9	ORT10139	274	264	538	49.1%
LabCorp Monogram Biosciences - 345 Oyster Point Blvd L9	ERT970	23	0	23	0.0%

Interpretation of the Findings

Technology advances play a significant role in the healthcare industry because system improvements provide the healthcare administration the means to create a structured platform to provide secure server access to different integrated organizations, to clients, and to patients (Hunter, et al., 2017). Data system innovations and security apparatuses are needed when implementing system upgrades, so organizations can apply security apparatuses presented when submitting data transfers (Irizarry et al., (2017). In return, the organization prospers, and the yielded results can be used to track the number of unsuccessful data transmissions due to incompatible and compatible systems (Covance, 2017). The existing research provides examples of data technology advancements and how they have progressed when linked directly with healthcare reform issues observed from many healthcare industry platforms. Methodological components help form a beneficial literature review designed to compare the older and newer system model errors presented in data transfers with incompatible systems (Wu et al., 2017). In this study, a secondary data set was used to establish the study's outcome, and the selected variables were categorized to evaluate the results yielded with a quantitative analysis. This method gives the research merit and realistic data presented to predict positive future outcomes when having compatible LISs.

Background

The Hunter et al., (2017) mentioned the outcomes to delivering patient data while measuring the present indirect dissimilarities for IT and laboratory users; while the sociotechnical methods helped to identify the need for information technologies when

evaluating research for healthcare studies. According to Irizarry, et al., (2017), researchers have recognized the relevance of LIS systems achieved through the collected data obtained for this study. Electronic healthcare systems are held to national standards when linking different healthcare systems, especially when an organization is putting better tracking mechanisms in place, so they have the means to readily pull a patient's medical information from system to system. Lippi et al. (2017) findings showed the clinical and strategic needs for the organization's LIS systems to be aligned to authenticate the patient data received. Wu et al. (2017) found that health information technology is the key to improving error rates while preserving care quality. According to LIMS (2016), linking LIMS systems not only assists providers in diagnosing patients quicker but linking LIMS helps project managers effectively manage study setups too (LIMS Project, 2016).

Limitations of the Study

Errors can be present in the mathematical equations because the equations are used as the final decision-makers for the transferred patient results. However, it can be problematic to perform TAT estimations with secondary data if the trustworthiness of the data received is not validated without initially developing an understanding of the various types of errors presented along with the root causes (Covance, 2020). This study had some limitations because the subjects were drafted from a testing group using the older RLI system and the newer EOR platform. The EOR system limited the study's load because this is a more unique data analytic platform. Plus, the feasibility of the restrictions had to be accurately measured due to the resulting sample size. Data quality

has a vital role in the outcome presented because data management plays a critical role during research projects. These issues noted are essential to keeping accurate metrics for both LISs to ensure the proposed theories are reinforced by the data generated.

Recommendations

Albright and Winston (2017) stated stagnant data can lead to stagnant conclusions. This perception addresses how to collect patient data viable to the research being conducted. For future reference, I would recommend re-reviewing the statistical data within the next year or two to have more data points to analyze for the newer EOR system. This suggestion can help the data administrator to understand the data trends presented from both LIS systems. It is necessary to have reliable data to calculate the meaningful statistical significance for real-world and research analysis since research statistics should always be reproducible and amenable. Hence, the yielded data is significant in understanding the data model most effectively so the organization can continue improving the quality of data care throughout the organization. If errors are seen within the organizational data transfers, the technology team must find ways to eliminate these data transfer issues. The organization must have the capabilities to provide secure servers so the results can be received quickly without having increased service fees tied to the data transfers. Healthcare systems help track data collected, and the data can be utilized to create systematic reviews to compare the results yielded from a quality, efficiency, and overall cost service view. Experts believe health information technology is the key to improving on error rates while preserving the quality of care provided to the clients and the patients (Chaudhry et al., 2006). Overall, organizations must select

decisive and effective leaders since one must be comfortable making hard decisions. Key variables should be examined so that the patient results can be received on time. Organizations who lack critical features like effective e-health policy's, inadequate involvement of physicians, failure to establish business cased LIS systems (Ex: electronic health records), focusing primarily on national rather than regional interoperability, and the inflexibility approach when effective technologies are not implemented (Rozenblum, et al., 2011). This is why clinical data management (CDM) is a critical segment used to set the principal purposes for the CDMs since this group is designed to ensure patient results' timely delivery. Innovative methods can be used during these studies because reliable data analyses are needed. This method is a form of system thinking. This mechanism helps to diagram the relationship formed from numerous pattern changes that will eventually lead to better specificity charted justified results. Theories are always evolving, so the investigator must evaluate several alternative theory approach tactics throughout the study.

Implications for Professional Practice and Social Change

EOR is a newly integrated data system to close the gaps identified from the data transfer issues associated with the RLI system. EOR will help improve the organization to effectively monitor the extended lab's overall performance by capturing accurate metrics from the patient reports resulted in time. The study also contributes a positive social change by providing health information and technological advancements within the healthcare administration profession. This study also helped to eliminate and minimize human error due to the utilization of automated systems to preserve the quality of the

patient data sent and received. According to Wu et al., (2017), linking LIS systems helps ensure the delivery of quality results and improve patient treatment outcomes. In return, organizational change can push the company to be one of the leading market providers for any unique, third-party testing.

Conclusion

Healthcare overseers must continue to find secure ways to deliver patient results, so society can continue to see a rise in the quality of care provided to every patient. Technology advancements continue to aide in healthcare reform. In conclusion, researchers can use the data collected to form a meaningful impression directly related to the findings linked to the statistically significant relationships presented throughout this study. Those relationships are formed between the predictor and response variables for innovative collection methods. This applied concept is valuable when paired with reliable data analysis since it can ensure that a study's research advances due to the system thinking mechanisms. The diagrams presented illustrate the studies relationships established from the selected variables. Plus, investigators need to remember the study; talking points should be reproducible to other investigations similar to the research being presented. Research topics should always be amenable to utilize in more studies; as additional comparison studies are conducted. This is an applied process that helps make sure the data is *amenable for scientific purposes, so data researchers can foresee any challenges while using* different survey techniques to address any issues being presented during the study (Burkholder et al., 2016). Plus, in the end, the researchers can continue to improve the quality of data care offered throughout the entire organization.

The above points listed throughout this summary should be rational enough for healthcare establishments to update their LIS systems, these system updates lead to better-quality healthcare assessments because it's beneficial to the patient's, researchers and the physicians being serviced. To conclude, before moving forward with any system upgrades or installations, the healthcare administrator must conclude the validity of the software being applied. Confirm if the integrated systems are effectively interconnecting with the mainframe LIS so the organization continues to grow and develop by implementing these efficient technology data system renovations.

References

Albright, S. C., & Winston, W. L. (2017). *Business analytics: Data analysis and decision making* (6th ed.). Stamford, CT: Cengage Learning.

Baehl, R., Sidobre, S., Jones, J., McClain, R., Montgomery, S., Berry, N., & Kovach, G. (2016). *CLS electronic orders & results* [Data set]. Covance. Retrieved from http://www.covance.com

Middleton, B., Bloomrosen, M., Dente, M. A., Hashmat, B., Koppel, R., Overhage, J. M. … Zhang, J. (2013). Enhancing patient safety and quality of care by improving the usability of electronic health record systems: recommendations from AMIA. *Journal of the American Medical Informatics Association*, 1(e1), e2. https://doi.org/10.1136/amiajnl-2012-001458

Brusniak, M.-Y., Ramos, H., Lee, B., & Olson, J. M. (2019). Laboratory information management software for engineered mini-protein therapeutic workflow. *BMC Bioinformatics*, *20(*1), 1–10. http://dx.doi.org/10.1186/s12859-019-2935-x

Burkholder, G. J., Cox, K. A., & Crawford, L. M. (2016). *The scholar-practitioner's guide to research design.* Baltimore, MD: Laureate Publishing

Chaudhry, B., Wang, J., Wu, S., Maglione, M., Mojica, W., Roth, E., … Shekelle, P. G. (2006). Systematic review: Impact of health information technology on quality, efficiency, and costs of medical care. *Annals of Internal Medicine*, *144*(10), E12–W18. https://doi.org/10.7326/0003-4819-144-10-200605160-00125

Covance. (2017a). *Overview of health systems*. Retrieved from http://www.covance.com

Covance. (2017b). *Referral lab interface & manual resulting process* [Report]. Retrieved

from http://www.covance.com

Covance. (2020). *EOR and RLI test code turnarounds (TATs)* [Data set]. Retrieved from http://www.covance.com

Covance. (2019). *EOR internal and external assessment questions and feedback*. Retrieved from http//www.covance.com

Farhadi, M., Haddad, H., & Shahriar, H. (2019, July 15). *Compliance checking of open source EHR applications for HIPAA and ONC security and privacy requirements* [Paper presentation]. 2019 IEEE 43rd Annual Computer Software and Applications Conference (COMPSAC), Milwaukee, WI, United States. https://doi.org/10.1109/COMPSAC.2019.00106

Wu, F. M., Shortell, S. M., Rundall, T. G., & Bloom, J. R. (2017). The role of health information technology in advancing care management and coordination in accountable care organizations. *Health Care Management Review*, (4), 282. https://doi.org/10.1097/HMR.0000000000000123

Gegg, M. (2017). *EOR vs. RLI summary* [Report]. Covance. Retrieved from http://www.covance.com

Hsia, T.-L., Chiang, A.-J., Wu, J.-H., Teng, N. N. H., & Rubin, A. D. (2019). What drives e-health usage? Integrated institutional forces and top management perspectives. *Computers in Human Behavior*, *97*, 260–270. http://dx.doi.org/10.1016/j.chb.2019.01.010

Hunter, A., Dayalan, S., De Souza, D., Power, B., Lorrimar, R., Szabo, T., … Bellgard, M. (2017). MASTR-MS: A web-based collaborative laboratory information

management system (LIMS) for metabolomics. *Metabolomics*, *13*(2), 1–9. https://doi.org/10.1007/s11306-016-1142-2

Irizarry, T., Shoemake, J., Nilsen, M. L., Czaja, S., Beach, S., & Dabbs, A. D. (2017). Patient portals as a tool for health care engagement: A mixed-method study of older adults with varying levels of health literacy and prior patient portal use. *Journal of Medical Internet Research*, *19*(3), e99. http://dx.doi.org/10.2196/jmir.7099

Laboratory Information Management System (LIMS) Project. (2016). *Mena report*.

Linnen, D. T., Kipnis, P., Rondinelli, J., Greene, J. D., Liu, V., & Escobar, G. J. (2018). Risk adjustment for hospital characteristics reduces unexplained hospital variation in pressure injury risk. *Nursing Research*, *67*(4), 314–323. http://doi.org/10.1097/NNR.0000000000000287

Lippi, G., Mattiuzzi, C., Bovo, C., & Favaloro, E. J. (2017). Managing the patient identification crisis in healthcare and laboratory medicine. *Clinical Biochemistry*, *50*(10–11), 562–567. http://dx.doi.org/10.1016/j.clinbiochem.2017.02.004

Lopez, J. (2015). Carl A. Burtis and David E. Bruns: Tietz fundamentals of clinical chemistry and molecular diagnostics, 7th ed. *Indian Journal of Clinical Biochemistry, 30*(2), 243. https://doi.org/10.1007/s12291-014-0474-9

Lukić, V. (2017). Laboratory information system - Where are we today? *Journal of medical biochemistry*, *36*(3), 220–224. https://doi.org/10.1515/jomb-2017-0021

Martinez, D. A., Kane, E. M., Jalalpour, M., Scheulen, J., Rupani, H., Toteja, R., … Levin, S. R. (2018). An electronic dashboard to monitor patient flow at the Johns

Hopkins Hospital: Communication of key performance indicators using the Donabedian model. *Journal of Medical Systems*, *42*(8). http://dx.doi.org/10.1007/s10916-018-0988-4

McClain, R. (2016). *EOR project: Clinical trial process overview* [Report]. Covance. http://www.covance.com

Mourtzikou, A., & Stamouli, M. (2017). An update on best practices and regulatory requirements for the improvement of clinical laboratory services through quality. *International Journal of Reliable and Quality E-Healthcare (IJRQEH)*, *6*(1), 1-17. http://dx.doi.org/10.4018/IJRQEH.2017010101

Petrides, A. K., Tanasijevic, M. J., Goonan, E. M., Landman, A. B., Kantartjis, M., Bates, D. W., & Melanson, S. E. F. (2017). Top ten challenges when interfacing a laboratory information system to an electronic health record: Experience at a large academic medical center. *International Journal of Medical Informatics*,*106(1)*, 9–16. http://dx.doi.org/10.1016/j.ijmedinf.2017.06.008

Rozenblum, R., Jang, Y., Zimlichman, E., Salzberg, C., Tamblyn, M., Buckeridge, D., Tamblyn, R. (2011). A qualitative study of Canada's experience with the implementation of electronic health information technology. *CMAJ: Canadian Medical Association Journal = Journal De L' association Medicale Canadienne*, *183*(5), E281–E288. https://doi-org.ezp.waldenulibrary.org/10.1503/cmaj.100856

Sami, M., Bhatti, S., Baloch, J., & Shah, S. (2019). How to keep your systems records safe. *International Journal of Information Technology*, *11(1)*, 287–293.

https://doi.org/10.1007/s41870-018-0104-5

Sund, T., Iwarsson, S., & Brandt, Å. (2015). The relationship between the key elements of Donabedian's conceptual model within the field of assistive technology. *Studies in Health Technology and Informatics*, *217*(1), 485–490.

Wu, F. M., Shortell, S. M., Rundall, T. G., & Bloom, J. R. (2017). The role of health information technology in advancing care management and coordination in accountable care organizations. *Health Care Management Review*, *42*(4), 282–291. http://doi.org/10.1097/HMR.0000000000000123

Yaroslavtsev, A. V., & Matukhina, O. V. (2019). Creating the Web Service of the Laboratory Information and Management System for Analytical Quality Control. In *The International Scientific and Practical Forum "Industry. Science. Competence. Integration",* 643-649. Springer, Cham.