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Electronic Health Records: Influencing Performance at Critical Access Hospitals

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Abstract

This study examines the effectiveness of management decisions with implementing electronic health record's initiatives through the Health Information Technology for Economic and Clinical Health Act of 2009. Specifically, this research explores attested stages of Meaningful Use with impacts on profitability, costs, and financial liquidity in Washington State Critical Access Hospitals through an analysis of ratios and financial measures. These facilities are often anchors supporting local economic growth, and a closure can bring financial hardship throughout the community. There is a need in critical access hospital markets to establish a relationship between management decisions investing in new technologies coordinating patient care and understanding the long-term financial impact to mitigate risks of insolvency. For this study, a descriptive statistical analysis and a t-test are used to assess the differences between financial indicators and ratios. A t-test examined each hypothesis, supporting a conclusion that there is not a statistically significant difference between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

Keywords: Critical Access Hospitals, Meaningful Use, Balanced Scorecard, high-performance work systems.

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Chapter 1 - Introduction

> America needs to move much faster to adopt information technology in our health care system. . . . Electronic health information will provide a quantum leap in patient power, doctor power, and effective health care. We can't wait any longer. . . . Health information technology can improve quality of care and reduce medical errors, even as it lowers administrative costs. It has the potential to produce savings of 10 percent of our total annual spending on health care, even as it improves care for patients and provides new support for health care professionals. . . . This plan sorts out the myriad of issues involved in achieving the benefits of health information technology, and it lays out a coherent direction for reaching our goals (Thompson, 2004).

Healthcare literature has documented the financial struggles within the hospital industry (Landi, 2017; Monegain, 2017; Fannin & Nedelea, 2013; AHA, 2018; Coyne & Singh, 2008). Isolation, limited resources, and unstable economic infrastructures have significantly impacted Critical Access Hospitals (CAH's) and their ability to deliver care (NRHA, 2012). Declining reimbursements through the Affordable Care Act (ACA) and Federal requirements to implement electronic health records (EHR) through the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 will further challenge these hospitals with maintaining financial sustainability while meeting growing community needs. A greater understanding of how the HITECH Act impacts

CAH's shows that there is a current need to study the economic effects of implementing electronic health records.

The Critical Access Hospital program was created by the Balanced Budget Act of 1997 to preserve access to emergency and primary care services in rural communities while improving their financial condition (Fannin & Nedelea, 2013). To be designated a CAH, the Centers for Medicare and Medicaid Services (CMS) established specific criteria for certification. These include (a) be located in a rural area; (b) offer 24-hour emergency care services; (c) have 25 inpatient beds or fewer; (d) have an average 96 hour or less length of stay for acute care services (Centers for Medicare & Medicaid Services, 2016). Studies have found that 50 percent of rural hospitals have 25 or fewer beds, representing 50 percent of all licensed hospitals in the United States and accounting for 12 percent of healthcare spending. Additionally, when compared to their urban counterparts, rural hospitals are more dependent on Federal reimbursements, receiving, on average 60 percent of their revenue from Medicare and Medicaid (Health Research & Educational Trust, 2013).

As healthcare reform continues to evolve, CAH's often struggle with the complexities of implementing electronic health record (EHR) systems. These complexities can lead to disruptions in accounts receivable collection, decreasing liquidity, pressures on operating income, and interruptions in inpatient service (Landi, 2017). In their report on problems with EHR implementation, Moody's found hospital operating cash flows had declined by 10 percent. As a result, days cash on hand experienced a 6 percent reduction during the year of implementation. This research further suggests these declines were temporary, with hospitals quickly returning to pre-

installation levels within 12 months (Monegain, 2017). Others argue, however, that some hospitals never return to pre-installation financial performance and continue struggling with the burdens of EHR adoption (Bresnick, 2015). Senior managers of CAH's must continually address changes of how information is digitally processed and create an environment optimizing employee development and performance output to overcome these burdens and promote EHR implementation (Blavin, Ramos, Shah, & Devers, 2013).

Insolvency of a rural hospital extends beyond only losing local healthcare services and traveling to urban areas for care. These facilities are often anchors supporting regional economic growth (Doeksen, St. Clair, & Eilrich, 2016). Closure of a CAH can bring financial hardship throughout the community. Isolated from populated urban areas, rural communities are dependent on their hospitals as a source of medical care, to support an employment base, and to foster economic growth (Flex, 2010). Beyond primary, acute, and specialty care, these facilities provide long term skilled nursing care and rehabilitation services. Often as the most significant community employer, they drive economic growth outside the lanes of traditional healthcare to include banks, construction trades, laundry, and general retail (Casey, Moscovice, Holmes, Pink, & Hung, 2015). To ensure solvency, leadership teams of CAH's need to optimize their employment practices and identify whether the implementation of EHR has contributed to operational and financial efficiencies.

Electronic Health Records and Meaningful Use

The Office of National Coordinator for Health Information Policy (ONC), division of the United States Department of Health and Human Services (HHS) is the lead agency tasked with coordinating federal health information technology strategies,

programs, and policies (Gold & McLaughlin, 2016). Specifically addressing hospitals, this agency creates standards for EHR platforms while serving as a conduit collecting and sharing information, helping providers transition from volume-based financial incentives towards quality-based measures (ONC, 2018). While not directly tasked under HITECH with implementing incentive programs promoting EHR adoption, ONC provides a framework through their role of expanding health information exchanges (HIE) necessary to improve quality of care outcomes reporting and Meaningful Use (MU) initiatives.

Meaningful Use

While ONC is responsible for providing an operational framework within the provisions of the HITECH Act, the Centers for Medicare and Medicaid (CMS) is responsible for creating a system stimulating EHR growth. As an incentive for installing electronic health records systems and promoting technologies to capture the quality of care measures, CMS established a payment program to assist hospitals with offsetting some of the financial burdens associated with purchase and implementation (Heisey-Grove, Danehy, Consolazio, Lynch, & Mostashari, 2014). Meaningful Use is a program administered by CMS with the following core objectives (Eberth & Thomas, 2017):

- Reducing health disparities by improving the quality and efficiency of patient care
- Improving coordination of care through electronic exchange of patient information
- Promoting public and population health initiatives
- Engaging patients and family members with health education

The MU platform consists of three stages, requiring hospitals to certify their EHR program meets legal objectives as prescribed by CMS directives and policy. To qualify

for financial incentives, CMS requires hospitals to attest to each stage of meaningful use with electronic health records. The MU stages are: (1) measuring 24 core objectives with an emphasis on storing of electronic documents and reporting quality proficiencies, (2) assessing 22 core objectives with a focus on EHR participation in electronic health exchanges for sharing of patient information, and (3) focusing on quality improvements, safety, efficiency, and decision making (Hung et al., 2015). This research explores stages one and two of Meaningful Use for Washington State Critical Access Hospitals

Research Study

This study examines the effectiveness of management decisions to implement EHR initiatives through the HITECH Act of 2009. Specifically, this research explores stages of Meaningful Use (MU) with impacts on profitability, costs, and financial liquidity in Washington State Critical Access Hospitals through an analysis of ratios and financial measures. Profitability indicators measure an organization's ability to generate revenue to cover operational costs, service patients, and expand market share. Liquidity measures the organizational capacity to service debt, pay liabilities, and meet other cash obligations. Ratio analysis and measuring percentage change of revenues or expenses between periods are widely accepted and applied methods of gauging financial performance in hospitals (Alexander, Weiner & Griffith, 2006).

Problem Statement

With the implementation of the Affordable Care Act (ACA), Critical Access Hospitals are experiencing increased patient volumes fueled by the expansion of insurance coverage (Fannin & Nedelea, 2013). These patient volumes have not brought relief to some communities, as rural hospitals continue to close at an accelerating rate,

leaving gaps in acute care services, limiting access to specialty care procedures and creating economic hardships (Kaufman, Thomas, Randolph, Perry, Thompson, Holmes & Pink, 2016). Dynamics leading to these closures include aging facilities, high uninsured demographics, heavy reliance on Medicaid and Medicare reimbursements, and financial mismanagement (Wishner, Solleveld, Ruowitz, Paradise & Antonisse, 2016).

Providing additional incentives to implement EHR, the HITECH Act of 2009 authorized the creation of payment programs to CAH's to assist with offsetting some of the financial costs associated with purchasing these systems. To qualify for these financial incentives, CAH's must achieve Meaningful Use (MU) with their electronic health records. The MU stages are: stage 1, storing of electronic records to report quality measures; stage 2, enhancing electronic exchanges, and stage 3, quality improvements, safety, efficiency, and decision making (Hung, Casey & Moscovice. 2015).

In 2015, the Meaningful Use incentive program transitioned into a broader-based CMS platform. The Medicare Access and CHIP Reauthorization Act (MACRA) was created to be transformative and shift the healthcare marketplace from fee for service reimbursement schedules to a merit-based incentive payment system (MIPS). This mandate has required CAH's to report feedback on the quality of care, EHR, clinical outcomes, and resource use (Phelps, Thomas, Cruse, & Esquibel, 2015). Reimbursements for patient care are then determined based on Medicare cost reporting outcomes.

As healthcare providers transition from fee for service to value-based care, CAH’s need to ensure they capture meaningful administrative information, quality of patient care outcomes, and financial data through electronic records, thereby mitigating decreases in

potential patient service billings and revenues. This study is limited to EHR implementation as defined by the HITECH Act of 2009 and does not include the MU transition into MACRA.

Significance of the study

Hospitals continue to close at alarming rates. A study by the American Hospital Association estimates there are 1,350 Critical Access Hospitals in the United States (AHA, 2018). During the years 2010 to 2019, 118 facilities closed primarily due to financial stress, with negative operating margins and lack of liquidity to service fixed costs and debt (U.S. Government Accountability Office, 2018; NC Rural Health Research Program, 2019).

There are existing research studies mitigating financial insolvency through financial and operational indicators at CAH's (Joynt, Harris, Orav, & Jha, 2011; Pink, Holmes, Slifkin, & Thompson, 2009; Flex, 2009), but there is minimal research aligning EHR adoption and MU decisions. This study will explore stages of Meaningful Use with impacts on financial liquidity, profitability, and labor costs in Washington State Critical Access Hospitals.

With an increasingly complex healthcare environment, leaders need to be aware of economic impacts in managing their financial operations. Existing research has implied there is a direct relationship between effective management of patient account receivables, cash flows, and organizational profitability. Others have suggested there is a link between profitability and firm liquidity, measuring through performance indicators (Singh & Wheeler, 2012; Goodspeed, 2006; Upadhyay & Smith, 2016).

Can the demise of a rural hospital be predicted? Financial and operational ratios are early predictors of an eventual closure (Lynn & Wertheim, 1993; Coyne & Singh, 2008; Wishner et al., 2016). A direct relationship exists between poor cash flow management and insolvency among healthcare organizations (Landry & Landry, 2009; Liu, Jervis, Younis, & Forgione, 2011)

There is a need in rural CAH markets to establish a relationship between management decisions investing in new technologies coordinating patient care and understanding the long-term financial impact to mitigate risks of insolvency. Beyond expanding existing academic research, information from this study will help healthcare consultants, government agencies, human resource managers, and management teams of CAH's develop effective strategies to promote organizational performance.

Purpose of this Study

The purpose of this study is to examine the effectiveness of management decisions in CAH's to implement EHR initiatives through the HITECH Act of 2009. This study assessed the relationship between MU Stage 2 attestation and impacts on operational and financial performance outcomes within the revenue cycle of Washington State Critical Access Hospitals.

Research questions

Q1: Is there a difference between implementing Stage 2 Meaningful Use and increasing operating margins in Washington State Critical Access Hospitals?

Q2: Is there a difference between implementing Stage 2 Meaningful Use and salaries as a percentage of net patient revenue in Washington State Critical Access Hospitals?

Q3: Is there a difference between implementing Stage 2 Meaningful Use and increasing financial liquidity in Washington State Critical Access Hospitals?

Assumptions and Limitations

Payment for patient care is shifting towards value-based reimbursement for hospitals. There is an underlying assumption that updating software platforms will lead to higher financial efficiencies while digitally capturing the quality of care and operational data. This study is limited to examining stages of Meaningful Use before merging into the MACRA program. As of January 2019, there are an estimated 1,349 CAH's in the United States (RHIHub, 2019), but this study is limited to explicitly examining 39 CAH's in Washington State.

Definitions of Terms

The following terms are in this research study:

Critical Access Hospitals

The Critical Access Hospital program was created by the Balanced Budget Act of 1997 to preserve access to emergency and primary care services in rural communities while improving their financial condition (Fannin & Nedelea, 2013). To be designated a CAH, a hospital must meet specific criteria and standards for certification established by the Centers for Medicare and Medicaid Services (CMS).

Revenue Cycle

The revenue cycle is a process of management and collecting activities capturing patient service revenues through clinical and administrative functions. Interlinking examples of this include patient scheduling, insurance verification, capturing charges and coding, claim submission, and payment remittance.

Current Ratio

The current ratio measures the ability to pay current liabilities with current assets that can be converted to cash within a 12-month cycle. A ratio yielding less than 1:1 would signify impending liquidity issues. This indicates current liabilities exceed current assets. Values less than 2:1 suggest a potential for liquidity risk (Nowicki, M., 2018).

Days in Accounts Receivables

Days in accounts receivable measures the average time for a hospital to collect on an insurance claim and patient account. A high number of days can be disruptive to cash flows and indicate problems within the early stages of the revenue cycle. Lower values imply a higher efficiency of processing and collecting accounts receivable (Flex, 2005).

Days Cash on Hand

Days cash on hand measures how many days a hospital could remain operational, paying outstanding expenses with current unrestricted cash funds. While high days imply solvency, this might indicate a lack of planning by management, developing a short-term investment strategy yielding higher returns (Singh & Wheeler, 2012). Lower days, when weighed against other measures of liquidity, could suggest increasing problems with sustaining financial operations (Nowicki, M., 2018; Upadhyay & Smith, 2016).

Operating Margin

Operating margin measures operating revenue relative to operating expenses required for patient care. Operating expenses include all costs associated with delivering hospital services. An example of these expenses are wages, employee benefits, medical supplies, bad debts, lease payments, and interest expense (Hahn, 2015). A positive percentage value indicates revenues are higher than costs while a negative value suggests

the hospital is operating at a loss, with expenses exceeding patient revenues (Pink, Freeman, Randolph & Holmes, 2013).

Salaries to Net Patient Revenue

Salaries to net patient revenue measures operating revenue from patient care relative to labor costs associated with that care. A lower value indicates management is efficiently controlling labor costs. Overstaffing can lead to labor inefficiencies, directly impacting hospital profitability (Nowicki, M., 2018).

Meaningful Use

Meaningful Use was established through the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 to standardize interoperable electronic health records. Through the certified stages of Meaningful Use, the Centers for Medicare and Medicaid Services (CMS) and other Government agencies can ensure EHR technology is connected for information exchanges and aligned to improve the quality of care. In 2015, the Meaningful Use incentive program transitioned into a broader, merit-based platform established through the Medicare Access and CHIP Reauthorization Act (MACRA).

Balanced Scorecard Theory

The use of financial and operational ratios as a vehicle for measurement is rooted in the Balanced Scorecard Theory. This theory was first proposed by Kaplan and Norton (1992) as a tool for organizations to measure, align, and drive performance (Abdullah, Umair, Rashid & Naeem, 2013). Balanced Scorecard is widely used in healthcare to assess financial, learning and growth, patient satisfaction, and internal process perspectives (Hwa, Sharpe & Wachter, 2013).

High-Performance Work System

A system in hospitals aligning operational practices with employees who are impassioned and committed to performance. Hospitals have adopted features of HPWS to improve financial and operational outcomes (Mihail, & Kloutsiniotis, 2016). Aspects of HPWS are associated with mitigating hospital costs while increasing quality of care (Scotti, Harmon, & Behson, 2007), improving employee retention (Bartram, Karimi, Leggat, & Stanton, 2014), and reducing patient infection rates (Lee, Lee, & Kang, 2012).

Chapter 2- Literature Review

Critical access hospitals (CAH's) are closing at alarming rates. During the period 2010 to 2019, 118 facilities shuttered, leaving rural communities vulnerable for accessing emergency and acute care (American Hospital Association, 2018). Closure of a hospital can bring financial hardship throughout the community. Often the largest community employer, they drive economic growth outside the lanes of traditional healthcare to include banks, construction trades, laundry, and general retail (Casey et al., 2015). There is a need in rural markets to establish a relationship between management decisions to invest in new technologies coordinating patient care and understanding the long-term financial impact to mitigate the risk of insolvency.

Healthcare facilities depend on a highly skilled labor force that is service-oriented with a willingness to embrace change through new, innovative technologies. This literature review examines the use of high-performance work systems (HPWS) to harness employee involvement and increase CAH performance. Human resource departments in these hospitals are limited by financial constraints from fully adopting the HPWS platforms of their urban counterparts. To compensate, they have begun to align their practices with the Balanced Scorecard, creating performance-based frameworks specifically designed for rural healthcare providers

Critical Access Hospitals

The Critical Access Hospital (CAH) program was created by the Balanced Budget Act of 1997 to preserve access to emergency and primary care services in rural communities. Federal legislation was needed to improve financial sustainability and mitigate increasing trends of hospital insolvencies (Fannin & Nedelea, 2013). Prior to this legislation, low-volume, rural hospitals were struggling to recover Medicare costs under the prospective payment system. This program increased reimbursements for inpatient care, outpatient services, and post-acute services to 101 percent of Medicare costs (WIORF, 2013). To be designated a CAH, the Centers for Medicare and Medicaid Services (CMS) established specific criteria for certification. This criteria includes (a) being located in a rural area; (b) offering 24-hour emergency care services; (c) having 25 inpatient beds or fewer; (d) having an average 96 hour or less length of stay for acute care services (Centers for Medicare & Medicaid Services, 2016).

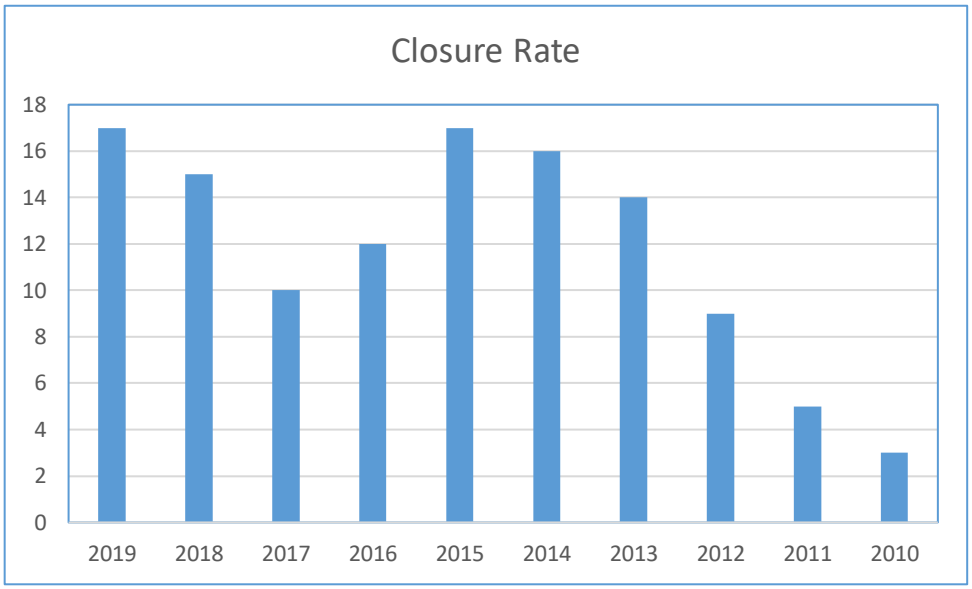
The impact of CAH's providing medical services in rural communities is significant. Studies have found that these facilities represent 50 percent of all licensed hospitals in the United States and account for 12 percent of healthcare spending. Unlike their urban counterparts, CAH's are more dependent on Federal reimbursements, receiving on average 60 percent of their revenue from Medicare and Medicaid (Health Research & Educational Trust, 2013). This greater reliance on Medicare and Medicaid revenues has led to increasing financial pressures and disruption in the quality of care for patients.

Insolvency of a rural hospital extends beyond simply losing local healthcare services and traveling to urban areas for care. These facilities are often anchors

supporting local economic growth (Doeksen, St. Clair, & Eilrich, 2016). Closure of a CAH can bring financial hardship throughout the community. Isolated from populated urban areas, rural communities are dependent on their hospitals not only as a source of medical care but also to support an employment base, and foster economic growth (Flex, 2010). Beyond primary, acute, and specialty care, these facilities provide long-term skilled nursing care and rehabilitation services. Often as the largest community employer, they drive economic growth outside the lanes of traditional healthcare to include banks, construction trades, laundry and general retail (Casey et al., 2015)

Hospitals are closing at alarming rates. A study by the American Hospital Association has estimated 30 hospitals closed in 2018 (AHA, 2018). CAH's have not escaped this trend. As detailed in Table 1,'Critical Access Hospital Closure Rates during the years 2010 to 2019', 118 facilities closed primarily due to financial stress caused by negative operating margins and lack of liquidity to service fixed costs and debt (U.S. Government Accountability Office, 2018; NC Rural Health Research Program, 2019).

Table 1– Critical Access Hospital Closure Rates



There is a need in rural CAH markets to establish a relationship between management decisions to invest in new technologies coordinating patient care and understanding the long-term financial impact to mitigate the risk of insolvency. This study will examine the effectiveness of management decisions of implementing EHR initiatives through the HITECH Act of 2009.

Human Resources: A Systems Approach

With increasing market pressures to remain competitive, healthcare organizations need to synergize their talent management resources and align with strategic goals and objectives, thereby embracing the practices of high performance organizations (HPO). Organizations can develop systems aligning operational practices with employees who are impassioned and committed to performance (Gephart & Van Buren, 1996). These systems are often referred to as high-performance work systems (HPWS).

Human resource (HR) practices continue evolving, being driven by organizations seeking optimal performance through employee expertise (Jacobs & Jones, 1995). This

evolution is requiring HR to assume an active role in shaping business strategy (Torraco & Swanson, 1995). Accordingly, talent management practices must be aligned with organizational strategic goals and objectives, optimizing the firm's outcomes (Gilley & Maycunich, 2000). To accomplish this, HR departments must evaluate their current role within the organization, identify future needs based on performance, quality, and production goals, then realign to boost talent management processes in achieving high-performance goals.

De Waal (2007) described a high performance organization (HPO) as achieving financial measurements beyond those of its competitors over a sustainable period of time, by adapting quickly to market changes through the alignment of strategy and management structures, while valuing employees as "main assets." For hospitals to align their strategies and structures with employees, they need to adopt high-performance work systems (HPWS). The success of a hospital in reaching optimal performance is completely dependent on management's ability to use employee expertise in achieving defined business objectives.

The Evolution of Human Resources

Resources in modern organizations consist of physical, financial, and human resources (Gilley, Eggland & Gilley, 2002). Physical resources are associated with tangible and fixed assets, including property, plant, equipment, and raw inventory parts available to make finished goods. These resources provide visual evidence, feeding perceptions of measurable success and promoting stability and strength. Financial resources are an organization’s ability to leverage opportunities for growth and expansion. Accordingly, these types of resources are liquid (cash, investments, accounts

receivable, bank CD's, and operating capital) and used by financial institutions as measurements in determining financial and loan covenants through the use of working capital or acid test ratio analysis. While physical and financial resources are easily quantifiable, human resources are just as valuable but are often overlooked because of the difficulties of measuring performance contributions (Gilley et al., 2002). The HR functions of the past have evolved, creating new opportunities for talent management business units to be an active participant in enhancing organizational performance, capability, and competitive readiness.

While hospital HR departments of today continue dealing in day-to-day functions of administrative duties, much of their responsibilities resemble little of the past. The convergence of technology and the demand for a skilled workforce brought forth the realization that to achieve corporate strategies and objectives, transformation needed to occur within human resources (Nojedeh, 2015). The operational focus of employee assessment, selection, training, and retention has been replaced by systems and processes designed to connect people to management (Broek, Boselie & Paauwe, 2018). With continued advancements in new technology, reimbursement methodologies, and changes in the regulatory environment, there is a trend within hospitals to be more innovative and creative in their hiring practices (Tan & Nasurdin, 2011). These facilities are now taking a holistic approach, viewing employees as valuable assets and embracing platforms aligning hospital strategies with high-performance work systems.

Practice Dimensions of a High Performance Work System

The healthcare market is driven by new technologies and innovation. While organizations of the past relied on the theories of Taylor (scientific management),

McGregor (Theory X and Theory Y), and Maslow (hierarchy of needs) to achieve efficiencies, hospitals of today must embrace new employee practices to remain competitive. To meet this challenge, hospitals have begun to adopt the principles of high-performance work systems (HPWS), (Lee, Lee, & Kang. 2012; Bartram et al., 2014; Mihail & Kloutsiniotis, 2016). Although there is no universal definition of HPWS, Appelbaum & Batt (1993) suggest it is a system designed around skills development, participation in decision making, and targeted incentives. Nadler, Gerstein & Shaw (1992), further refine HPWS as:

> An organizational architecture that brings together work, people, technology and information in a manner that optimizes the congruence of fit among them in order to produce high performance in terms of the effective response to customer requirements and other environmental demands and opportunities (p. 118).

While Appelbaum, Bailey, Berg & Kalleberg (2000) argue that HPWS practices should be bundled into four categories (teamwork, incentives, development, communications) with 13 measurable practices, others (Ashton & Sung, 2002) suggest organizations should define their practices with the following four dimensions:

- *Employee autonomy.* This includes the use of self-managed work teams and increased opportunities for employee cross-training and skill development.
- *Support for employee performance.* This practice is designed to support an employee appraisal system through mentoring and coaching.
- *Rewards for performance.* Systems of performance must be created to reward and motivate individual and group performance.

- *Sharing information/knowledge.* The practice of sharing information and knowledge should be looping to ensure it is interwoven with organizational strategy, management, and employee structures to promote participation in decision making.

Although there is not a clear label defining HPWS, hospitals can harness employee involvement, thereby increasing their operational performance.

HPWS in Hospitals

Hospitals depend on a highly skilled labor force that is service-oriented with a willingness to embrace change through new, innovative technologies. These employees are often required to operate advanced machinery to deliver patient care (Agarwal, Green, Agarwal, & Randhawa, 2016). To sustain competitive advantages, hospitals have adopted features of HPWS to improve financial and operational outcomes (Mihail, & Kloutsiniotis, 2016). Aspects of HPWS have been associated with mitigating hospital costs while increasing quality of care (Scotti et al.,2007), improving employee retention (Bartram et al., 2014), and reducing patient infection rates (Lee et al., 2012).
Human resource departments in CAH's are typically limited by financial resources in fully adopting the HPWS platforms of their urban counterparts. To compensate, they have begun to align their practices with the Balanced Scorecard, creating performance-based frameworks specifically designed for rural healthcare providers.

Measuring success: Balanced Scorecard Theory

The Balanced Scorecard (BSC) provides a framework for measuring improvements and aligning with strategic initiatives (Awadallah & Allam, 2015). This theory was first proposed by Kaplan and Norton (1992) as a tool for organizations to

measure, align, and drive performance (Abdullah et al., 2013). Through this approach, organizations can continually link financial information with tangible resources and intangible assets. BSC framework consists of four interrelated perspectives (Kaplan, 2010):

- *Learning and growth* - Measures organizational development with learning innovative operational processes to remain competitive
- *Financial* - Assesses financial performance impacting stakeholders and bottom-line improvements
- *Internal business process* - Evaluates internal operations of organizations critical to satisfying customer needs
- *Customer* - Measures customer needs through determinates of time, costs, quality, and performance

The BSC approach is used in urban hospitals and larger healthcare systems to assess financial, learning and growth, patient satisfaction, and internal process perspectives (Hwa et al., 2013; Catuogno, Arena, Saggese & Sarto, 2017; Gurd & Gao, 2008). While many hospitals have the capacity, staffing, and funds available to integrate a comprehensive framework interrelating these four dimensions, the challenge for CAH's is finding a model that is relevant and affordable.

The Department of Health and Human Services commissioned a study investigating the implications of integrating BSC dimensions into rural hospitals. From this, the Balanced Scorecard for small rural hospitals was developed (HRSA, 2005). This scaled approach retains the four perspectives of Kaplan and Norton (1992), with modifications designed for hospitals providing patient care in rural communities. These

modifications include (a) engaging and involving leadership; (b) education of internal and external stakeholders; (c) data: gathering, processing, and benchmarking, and (d) building long-term sustainability. Bringing greater awareness to data gathering, processing, and benchmarking, the Flex Monitoring Team developed a CAH financial indicators report, creating a level of standardization for hospitals seeking to benchmark their financial and operational information (Flex, 2005).

The Flex Monitoring Team is a consortium of the Rural Health Resource Centers located at the Universities of Southern Maine, Minnesota, and North Carolina at Chapel Hill. Their ongoing research is funded through the Federal Office of Rural Health Policy. Specific to their objectives are improving quality of care, developing health systems, and increasing the financial performance of CAH's (Flex, 2005). In their effort to increase financial performance and provide national comparable benchmarking measures, the Flex Monitoring Team created a list of 23 performance indicators (Flex, 2019). These indicators are further categorized into the dimensions of :

- *Liquidity:* Current ratio, gross days in accounts receivable, net days in accounts receivable, and days cash in hand
- *Profitability*: Total margin, cash flow margin, return on equity, and operating margin
- *Capital Structure*: Equity financing, debt service coverage, and long-term debt to capitalization
- *Revenue*: Outpatient revenues to total revenues, patient deductions, Medicare inpatient mix, Medicare outpatient mix, Medicare outpatient cost to charge, and Medicare acute inpatient cost per day

- *Costs*: Salaries to net patient revenue, the average age of plant, FTE's per adjusted occupied bed, and average salary per FTE
- *Utilization:* Average daily census – swing/SNF beds, and average daily census – acute bed.

The dimensions of liquidity, profitability, and costs will be used in this study to examine the effectiveness of management decisions to implement EHR initiatives through the HITECH Act of 2009.

Financial Liquidity

Access to innovative equipment and adopting new technologies to increase patient care and experiences is influencing hospital executive decisions. Investment in infrastructure and capital-intensive projects require the ability to raise funds (Lee, 2015). The inability to raise capital or debt financing, with decreasing hospital solvency, goes beyond troubles with meeting cash flows. Liquidity issues can directly impact the quality of care. Higher infection rates, readmit patients, staffing shortages, and low compliance standards are common problems with financially stressed hospitals (Dong, 2015). The inability to meet basic patient needs can impact community perceptions. Referring physicians and patients are the primary source generating hospital revenue. They often associate higher levels of care with investments in infrastructure, new technologies, and greater amenities (Curtis & Roupas, 2009). To avoid problems and assess this need for additional resources, hospital management must continually evaluate the liquidity and solvency of their facility.

Financial liquidity is the short-term ability to pay liabilities with current asset resources. When solvency decreases, hospitals struggle meeting cash flow needs, paying

vendors, equipment leases, and employees. This can lead to broader issues with credit ratings, thereby increasing the cost associated with debt financing (Curtis & Roupas, 2009). To monitor liquidity, hospital managers can employ a dashboard of key performance indicators (KPI's), assessing continual changes with their financial performance.

Ratio analysis and measuring percentage change of financial statement accounts between periods are widely accepted and applied instruments to measure financial performance in hospitals (Alexander et al., 2006). For this study, a review of liquidity, through ratio analysis, will be performed. Specifically, current ratio, days cash on hand, and days in accounts receivable will be reviewed and analyzed for 39 Washington State Critical Access Hospitals. These liquidity ratios measure the ability to service debt, pay liabilities, and meet other cash obligations (Curtis & Roupas, 2009).

Current Ratio

Current ratio measures the ability to pay current liabilities with current assets that can be readily converted to cash within a 12-month cycle. A ratio yielding less than 1:1 would signify impending liquidity issues. This indicates current liabilities exceed current assets. Values less than 2:1 suggest potential for liquidity risk (Nowicki, 2018). Hospitals with values of 200 percent or greater are considered to be solvent for purposes of this study.

Calculation: $\frac{\text{Current Assets}}{\text{Current Liabilities}}$

Net Days in Accounts Receivables

Days in accounts receivable measures the average time for a hospital to collect on an insurance claim and patient account. A high number of days can be disruptive to cash

flows and indicate problems within early stages of the revenue cycle. Lower values imply a greater efficiency with processing and collecting accounts receivable (Flex, 2005).

Calculation: $\frac{\text{Net patient accounts receivable}}{(\text{Net patient revenue}/\text{Days in period})/365}$

Days Cash on Hand

Day's cash on hand measures how many days a hospital could remain operational paying outstanding expenses with current, unrestricted cash funds. While high days imply solvency, this might indicate a lack of planning by management, developing a short-term investment strategy yielding higher returns (Singh & Wheeler, 2012). Lower days, when weighed against other measures of liquidity, could suggest increasing problems with sustaining financial operations (Nowicki, 2018).

Calculation: $\frac{\text{Cash + temporary investments +investments}}{(\text{Total expenses – depreciation})/\text{Days in period}}$

Profitability and Cost

Critical access hospitals have a high dependency on Federal reimbursements. They receive, on average, 60 percent of their revenue from Medicare and Medicaid (Health Research & Educational Trust, 2013). For many facilities, this has led to increasing pressures to manage cost structures to achieve profitability. Further impacting financial operations, the landscape of reimbursements for hospital care is quickly changing and evolving. Reimbursements for care have shifted away from fixed-rate, reasonable cost models to structures that take into account value-based purchasing measures of quality (Gapensk & Reiter, 2016). These measures include the clinical process of care, patient experience of care, outcomes, and efficiencies (Jerzak, 2015).

Hospitals must lean on a highly skilled labor force that is service-oriented and embraces strategies of measuring performance outcomes to optimize high levels of reimbursement (Agarwal et al., 2016).

To achieve long term sustainability, hospital managers must continually review their financial performance through operational profitability. Profitability is a key determinant impacting costs, the spectrum of patient care, and liquidity in hospitals (Cho & Hong, 2018). Creating labor efficiencies through systems of cost management can increase profitability for hospital facilities. With an orientation towards service, wages are often the highest expense category for CAH's (Flex, 2005). For this study, a review of profitability and salaries to net patient revenue through ratio analysis will be performed.

Operating Margin

Operating margin measures operating revenue relative to operating expenses required for patient care. Operating expenses include all costs associated with delivering hospital services. Examples of these expenses are wages, employee benefits, medical supplies, bad debts, lease payments, and interest expense (Hahn, 2015). A positive percentage value indicates revenues are greater than expenses while a negative value suggests the hospital is operating at a loss, with expenses exceeding patient revenues. (Pink et al., 2013).

Calculation: $\frac{\text{Net Patient Revenue + Other Revenue – Total Operating Expenses}}{\text{Net Patient Revenue + Other Revenue}}$

Salaries to Net Patient Revenue

Salaries to net patient revenue measures operating revenue from patient care relative to labor costs associated with that care. A lower value indicates management is

efficiently controlling labor costs. Overstaffing can lead to labor inefficiencies directly impacting hospital profitability (Nowicki, M., 2018).

Calculation: $\frac{\text{Salary Expense}}{\text{Net Patient Revenue}}$

To achieve high performance within the Balanced Scorecard approach benchmarking and monitoring key performance indicators (KPI's), management teams of CAH's must lean on the principles of HPWS, creating efficiencies within the revenue cycle. Managing the revenue cycle stabilizes revenues, increases financial margins, and improves the quality of care (Billingsley & Williams, 2016).

Managing the Hospital Revenue Cycle

Complexities of Federal and State regulations, patient privacy rules, non-standard insurance reimbursements, and quality reporting measures have complicated the efforts by hospitals to remain profitable (Nowicki, 2018). To stabilize revenues, increase financial margins, and meet the quality of care goals, hospital leaders have increased their efforts to manage the revenue cycle (Billingsley & Williams, 2016). The hospital revenue cycle is often described as the life cycle of patients. This process begins with patient registration and ends with final collections for services provided. Management stages within the revenue cycle are outlined below in Figure 2 – Hospital Revenue Cycle Management.

Figure 2 – Hospital Revenue Cycle Management

Stages within the revenue cycle are not unique to CAH's or their urban acute care counterparts. Each stage must be managed through best practices, achieving optimal patient satisfaction and quality measures. To accomplish this, hospitals collectively rely on EHR systems, highly skilled employees, and benchmarking to achieve desired outcomes. When failure occurs between stages, this can create disruption in later stages, thereby impacting cash flows. To illustrate, rejected or denied claims require additional hospital resources to resolve. These claims are denied or rejected by insurance companies for systematic input errors in data entry, or lack of preauthorization during insurance verification and eligibility (Gapenski & Reiter, 2016). Data entry errors and

missing information are often identified 30-40 days later in the process with accounts receivable follow up. Stage activity is detailed below in Table 2 – General description of activity within stages of the revenue cycle.

Table 2 – General description of activity within stages of the revenue cycle

Stage Sequence	Revenue Cycle Activity	Description of Activity
1	Patient Scheduling & Registration	• Receive a patient referral from the physician's office. • The patient is scheduled for admission, clinical test, or procedure. • Copays are collected
2	Insurance Verification & Eligibility	• Hospital business office staff contact insurance company and verify coverage. • Pre-authorization numbers are obtained for scheduled tests or procedures.
3	Medical Coding	• Clinical notes are reviewed and assigned ICD-10, CPT and DRG Hospital codes
4	Charge Capture & Data Entry	• Patient information, pre-authorizations, clinical notes, and Medical coding are collected and aligned with insurance type, and Master Charge Schedule
5	Claims Transmission	• Claims are submitted electronically through various vendors
6	Payment Posting	• Once the Explanation of Benefits (EOB) has been received, payment is posted to the patient's account.
7	Accounts Receivable & Denial Management	• Accounts receivable staff follow up on outstanding insurance and patient balances. • Responsibility of accounts receivable staff to identify denied or rejected claims.
8	Correspondence Follow up	• Missing clinical information or correspondence necessary to resubmit the claim for collection.
9	Self-Pay Follow up	• Patients are contacted for follow up balance billing
10	Collections	• “Stale dated” accounts are sent to outside collection agency.

Critical access hospitals depend on federal reimbursements, receiving, on average, 60 percent of their revenue from Medicare and Medicaid (Health Research & Educational Trust, 2013). With greater reliance on Medicaid and Medicaid revenues, these hospitals

will need to continually review pending and approved state and federal healthcare policies to determine impacts on operational and financial strategies.

Health Information Technology for Economic and Clinical Health Act

While other industries embraced new technologies promoting digital processes, the healthcare industry continued using outdated electronic revenue cycle management systems, requiring high use of paper records, creating greater challenges coordinating patient care (Cleveland, 2015). In an effort to increase the adoption of interoperable electronic health records and promote new technologies reforming care, the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 was enacted (Adler-Milstein & Jha, 2017). Framework of this policy specifically addresses three functions: (a) recognizes Office of National Coordinator for Health Information Policy (ONC); (b) strengthens patient security and privacy requirements found in the Health Insurance Portability and Accountability Act of 1996 (HIPAA), and (c) provides an incentive program for healthcare providers to adopt technologies promoting electronic health records systems.

The Office of National Coordinator for Health Information Policy (ONC), division of the United States Department of Health and Human Services (HHS), is the lead agency tasked with coordinating federal health information technology strategies, programs, and policies (Gold & McLaughlin, 2016). Specifically addressing hospitals, this agency creates standards for EHR platforms while serving as a conduit collecting and sharing information, helping providers transition from volume-based financial incentives towards quality-based measures (ONC, 2018). While not directly tasked under HITECH with implementing incentive programs promoting EHR adoption, ONC provides a

framework through their role with expanding the health information exchanges (HIE) necessary to improve quality of care outcomes reporting and Meaningful Use (MU) initiatives.

Meaningful Use

While ONC is responsible for providing an operational framework within the provisions of the HITECH Act, the Centers for Medicare and Medicaid (CMS) is tasked with creating a system stimulating EHR growth. As an incentive for installing electronic health records systems and promoting technologies to capture the quality of care measures, CMS established a payment program to assist hospitals with offsetting some of the financial burdens associated with purchase and implementation (Heisey-Grove et al., 2014). Meaningful Use (MU) is a program administered by CMS with the following core objectives (Eberth & Thomas, 2017):

- Reducing health disparities by improving the quality and efficiency of patient care
- Improving coordination of care through electronic exchange of patient information
- Promoting public and population health initiatives
- Engaging patients and family members with health education

The MU platform consists of three stages, requiring hospitals to certify their EHR program meets legal objectives as prescribed by CMS directives and policy. To qualify for financial incentives, CMS requires hospitals to attest for each stage of meaningful use with electronic health records. The MU stages are: (1) measures 24 core objectives with an emphasis on storing of electronic records and reporting quality proficiencies; (2) assesses 22 core objectives with a focus on EHR participation in electronic health

exchanges for sharing of patient information, and (3) focuses on quality improvements, safety, efficiency, and decision making (Hung et al., 2015).

This research explores stages one and two of Meaningful Use for Washington State Critical Access Hospitals (CAH's). MU attestation stage data for the periods 2014 – 2018 was extracted from the ONC website. Hospitals are listed by assigned National Provider Identifier (NPI) numbers. A crosswalk file was used to link NPI numbers from the CMS data registry to licensed Washington State CAH's. For this study, 28 hospitals have been identified as achieving a level of Medicare MU attestation.

Affordable Care Act: Expansion of Care

The Patient Protection and Affordable Care Act (ACA) of 2010 brought forth pathways promoting insurance coverage through Medicaid expansion programs and consumer health exchanges (Buettgens. Garrett & Holahan, 2010). Rural communities have been impacted by these initiatives. ACA affords individual states an option of expanding Medicaid coverage by increasing threshold requirements. While some states have elected to opt-out of expanding Medicaid programs, others argue expansion will reduce the volume of uninsured while bringing in federal Medicaid funds to offset some of the costs associated with care (Dorn, McGrath & Holahan, 2014). Existing research suggests Medicaid expansion has increased insurance coverage, access to care, and utilization of services in rural communities among low-income populations (Antonisse, Garfield, Rudowitz & Artiga, 2018). As with Medicaid expansion, the health exchanges under ACA have increased insurance coverage for people living in rural communities. With fewer plan choices, smaller risk pools, and higher premiums, rural residents

disproportionally enroll in low coverage health plans, thereby increasing their out of pocket costs when needing care (Williams & Holmes, 2018).

Medicaid expansion in rural communities has decreased uncompensated care at Critical Access Hospitals, but this has not brought financial relief to these facilities (Dranove, Garthwaite & Ody, 2017). Low coverage health plans have increased pressures on charity care programs at these hospitals (Williams & Holmes, 2018). Furthermore, CAH's continue struggling with increasing costs, decreasing operating margins, and disruption in quality of care for patients.

Conclusion

With a progressively complex healthcare environment and greater reliance on Medicare and Medicaid revenues in rural communities, Critical Access Hospitals are experiencing increasing pressures to remain financially viable and competitive. Beyond primary, acute, and specialty care, these facilities provide long-term skilled nursing care, rehabilitation services, and promote general economic growth in their communities. To mitigate the risk of insolvency, management teams at CAH's must understand the dynamics between their decisions to invest in new technologies coordinating patient care and the long-term financial impacts.

All hospitals, including CAH's, depend on a highly skilled labor force that is service-oriented, with a willingness to embrace change through the use of new technologies. These employees are required to operate imaging equipment, surgical robotics, and other machinery advancing patient care (Agarwal et al., 2016). To sustain competitive advantages with talent management practices, hospitals have adopted features of HPWS to improve financial and operational outcomes (Mihail, &

Kloutsiniotis, 2016) and increase quality of care (Scotti et al., 2007) while, reducing costs and infection rates (Lee et al., 2012).

Talent management practices in CAH's are limited by financial constraints from adopting broader aspects of HPWS platforms. To compensate, they can selectively align HPWS practices through a Balanced Scorecard framework specifically designed for rural hospitals. This scaled approach considers the interrelationships between (a) engaging and involving leadership; (b) education of internal and external stakeholders; (c) data: gathering, processing, and benchmarking, and (d) building long-term sustainability. To quantify and measure data gathering, processing, and benchmarking, the Flex Monitoring Team developed a CAH financial indicators report, creating a level of standardization for hospitals seeking to benchmark their financial and operational information (Flex, 2005). These 23 performance indicators are categorized into the dimensions of liquidity, profitability, capital structure, revenue, costs, and utilization (Flex, 2019).

Existing research implies there is a direct relationship between effective management of patient account receivables, cash flows, and organizational profitability Landry & Landry, 2009; Liu et al., 2011). Others suggest there is a link between profitability and firm liquidity, which can be measured through performance indicators (Singh, 2012; Goodspeed, 2006; Upadhyay & Smith, 2016). Critical Access Hospitals can mitigate financial insolvency through financial and operational indicators (Joynt et al., 2011; Pink et al., 2009; Flex, 2009). Moreover, these indicators have been found to be an early predictor of an eventual closure (Lynn & Wertheim, 1993; Coyne & Singh, 2008; Wishner et al., 2016). This study explores the gap between research promoting the

use of financial and operational ratios mitigating CAH insolvency, and management decisions to implement EHR initiatives through the HITECH Act of 2009.

Chapter 3 - Research Methods and Design

This chapter summarizes the research methodology and design, instrumentation, research questions, participants, data collection, and analysis used for this study. This study examines the effectiveness of management decisions to implement EHR initiatives through the HITECH Act of 2009. Specifically, this research explores stages of Meaningful Use (MU) with impacts on profitability, costs and financial liquidity in Washington State Critical Access Hospitals (CAH's)

There is a need in rural CAH markets to establish a relationship between management decisions to invest in new technologies coordinating patient care and understanding the long-term financial impact to optimize high levels of reimbursement. Beyond expanding existing academic research, information from this study can be beneficial for healthcare consultants, government agencies, human resource managers, and management teams of CAH's to develop effective strategies to promote organizational performance.

For this study, descriptive statistical analysis and t-tests will analyze averages and differences between attested MU and non-attested MU CAH's and assess the relationships of financial indicators and ratios. The results of these tests can help support existing literature that examines the positive correlation of these variables by increasing the use of Electronic Health Records (EHR) systems.

Research Design and Rational

Rural communities depend on local hospitals as a source of medical care, to support an employment base, and to foster economic growth. Beyond primary, acute, and specialty care, these local hospitals provide long-term skilled nursing care and rehabilitation services (Flex, 2010). Often, as the most significant community employer, they drive economic growth outside lanes of traditional healthcare, including banking, construction trades, laundry, and general retail (Casey et al., 2015). The closure of a CAH extends beyond losing local healthcare services and traveling to urban areas for care (AHA, 2011). The loss of a CAH can bring financial hardship throughout the community.

The purpose of this study is to examine the effectiveness of management decisions to implement EHR initiatives through the HITECH Act of 2009. The study assessed the relationship between MU Stage 2 attestation and impacts on operational and financial performance outcomes within the revenue cycle of Washington State Critical Access Hospitals.

Research for this study is grounded in high-performance work systems (HPWS) theory through a Balanced Scorecard approach. Hospitals have employed HPWS to align operational practices with employees who are impassioned and committed to performance, thereby leading to improved financial and operational outcomes (Mihail, & Kloutsiniotis, 2016). Aspects of HPWS are associated with mitigating hospital costs while increasing quality of care (Scotti et al., 2007), improving employee retention (Bartram et al., 2014), and reducing patient infection rates (Lee et al., 2012). The success of a hospital in reaching optimal performance is entirely dependent on management's

ability to use employee expertise in achieving defined business objectives. The use of financial and operational ratios as a vehicle for measurement is rooted in Balanced Scorecard Theory. This theory was first proposed by Kaplan and Norton (1992) as a tool for organizations to measure, align, and drive performance (Abdullah et al., 2013). Balanced Scorecard is used in hospitals to assess financial, learning and growth, patient satisfaction, and internal process perspectives (Hwa et al., 2013).

Descriptive statistics and t-test analysis examining longitudinal data spanning five years are in this study. The use of ratios was first proposed by the Flex Monitoring Team (Flex, 2005) to evaluate liquidity, profitability, and performance in CAH's. This monitoring program was initiated by the Federal Office of Rural Health Policy and coordinated through the Rural Health Research Centers located at the Universities of North Carolina at Chapel Hill, Southern Maine, and Minnesota. Specific to their objectives are improving quality of care, developing health systems, and increasing the financial performance of CAH's (Flex, 2005).

Measures

Instrumentation

Secondary data is appropriate to use when evaluating datasets and to analyze trend assessments or make comparative associations (Johnston, 2014). The financial information for this research, retrieved through the Washington State Department of Health data section web portal for statistical reports, is publicly available. Washington State licensed hospitals are required annually to submit audited financial statements and Medicare Cost Reports to the Department of Health (WSDH, 2020). This information includes financial statements, payer tables, patient volumes, costing information, and

wage reports. From these datasets, balance sheets, income statements, and wage reports for the periods 2014 – 2018 are in this study. The Office of the National Coordinator for Health Information Technology (ONC) is the lead Federal Agency tasked with collecting data supporting the HITECH Act. (ONC, 2019). Meaningful use (MU) attestation data for the periods 2014 – 2018 was extracted from the ONC website listing hospitals by assigned National Provider Identifier (NPI) numbers. A crosswalk file links NPI numbers from the CMS data registry to licensed Washington State CAH's.

Comparative analysis utilizing secondary data is common practice in fields of accounting and finance to study quantitative variances in organizational performance. Evaluation of financial statement information is most often associated with horizontal analysis reviewing variations between reporting periods, vertical analysis examining changes within the same reporting period, or through cross-sectional ratio analysis (Ranjan, 2016). For this research, Excel has been used to review Meaningful Use attestation stage data files from the ONC and CAH financial statement datasets retrieved from the Washington State Department of Health.

Ratio analysis and measuring percentage change of revenues or expenses between periods are widely accepted applications using secondary data to measure financial performance in hospitals (Alexander et al., 2006). For this study, a review of profitability, costs, and liquidity through ratio analysis is performed. Profitability indicators measure an organization's ability to generate revenue to cover operational costs, service patients, and expand market share. Liquidity measures the organizational capacity to service debt, pay liabilities, and meet other cash obligations.

Dependent Variables

The dependent variables used for this study include (a) no attestation, (b) Stage 1 attestation, and (c) Stage 2 attestation.

Independent Variables

The independent variables used for this research include widely accepted financial and operational ratios. The financial ratios measuring liquidity for this study are (a) days in net accounts receivable, (b) days cash on hand, and (c) current ratio. For evaluating the effectiveness of controlling costs, operating margin and wages as a percentage of net revenue are included as an independent variable.

Research Questions

Q1: Is there a difference between implementing Stage 2 Meaningful Use and increasing financial liquidity in Washington State Critical Access Hospitals?

Q2: Is there a difference between implementing Stage 2 Meaningful Use and increasing operating margin in Washington State Critical Access Hospitals?

Q3: Is there a difference between implementing Stage 2 Meaningful Use and salaries as a percentage of net patient revenue in Washington State Critical Access Hospitals?

Research Hypotheses

H1: There is a statistically significant difference between implementing Stage 2 Meaningful Use and increasing operating margin in Washington State Critical Access Hospitals.

H2: There is a statistically significant difference between implementing Stage 2 Meaningful Use and decreasing labor costs as measured by wages as a percentage of net revenue in Washington State Critical Access Hospitals

H3: There is a statistically significant difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by the current ratio in Washington State Critical Access Hospitals.

H4: There is a statistically significant difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by days in accounts receivable in Washington State Critical Access Hospitals.

H5: There is a statistically significant difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by days cash on hand in Washington State Critical Access Hospitals.

Participants

The participants for this study are licensed Critical Access Hospitals (CAH's) located in the State of Washington. To be designated, a CAH, the Centers for Medicare and Medicaid Services (CMS), established specific criteria for certification. These include (a) being located in a rural area; (b) offering 24-hour emergency care services; (c) having 25 inpatient beds or fewer; (d) having an average 96 hour or less length of stay for acute care services (CMS, 2016). In the State of Washington, there are currently 39 Hospitals licensed through the Centers for Medicare and Medicaid Services CAH Program (Flex, 2019). All 39 CAH's, as listed in Table 3.1 – Study Participants, have been included in this research study.

Table 3.1 – Study Participants

Hospital Name	Hospital Name
Klickitat Valley Hospital	Kittitas Valley Community Hospital
Newport Community Hospital	Dayton General Hospital
Lourdes Medical Center	Mid-Valley Hospital
Three Rivers Hospital	Coulee Community Hospital
Francisican St Elizabeth Hospital	Mason General Hospital
Columbia Basin Hospital	Whitman Hospital and Medical Center
Prosser Memorial Hospital	Whidbey General Hospital
Forks Community Hospital	Cascade Medical Center
Willapa Harbor Hospital	Lake Chelan Community Hospital
Ocean Beach Hospital	Ferry County Memorial Hospital
Odessa Memorial Hospital	Pullman Regional Hospital
Garfield County Memorial Hospital	Morton General Hospital
Jefferson General Hospital	Summit Pacific Medical Center
Skyline Hospital	Providence Mount Carmel Hospital
North Valley Hospital	Providence Saint Joseph's Hospital
Tri-State Memorial Hospital	Snoqualmie Valley Hospital
East Adams Rural Hospital	Sunnyside Community Hospital
Othello Community Hospital	United General Hospital
Quincy Valley Hospital	Peacehealth Peace Island Medical Center
Lincoln Hospital	

Data Collection

Financial Data

Washington State licensed hospitals are required annually to submit audited financial statements and Medicare Cost Reports to the Department of Health (WSDH, 2020). The financial information for this research, retrieved through the Washington State Department of Health data section web portal for statistical reports, is publicly available. Datasets for all licensed hospitals within the state include financial statements, payer tables, patient volumes, costing information, and wage reports. From these datasets, balance sheets, income statements, and wage reports for the periods 2014 – 2018 are in this study. This study is limited to 39 Washington State Critical Access Hospitals.

One facility, Othello Community Hospital, was removed for missing data consistently across reporting periods. Less than 5% of random data was missing for the remaining 38 hospitals in this study. For these hospitals, there is no attempt to replicate the data or remove it from the list.

Meaningful Use Data

As an incentive for installing electronic health records systems, the HITECH Act of 2009 authorized the creation of payment programs for CAH's to assist with offsetting some of the financial costs associated with implementation. To qualify for these financial incentives, CMS requires CAH's to attest for each stage of Meaningful Use (MU) with their electronic health records. The MU stages are: stage 1 - the storing of electronic records to report quality measures; stage 2 - automatic exchanges, and stage 3 - quality improvements, safety, efficiency, and decision making (Hung et al., 2015). Figure 3 illustrates these three stages and the criteria that must be achieved for attestation (ONC, 2013).

Stage 1: Meaningful use criteria focus on:	Stage 2: Meaningful use criteria focus on:	Stage 3: Meaningful use criteria focus on:
Electronically capturing health information in a standardized format	More rigorous health information exchange (HIE)	Improving quality, safety, and efficiency, leading to improved health outcomes
Using that information to track key clinical conditions	Increased requirements for e-prescribing and incorporating lab results	Decision support for national high-priority conditions
Communicating that information for care coordination processes	Electronic transmission of patient care summaries across multiple settings	Patient access to self-management tools
Initiating the reporting of clinical quality measures and public health information	More patient-controlled data	Access to comprehensive patient data through patient-centered HIE
Using information to engage patients and their families in their care		Improving population health

Figure 3 – Stages of Meaningful Use (ONC, 2013)

The Office of the National Coordinator for Health Information Technology (ONC) is the lead Federal Agency tasked with supporting the HITECH Act. (ONC, 2019). Meaningful use (MU) attestation data for the periods 2014 – 2018 was extracted from the ONC website listing hospitals by assigned National Provider Identifier (NPI) numbers. A crosswalk file links NPI numbers from the CMS data registry to licensed Washington State CAH's. For this study, 28 hospitals have achieved a level of MU attestation.

Data Analysis

Once the financial and Meaningful Use datasets were collected, each had to be sorted, limiting information to Washington State Critical Access Hospitals. From the crosswalk file aligning MU attestation stages by year with National Provider Identifier (NPI) numbers and, finally, to licensed Washington State CAH's, facilities were identified and sorted by (a) no attestation, (b) Stage 1 attestation, and (c) Stage 2 attestation. Of the 39 licensed Washington State CAH's identified in this analysis, 27 facilities have attested to Stage 2 of MU. A summary of these findings is detailed below in Table 3.2 – Meaningful Use Attestation Stage.

Table 3.2 – Meaningful Use Attestation Stage

Meaningful Use Stage Analysis	
Total CAH's	39
Total CAH's Reaching Stage of MU	28
Total CAH's Stage 2	27
CAH's Stage 2 in 2016	8
CAH's Stage 2 in 2015	8
CAH's Stage 2 in 2014	11
Total CAH's Stage 1	1
CAH's Stage 1 in 2016	1
Total CAH's Non MU	11

Two statistical methods will measure the dependent variables with profitability, liquidity, and salaries. First, a descriptive statistical test will determine the mean and

standard deviation. Analyzing averages and deviation will assist in confirming differences between periods before and after Stage 2 Meaningful Use. Secondly, a t-test will assess whether there are statistically significant differences between the periods before and after Stage 2 MU of (a) days in net accounts receivable, (b) days cash on hand, (c) current ratio, (d) operating margin, and (e) wages. The results of this test can help support existing literature that examined the positive differences of these variables through increasing the use of Electronic Health Records (EHR) systems.

Chapter 4 – Research Results

The purpose of this chapter is to analyze data collected for stages of Meaningful Use (MU) and determine impacts in Washington State Critical Access Hospitals (CAH's). To measure the dependent variables with profitability, liquidity, and salaries, two statistical methods are utilized in this study. A descriptive statistical test will determine the mean and standard deviation while a t-test will assess whether there are statistically significant differences between the periods before and after Stage 2 MU. Results from these tests can help support existing research studies examining use of Electronic Health Records (EHR) to create financial and operational efficiencies.

Participants

The participants for this study are licensed Critical Access Hospitals located in the State of Washington. To be designated a CAH, the Centers for Medicare and Medicaid Services (CMS) established specific criteria. These include (a) being located in a rural area; (b) offering 24-hour emergency care services; (c) having 25 inpatient beds or fewer; (d) having an average 96 hour or less length of stay for acute care services (CMS, 2016). In the State of Washington, there are currently 39 Hospitals licensed through the Centers for Medicare and Medicaid Services CAH Program (Flex, 2019). All 39 CAH's, as listed in Table 4. 1 – Research Study Participants, have been included in this examination.

Table 4.1 – Research Study Participants

Hospital Name	Hospital Name
Klickitat Valley Hospital	Kittitas Valley Community Hospital
Newport Community Hospital	Dayton General Hospital
Lourdes Medical Center	Mid-Valley Hospital
Three Rivers Hospital	Coulee Community Hospital
Francisican St Elizabeth Hospital	Mason General Hospital
Columbia Basin Hospital	Whitman Hospital and Medical Center
Prosser Memorial Hospital	Whidbey General Hospital
Forks Community Hospital	Cascade Medical Center
Willapa Harbor Hospital	Lake Chelan Community Hospital
Ocean Beach Hospital	Ferry County Memorial Hospital
Odessa Memorial Hospital	Pullman Regional Hospital
Garfield County Memorial Hospital	Morton General Hospital
Jefferson General Hospital	Summit Pacific Medical Center
Skyline Hospital	Providence Mount Carmel Hospital
North Valley Hospital	Providence Saint Joseph's Hospital
Tri-State Memorial Hospital	Snoqualmie Valley Hospital
East Adams Rural Hospital	Sunnyside Community Hospital
Othello Community Hospital	United General Hospital
Quincy Valley Hospital	Peacehealth Peace Island Medical Center
Lincoln Hospital	

Data Collection

Financial Data

Washington State licensed hospitals are required annually to submit audited financial statements and Medicare Cost Reports to the Department of Health (WSDH, 2020). The financial information for this research, retrieved through the Washington State Department of Health data section web portal for statistical reports, is publicly available. Datasets for all licensed hospitals within the state include financial statements, payer tables, patient volumes, costing information, and wage reports. From these datasets, balance sheets, income statements, and wage reports for the periods 2014 – 2018 are in this study. This study is limited to 39 Washington State Critical Access Hospitals.

One facility, Othello Community Hospital, was removed for missing data consistently across reporting periods. Less than 5% of random data was missing for the remaining 38 hospitals analyzed for this study. For these hospitals, there was no attempt to replicate the data or remove it from the list.

Meaningful Use Data

The Office of the National Coordinator for Health Information Technology (ONC) is the lead Federal Agency tasked with supporting the HITECH Act (ONC, 2019). Meaningful use (MU) attestation data for the periods 2014 – 2018 was extracted from the ONC website listing hospitals by assigned National Provider Identifier (NPI) numbers. A crosswalk file linked NPI numbers from the CMS data registry to licensed Washington State CAH's. For this study, 28 hospitals attested to a level of MU attestation.

Table 4.2 – Research Meaningful Use Attestation Stage

Meaningful Use Stage Analysis	
Total CAH's	39
Total CAH's Reaching Stage of MU	28
Total CAH's Stage 2	27
CAH's Stage 2 in 2016	8
CAH's Stage 2 in 2015	8
CAH's Stage 2 in 2014	11
Total CAH's Stage 1	1
CAH's Stage 1 in 2016	1
Total CAH's Non MU	11

Research Questions

Q1: Is there a difference between implementing Stage 2 Meaningful Use and increasing operating margin in Washington State Critical Access Hospitals?

Q2: Is there a difference between implementing Stage 2 Meaningful Use and salaries as a percentage of net patient revenue in Washington State Critical Access Hospitals?

Q3: Is there a difference between implementing Stage 2 Meaningful Use and increasing financial liquidity in Washington State Critical Access Hospitals?

Descriptive Statistics

Ratio analysis and measuring percentage change of revenues or expenses between periods are widely accepted applications using secondary data to measure financial

performance in Hospitals (Alexander et al., 2006). For this study, a descriptive statistical test will measure the dependent variable of Stage 2 attestation with profitability, salaries, and liquidity. This test applies the independent variables of (a) operating margin, (b) salaries to net patient revenue, c) current ratio, (d) days in net accounts receivable, and (e) days cash on hand to determine mean and standard deviation.

Washington State Critical Access Hospitals attesting to Stage 2 Meaningful Use during the periods 2015 – 2016 are in this study (Table 4.3 – Research Meaningful Use Attestation Stage). From the 16 hospitals identified during this period, Prosser Memorial Hospital was removed from this analysis due to missing reported financial information to the State of Washington Department of Health for years 2014 and 2017.

Operating Margin

Operating margin measures operating revenue relative to operating expenses required for patient care. Operating expenses include all costs associated with delivering hospital services. Examples of these expenses are wages, employee benefits, medical supplies, bad debts, lease payments, and interest expense (Hahn, 2015). A positive percentage value indicates revenues are higher than expenses while a negative value suggests the hospital is operating at a loss, with costs exceeding patient revenues (Pink, Freeman, Randolph & Holmes, 2013). Participants for this study are detailed in Table 4.3 – Study Participants: Operating Margin.

Table 4.3 – Study Participants: Operating Margin

Operating Margin Ratio Hospital Name	Average Operating Margin Prior to Stage 2	Average Operating Margin After Stage 2
Newport Hospital & Health Services	2.30%	-3.05%
Lourdes Medical Center	0.91%	5.89%
Three Rivers Hospital	1.01%	2.76%
Columbia Basin Hospital	-6.39%	-3.40%
Willapa Harbor Hospital	-1.70%	0.32%
Ocean Beach Hospital	7.68%	7.20%
Jefferson Healthcare	2.55%	3.49%
North Valley Hospital	-0.20%	3.87%
Kittitas Valley Healthcare	6.75%	2.93%
Coulee Community Hospital	-36.19%	-6.10%
Lake Chelan Community Hospital	0.50%	-1.19%
Morton General Hospital	0.27%	1.55%
Snoqualmie Valley Hospital	-12.37%	-2.26%
Sunnyside Community Hospital	11.80%	8.31%
Peacehealth United General Med Ctr	9.25%	7.10%

Table 4.4 - Descriptive Statistics Analysis: Operating Margin

Description	Operating Margin Prior to Stage 2	Operating Margin After Stage 2
Mean	-0.0092	0.0183
Standard Deviation	0.1145	0.0436

Washington State Critical Access Hospitals reported a mean of .0183 in operating margin post attestation to Stage 2 of Meaningful Use (Table 4.4 - Descriptive Statistics Analysis: Operating Margin). This is up .0091 from a mean of -.0092 in operating margin before Stage 2 of Meaningful Use. There is a higher variance between Washington State CAH's in operating margins before Stage 2, as evidenced by the standard deviation of .1145. This variance in standard deviation decreases to .0436 after Stage 2 attestation. Evidence suggests attesting to Stage 2 of Meaningful Use can lead to increased operating margins in Washington State Critical Access Hospitals.

Salaries to Net Patient Revenue

Salaries to net patient revenue measures operating revenue from patient care relative to labor costs associated with that care. A lower value indicates management is efficiently controlling labor costs. Overstaffing can lead to labor inefficiencies, directly impacting hospital profitability (Nowicki, M., 2018). Participants for this study are detailed in Table 4.5 – Study Participants: Salaries to Net Patient Revenue.

Table 4.5 – Study Participants: Salaries to Net Patient Revenue

Salaries to Net Patient Revenue Hospital Name	Average Salaries to Net Patient Revenue Prior to Stage 2	Average Salaries to Net Patient Revenue After Stage 2
Newport Hospital & Health Services	71.29%	72.52%
Lourdes Medical Center	43.30%	43.65%
Three Rivers Hospital	69.02%	63.16%
Columbia Basin Hospital	60.98%	57.82%
Willapa Harbor Hospital	77.29%	76.63%
Ocean Beach Hospital	59.98%	56.87%
Jefferson Healthcare	65.17%	62.31%
North Valley Hospital	62.78%	57.61%
Kittitas Valley Healthcare	58.82%	63.98%
Coulee Community Hospital	82.61%	64.89%
Lake Chelan Community Hospital	78.41%	78.29%
Morton General Hospital	69.75%	65.31%
Snoqualmie Valley Hospital	75.78%	61.18%
Sunnyside Community Hospital	47.62%	46.68%
Peacehealth United General Med Ctr	39.38%	42.00%

Table 4.6 - Descriptive Statistics Analysis: Salaries to Net Patient Revenue

Description	Salaries to Net Patient Revenue Prior to Stage 2	Salaries to Net Patient Revenue After Stage 2
Mean	0.641	0.609
Standard Deviation	0.129	0.108

Washington State Critical Access Hospitals reported a mean of .609 in salaries to net patient revenue post attestation to Stage 2 of Meaningful Use (Table 4.6 - Descriptive Statistics Analysis: Salaries to Net Patient Revenue). This is down .032 from a mean of .641 in salaries to net patient revenue before Stage 2 of Meaningful Use. There is a higher variance between Washington State CAH's in salaries to net patient revenue before Stage 2, as evidenced by the standard deviation of .129. This variance in standard deviation decreases to .108 after Stage 2 attestation. Evidence suggests attesting to Stage 2 of Meaningful Use can lead to reduced salaries to net patient revenue in Washington State Critical Access Hospitals.

Current Ratio

The current ratio measures the ability to pay current liabilities with current assets that can be readily converted to cash within a 12-month cycle. A ratio yielding less than 1:1 would signify impending liquidity issues. This indicates current liabilities exceed current assets. Values less than 2:1 suggest a potential for liquidity risk (Nowicki, M., 2018). Participants for this study are detailed in Table 4.7 Study Participants: Current Ratio.

Table 4.7 – Study Participants: Current Ratio

Current Ratio Hospital Name	Average Current Ratio Prior to Stage 2	Average Current Ratio After Stage 2
Newport Hospital & Health Services	3.67	3.52
Lourdes Medical Center	1.58	0.99
Three Rivers Hospital	0.93	1.67
Columbia Basin Hospital	2.23	1.91
Willapa Harbor Hospital	1.66	2.67
Ocean Beach Hospital	1.54	2.84
Jefferson Healthcare	2.10	2.82
North Valley Hospital	1.97	3.89
Kittitas Valley Healthcare	2.53	2.33
Coulee Community Hospital	1.55	0.91
Lake Chelan Community Hospital	2.80	2.24
Morton General Hospital	4.06	2.39
Snoqualmie Valley Hospital	2.01	5.70
Sunnyside Community Hospital	2.25	2.21
Peacehealth United General Med Ctr	1.56	3.99

Table 4.8 - Descriptive Statistics Analysis: Current Ratio

Description	Current Ratio Prior to Stage 2	Current Ratio After Stage 2
Mean	2.16	2.67
Standard Deviation	0.834	1.232

Washington State Critical Access Hospitals reported a mean of 2.67 in current ratio post attestation to Stage 2 of Meaningful Use (Table 4.8 - Descriptive Statistics Analysis: Current Ratio). This is up .51 from a mean of 2.16 in the current ratio before Stage 2 of Meaningful Use. There is a higher variance between Washington State CAH's in current ratios after Stage 2, as evidenced by the standard deviation of 1.232. This is up from a standard deviation of .834 before Stage 2 attestation. Evidence suggests attesting to Stage 2 of Meaningful Use can lead to increased liquidity as measured by the current ratio in Washington State Critical Access Hospitals.

Net Days in Accounts Receivables

Net days in accounts receivable measures the average time for a hospital to collect on an insurance claim and patient account. A high number of days can be disruptive to cash flows and indicate problems within the early stages of the revenue cycle. Lower values imply a higher efficiency with processing and collecting accounts receivable (Flex, 2005). Participants for this study are detailed in Table 4.9 – Study Participants: Net Days in Accounts Receivables.

Table 4.9 – Study Participants: Net Days in Accounts Receivables

Net Days in Accounts Receivable Hospital Name	Net Days in A/R Prior to Stage 2	Net Days in A/R After Stage 2
Newport Hospital & Health Services	54	50
Lourdes Medical Center	54	51
Three Rivers Hospital	56	52
Columbia Basin Hospital	45	40
Willapa Harbor Hospital	40	41
Ocean Beach Hospital	41	69
Jefferson Healthcare	58	44
North Valley Hospital	40	39
Kittitas Valley Healthcare	45	52
Coulee Community Hospital	47	40
Lake Chelan Community Hospital	67	61
Morton General Hospital	64	50
Snoqualmie Valley Hospital	82	49
Sunnyside Community Hospital	61	61
Peacehealth United General Med Ctr	152	54

Table 4.10 - Descriptive Statistics Analysis – Net Days in Accounts Receivables

Description	Days in A/R Prior to Stage 2	Days in A/R After Stage 2
Mean	60.50	50.22
Standard Deviation	27.94	8.78

Washington State Critical Access Hospitals reported a mean of 50.22 net days in accounts receivable post attestation to Stage 2 of Meaningful Use (Table 4.10 - Descriptive Statistics Analysis – Net Days in Accounts Receivables). This is down 10.28 days from a mean of 60.50 net days of accounts receivable before Stage 2 of Meaningful Use. Average collection periods varied significantly before Stage 2, as evidenced by the standard deviation of 27.94 days but varied less with a standard deviation of 8.78 days after Stage 2 attestation. Evidence suggests attesting to Stage 2 of Meaningful Use can lead to increased liquidity as measured by net days in accounts receivable for Washington State Critical Access Hospitals.

Days Cash on Hand

Days cash on hand measures how many days a hospital could remain operational, paying outstanding expenses with current unrestricted cash funds. While high days imply solvency, this might indicate a lack of planning by management, developing a short-term investment strategy yielding higher returns (Singh & Wheeler, 2012). Lower days, when weighed against other measures of liquidity, could suggest increasing problems with sustaining financial operations (Nowicki, M., 2018; Upadhyay & Smith, 2016). Participants for this study are in Table 4.11 – Study Participants: Days Cash on Hand.

Table 4.11 – Study Participants: Days Cash on Hand

Days Cash on Hand Hospital Name	Average Days Cash on Hand Prior to Stage 2	Average Days Cash on Hand After Stage 2
Newport Hospital & Health Services	21	31
Lourdes Medical Center	2	2
Three Rivers Hospital	7	18
Columbia Basin Hospital	35	56
Willapa Harbor Hospital	25	40
Ocean Beach Hospital	49	94
Jefferson Healthcare	20	18
North Valley Hospital	6	90
Kittitas Valley Healthcare	45	27
Coulee Community Hospital	31	10
Lake Chelan Community Hospital	13	9
Morton General Hospital	38	66
Snoqualmie Valley Hospital	49	149
Sunnyside Community Hospital	145	79
Peacehealth United General Med Ctr	6	28

Table 4.12 - Descriptive Statistics Analysis – Days Cash on Hand

Description	Days Cash on Hand Prior to Stage 2	Days Cash on Hand After Stage 2
Mean	32.75	47.96
Standard Deviation	34.99	41.00

Washington State Critical Access Hospitals reported a mean of 47.96 days cash on hand post attestation to Stage 2 of Meaningful Use (Table 4.12 - Descriptive Statistics Analysis – Days Cash on Hand). This is up 15.21 days from a mean of 32.75 days cash on hand before Stage 2 of Meaningful Use. There is a higher variance between Washington State CAH's in days cash on hand after Stage 2, as evidenced by the standard deviation of 41. This is up from a standard deviation of 34.99 before Stage 2 attestation. Evidence suggests attesting to Stage 2 of Meaningful Use can lead to increased liquidity as measured by days cash on hand in Washington State Critical Access Hospitals.

T-test Analysis

A t-test is performed on each variable to determine if there is a significant difference between means. For each test, the probability (p-value) using an *alpha level* of .05 is used to assess statistical significance. A t-test is used when testing different means between two samples (Liang & Pan, 2006). This test will examine each hypothesis to assess differences before and after Stage 2 MU. The independent variables of (a) operating margin, (b) salaries to net patient revenue, c) current ratio, (d) days in net accounts receivable, and (e) days cash on hand will be analyzed.

Washington State Critical Access Hospitals attesting to Stage 2 Meaningful Use during the periods 2015 – 2016 are used in this study (Table 4.4 – Research Meaningful Use Attestation Stage). From the 16 hospitals identified during this period, Prosser Memorial Hospital reported missing financial information to the State of Washington Department of Health for years 2014 and 2017 and is not part of this study

Results of Hypothesis Testing

Operating Margin

H1: There is a statistically significant difference between implementing Stage 2 Meaningful Use and increasing operating margin in Washington State Critical Access Hospitals.

Table 4.13 – Hypothesis H1

t-Test: Two Sample Operating Margin		
Description	CAH Prior to Stage 2	CAH Post Stage 2
Mean	-0.92%	1.83%
Variance	0.013	0.002
Observations	15	15
Hypothesized Mean Difference	0	
df	18	
t Stat	-0.870	
P(T<=t) one-tail	0.198	
t Critical one-tail	1.734	

Examining the difference between implementing Stage 2 Meaningful Use and increasing operating margin, the findings t (18) = -0.870, p=.198 fail to reject the null hypothesis (Table 4.13 – Hypothesis H1). There is not a statistically significant difference in mean operating margin between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

Salaries to Net Patient Revenue

H2: There is a statistically significant difference between implementing Stage 2 Meaningful Use and decreasing labor costs as measured by salaries as a percentage of net revenue in Washington State Critical Access Hospitals

Table 4.14 – Hypothesis H2

t-Test: Two Sample Salaries to Net Patient Revenue		
Description	CAH Prior to Stage 2	CAH Post Stage 2
Mean	64%	61%
Variance	0.017	0.012
Observations	15	15
Hypothesized Mean Difference	0	
df	27	
t Stat	0.755	
P(T<=t) one-tail	0.228	
t Critical one-tail	1.703	

Examining the difference between implementing Stage 2 Meaningful Use and decreasing labor costs, the findings t (27) = 0.755, p=.228 fail to reject the null hypothesis (Table 4.14 – Hypothesis H2). There is not a statistically significant difference in mean salaries as a percentage of net revenue between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

Current Ratio

H3: There is a statistically significant difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by the current ratio in Washington State Critical Access Hospitals

Table 4.15 – *Hypothesis H3*

t-Test: Two Sample Current Ratio		
Description	CAH Prior to Stage 2	CAH Post Stage 2
Mean	2.16	2.67
Variance	0.70	1.52
Observations	15	15
Hypothesized Mean Difference	0	
df	25	
t Stat	-1.333	
P(T<=t) one-tail	0.097	
t Critical one-tail	1.708	

Examining the difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by current ratio, the findings t (25) = - 1.333, p=.097 fail to reject the null hypothesis (Table 4.15 – Hypothesis H3). There is not a statistically significant difference between increasing financial liquidity as measured by the mean current ratio between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

Net Days in Accounts Receivables

H4: There is a statistically significant difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by days in accounts receivable in Washington State Critical Access Hospitals.

Table 4.16 – Hypothesis H4

t-Test: Two Sample Net Days in Accounts Receivable		
Description	CAH Prior to Stage 2	CAH Post Stage 2
Mean	60.50	50.22
Variance	781	77
Observations	15	15
Hypothesized Mean Difference	0	
df	17	
t Stat	1.360	
P(T<=t) one-tail	0.096	
t Critical one-tail	1.740	

Examining the difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by days in accounts receivable, the findings $t(17) = 1.360$, $p=.096$ fail to reject the null hypothesis (Table 4.16 – Hypothesis H4). There is not a statistically significant difference between increasing financial liquidity as measured by mean net days in accounts receivable between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

Days Cash on Hand

H5: There is a statistically significant difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by days cash on hand in Washington State Critical Access Hospitals.

Table 4.17 – Hypothesis H5

t-Test: Two Sample Days Cash on Hand		
Description	CAH Prior to Stage 2	CAH Post Stage 2
Mean	32.75	49.39
Variance	1224.47	1777.01
Observations	15	14
Hypothesized Mean Difference	0	
df	25	
t Stat	-1.152	
P(T<=t) one-tail	0.130	
t Critical one-tail	1.708	

Examining the difference between implementing Stage 2 Meaningful Use and increasing financial liquidity as measured by days cash on hand, the findings t (25) = -1.152, p=.130 fail to reject the null hypothesis (Table 4.17 – Hypothesis H5). There is not a statistically significant difference between increasing financial liquidity as measured by mean cash on hand between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

Additional Research

To understand the differences between hospitals that have attested to Stage 1 and 2 of Meaningful Use and hospitals that have not attested to any stages of Meaningful Use, additional research examining the variables of operating margin and salaries to net patient revenue was performed. A t-test was conducted on each variable to determine if there was a significant difference between means. For each test, the probability (p-value) is set at an *alpha level* of .05 to assess statistical significance. A t-test analyzes different means between two samples (Liang & Pan, 2006).

Washington State Critical Access Hospitals attesting to Stage 1 or 2 Meaningful Use during the periods 2014 – 2018 are in this study (Table 4.5 – Research Meaningful

Use Attestation Stage). From the 28 hospitals identified during this period, Othello Community Hospital is not a part of this study due to missing reported financial information to the State of Washington Department of Health for years 2014 through 2018. Additionally, 11 Washington State CAH's identified as not attesting to stages of Meaningful Use for periods 2014 – 2018 and are in this additional research study (Table 4. 6 – Research Meaningful Use Attestation Stage).

Additional Hypotheses Results

Operating Margin

H6: There a significant statistical difference in operating margin between Stage 1 or 2 of Meaningful Use Washington State Critical Access Hospitals and non-attested Washington State Critical Access Hospitals.

Table 4.18 – Hypothesis H6: t-test

t-Test: Two-Sample		
Description	CAH with Stage of MU	CAH No Stage of MU
Mean	1.73%	-1.60%
Variance	0.003	0.001
Observations	27	11
Hypothesized Mean Difference	0	
df	34	
t Stat	2.307	
P(T<=t) one-tail	0.014	
t Critical one-tail	1.691	

Examining the difference in mean operating margin between attested Stage 1 or 2 of Meaningful Use and non-attested Washington State Critical Access Hospitals, the findings t (34) =2.307, p=.014 support accepting this hypothesis (Table 4.18 – Hypothesis H6: t-test). There is a statistically significant difference (p<.05) in operating

margin between Washington State Critical Access Hospitals attesting to Stage 1 or 2 of Meaningful Use and non-attested Washington State Critical Access Hospitals.

Salaries to Net Patient Revenue

H7: There a significant statistical difference in Salaries to Net Patient Revenue between Stage 1 or 2 of Meaningful Use Washington State Critical Access Hospitals and non-attested Washington State Critical Access Hospitals

Table 4.19 – Hypothesis H7: t-test

t-Test: Two-Sample		
Description	CAH with Stage of MU	CAH No Stage of MU
Mean	58%	65%
Variance	0.01288	0.00484
Observations	27	11
Pooled Variance	0.0106	
Hypothesized Mean Difference	0	
df	36	
t Stat	-2.0241	
P(T<=t) one-tail	0.0252	
t Critical one-tail	1.6883	

Examining the difference in mean salaries to net patient revenue between attested Stage 1 or 2 of Meaningful Use and non-attested Washington State Critical Access Hospitals, the findings t (36) = - 2.0241, p=.0252 support accepting this hypothesis (Table 4.19 – Hypothesis H7: t-test). There is a statistically significant difference (p<.05) in salaries to net patient revenue between Washington State Critical Access Hospitals attesting to Stage 1 or 2 of Meaningful Use and non-attested Washington State Critical Access Hospitals.

Conclusion

The study examined differences between implementing Stage 2 Meaningful Use and increasing operating margin, salaries, and liquidity in Washington State Critical

Access Hospitals. A t-test examined each hypothesis, supporting a conclusion that there is not a statistically significant difference between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

To determine if there was a significant difference between hospitals that have attested to Stage 1 and 2 of Meaningful Use and hospitals that have not attested to any stages of Meaningful Use, an additional t-test was performed. The results of this test support accepting that there is a statistically significant difference ($p<.05$) in operating margin and salaries to net patient revenue between Washington State Critical Access Hospitals attesting to Stage 1 or 2 of Meaningful Use and non-attested Washington State Critical Access Hospitals.

Chapter 5 – Discussion

Existing studies have researched mitigating financial insolvency through financial and operational indicators at Critical Access Hospitals (Joynt, Harris, Orav, & Jha, 2011; Pink, Holmes, Slifkin, & Thompson, 2009; Flex, 2009), but there is minimal research aligning Electronic Health Records (EHR) adoption and Meaningful Use decisions. This study examines the effectiveness of management decisions in Washington State Critical Access Hospitals to implement EHR initiatives through the HITECH Act of 2009 and assesses relationships between attested stages of Meaningful Use and impacts on operational and financial performance outcomes within the revenue cycle. Specifically, this research explores:

- Is there a difference between implementing Stage 2 Meaningful Use and increasing operating margin in Washington State Critical Access Hospitals?
- Is there a difference between implementing Stage 2 Meaningful Use and salaries as a percentage of net patient revenue in Washington State Critical Access Hospitals?
- Is there a difference between implementing Stage 2 Meaningful Use and increasing financial liquidity in Washington State Critical Access Hospitals?

To ensure solvency and sustain competitive advantages, leadership teams of CAH's must optimize their employment practices and identify whether the implementation of EHR has contributed to operational and financial efficiencies.

Summary of Findings

The study examined differences between implementing Stage 2 Meaningful Use and increasing operating margin, salaries, and liquidity in Washington State Critical Access Hospitals. Means and standard deviations were analyzed, while a t-test examined each hypothesis. To determine if there was a significant difference between hospitals that have attested to Stage 1 and 2 of Meaningful Use and hospitals that have not attested to any stages of Meaningful Use, an additional t-test was performed. The following summarizes these findings:

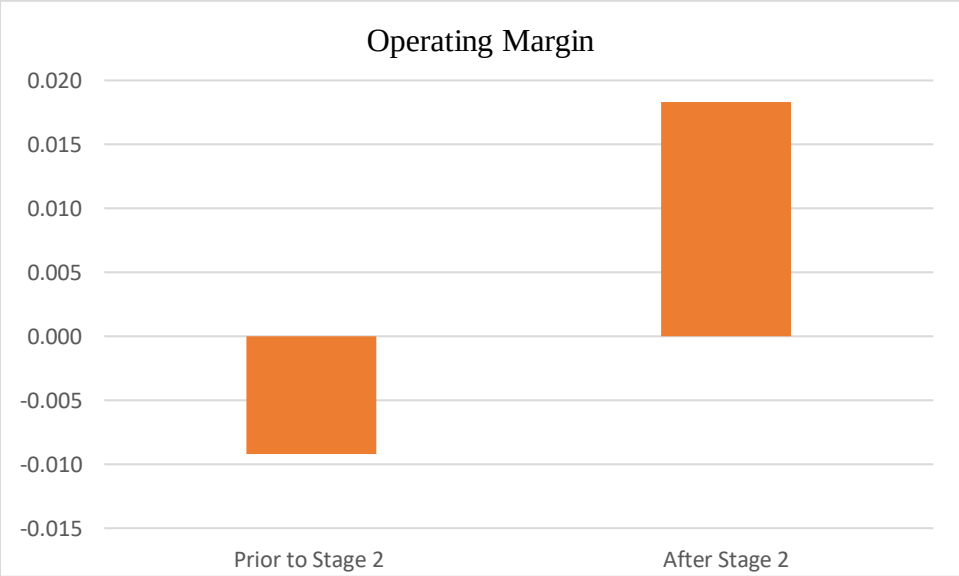
Operating Margin

Operating margin is the difference between operating revenue and operating expenses required to deliver patient care. A positive percentage value indicates revenues are higher than expenses while a negative value suggests the hospital is operating at a loss, with costs exceeding patient revenues (Pink et al., 2013).

Descriptive statistics and a t-test examine the research question investigating differences between implementing Stage 2 Meaningful Use and increasing operating margin in Washington State Critical Access Hospitals. A descriptive statistical analysis confirms the rising mean in operating margin post attestation to Stage 2 of Meaningful Use, from a negative operating margin of -.0092 to a positive margin of .0183. Using a t-test to answer H1 and examine differences between implementing Stage 2 Meaningful Use and increasing operating margins, the findings fail to reject the null hypothesis t (18) = -0.870, p=.198. There is not a statistically significant difference in mean operating margin between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

The t-test confirms there is not a statistically significant difference in operating margin between pre and post attestation. Still, evidence from the descriptive statistics analysis (Table 5.1 – Operating Margin) indicates attesting to Stage 2 Meaningful Use increases mean operating margins in Washington State CAH's. These findings support existing literature of using technology platforms as features of HPWS in hospitals to improve financial outcomes (Mihail, & Kloutsiniotis, 2016; Scotti et al., 2007) and can assist leadership teams in CAH's with opportunities to increase profitability.

Table 5.1 – Operating Margin



Salaries to Net Patient Revenue

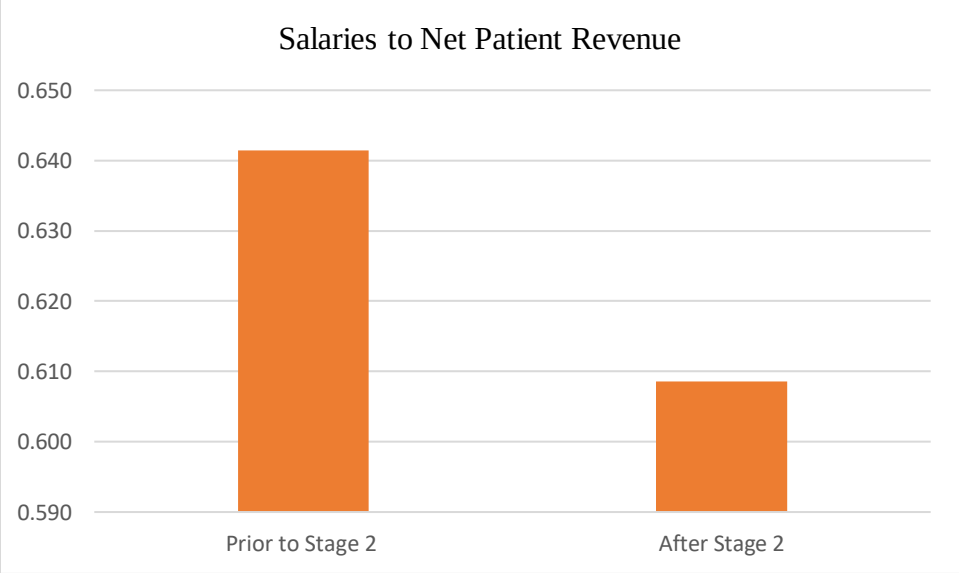
Salaries to net patient revenue measures operating revenue from patient care relative to labor costs associated with that care. A lower value indicates management is efficiently controlling labor costs. (Nowicki, M., 2018).

Descriptive statistics and a t-test examine the research question investigating differences between implementing Stage 2 Meaningful Use and decreasing salaries to net patient revenue in Washington State Critical Access Hospitals. A descriptive statistical analysis confirms the decreasing mean in salaries to net patient revenue post attestation to

Stage 2 of Meaningful Use, from .641 to .609. Using a t-test to answer H2 examining differences between implementing Stage 2 Meaningful Use and decreasing labor costs as measured by salaries as a percentage of net revenue, the findings fail to reject the null hypothesis t (27) = 0.755, p=.228. There is not a statistically significant difference in mean salaries as a percentage of net revenue between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals

The t-test confirms there is not a statistically significant difference in salaries as a percentage of net revenue between pre and post attestation. Still, evidence from the descriptive statistics analysis (Table 5.2 – Salaries to Net Patient Revenue) indicates attesting to Stage 2 Meaningful Use decreases mean salaries as a percentage of net revenue in Washington State Critical Access Hospitals. These findings can assist CAH leaders to reduce patient care expenses in their facilities and supports existing literature of aligning EHR systems with a highly skilled labor force in hospitals to improve labor costs and performance outcomes (Jerzak, 2015; Agarwal et al., 2016).

Table 5.2 – Salaries to Net Patient Revenue



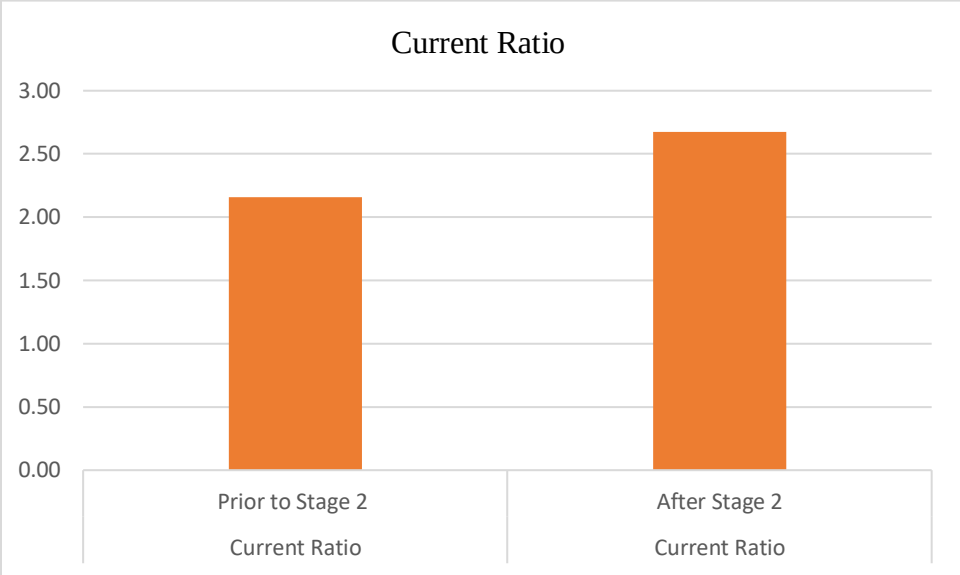
Liquidity – Current Ratio

The current ratio measures the ability to pay current liabilities with current assets that can be readily convertible into cash within a 12-month cycle. A ratio yielding less than 1:1 would signify impending liquidity issues. This indicates current liabilities exceed current assets. Values less than 2:1 suggest a potential for liquidity risk (Nowicki, M., 2018).

Descriptive statistics and a t-test examine the research question investigating financial liquidity with implementing Stage 2 Meaningful Use in Washington State Critical Access Hospitals through current ratio analysis. A descriptive statistical analysis confirms the increasing mean in current ratio post attestation to Stage 2 of Meaningful Use, from 2.16 to. 2.67. Using a t-test to answer H3 examining differences between implementing Stage 2 Meaningful Use and current ratio, the findings fail to reject the null hypothesis t (25) = - 1.333, p=.097. There is not a statistically significant difference in mean current ratio between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals

The t-test confirms there is not a statistically significant difference in current ratios between pre and post attestation. Still, evidence from the descriptive statistics analysis (Table 5.3 – Current Ratio) indicates attesting to Stage 2 Meaningful Use increases mean current ratios in Washington State Critical Access Hospitals. This finding supports existing research, noting there is a direct relationship between liquidity and adopting effective management practices through EHR programs in Hospitals (Landry & Landry, 2009; Liu et al., 2011) and can assist leadership teams in CAH's with opportunities to increase financial solvency.

Table 5.3 – Current Ratio



Liquidity – Net Days in Accounts Receivable

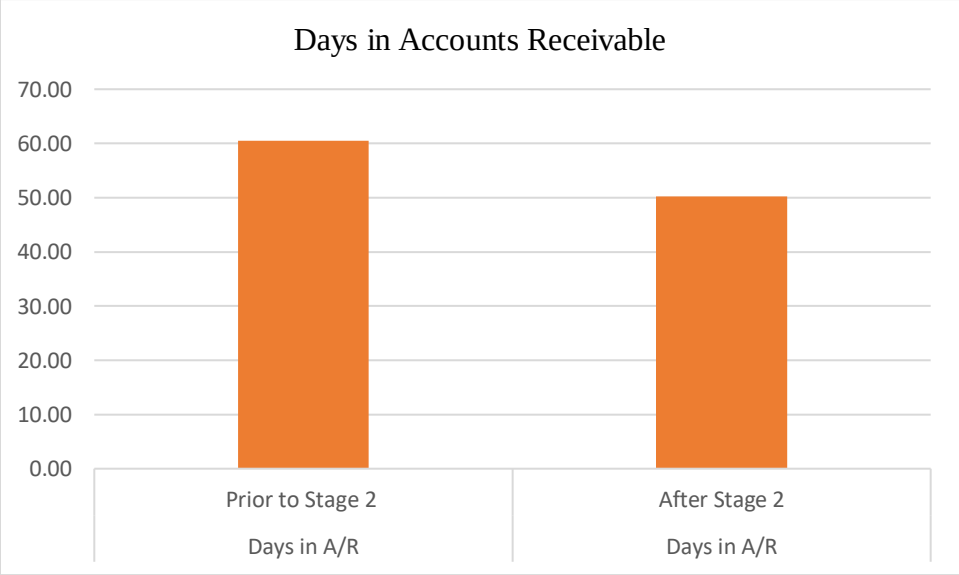
Net days in accounts receivable measures the average time for a hospital to collect on an insurance claim and patient account. A high number of days can be disruptive to cash flows and indicate problems within the early stages of the revenue cycle. Lower values imply a higher efficiency with processing and collecting accounts receivable (Flex, 2005).

Descriptive statistics and a t-test examine the research question investigating financial liquidity with implementing Stage 2 Meaningful Use in Washington State Critical Access Hospitals through net days in accounts receivables. A descriptive statistical analysis confirms the decreasing mean in net days in accounts receivables post attestation to Stage 2 of Meaningful Use from 60.50 to 50.33 days. Using a t-test to answer H4 examining differences between implementing Stage 2 Meaningful Use and net days in accounts receivables, the findings fail to reject the null hypothesis t (17) = 1.360, p=.096. There is not a statistically significant difference in mean net days in accounts

receivables between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

The t-test confirms there is not a statistically significant difference in mean net days in accounts receivable between pre and post attestation. Still, evidence from the descriptive statistics analysis (Table 5.4 – Days in Accounts Receivable) indicates attesting to Stage 2 Meaningful Use decreases mean net days in account receivable in Washington State Critical Access Hospitals. These findings support existing literature of promoting technologies to increase the third party and patient collection of accounts receivable in Hospitals (Singh & Wheeler, 2012; Goodspeed, 2006; Upadhyay & Smith, 2016). Additionally, management teams of CAH's can use these findings to raise awareness of new technologies impacting revenue cycle efficiencies.

Table 5.4 – Days in Accounts Receivable



Liquidity – Days Cash on Hand

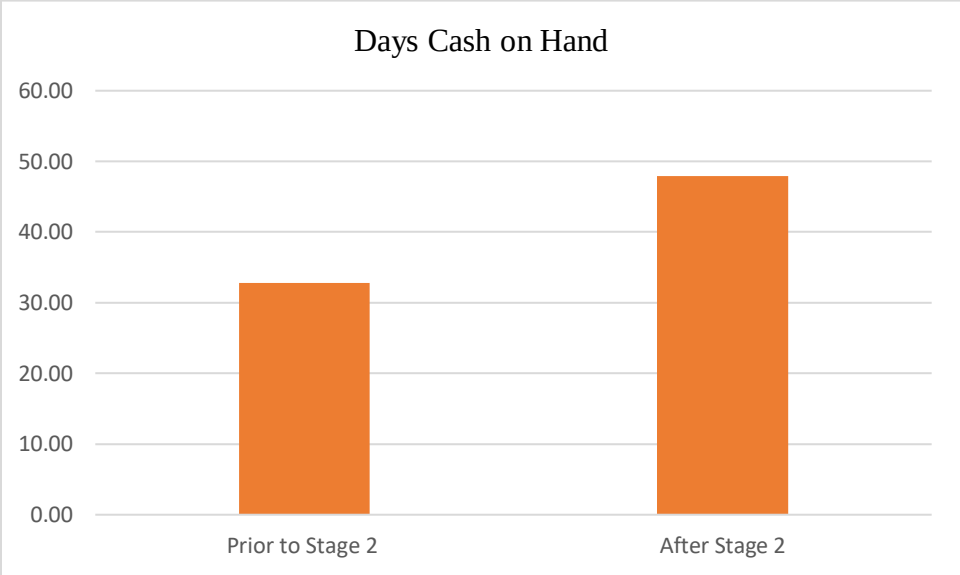
Days cash on hand measures how many days a hospital could remain operational, paying outstanding expenses with current, unrestricted cash funds. While high days imply solvency, lower days, when weighed against other measures of liquidity, could

suggest increasing problems with sustaining financial operations (Nowicki, M., 2018; Upadhyay & Smith, 2016; Singh & Wheeler, 2012).

Descriptive statistics and a t-test examine the research question investigating financial liquidity with implementing Stage 2 Meaningful Use in Washington State Critical Access Hospitals through days cash on hand. A descriptive statistical analysis confirms the increasing mean in days cash in hand post attestation to Stage 2 of Meaningful Use from 32.75 to 47.96 days. Using a t-test to answer H5 examining differences between implementing Stage 2 Meaningful Use and days cash on hand, the findings fail to reject the null hypothesis t (25) = -1.152, p=.130. There is not a statistically significant difference in mean cash days on hand between pre-Stage 2 Meaningful Use and post attestation of Stage 2 Meaningful Use in Washington State Critical Access Hospitals.

The t-test confirms there is not a statistically significant difference in days cash on hand between pre and post attestation. Still, evidence from the descriptive statistics analysis (Table 5.5 – Days Cash on Hand) indicates attesting to Stage 2 Meaningful Use increases days cash on hand in Washington State Critical Access Hospitals. These findings support existing literature of increasing financial liquidity in Hospitals by implementing EHR technologies (Blavin, Ramos, Shah, & Devers, 2013). Moreover, CAH leadership teams can use these findings to support decisions aligning EHR platforms with improving treasury capitalization.

Table 5.5 – Days Cash on Hand



Additional Research Findings

To understand the differences between hospitals that have attested to Stage 1 and 2 of Meaningful Use and hospitals that have not attested to any stages of Meaningful Use, additional research examining the variables of operating margin and salaries to net patient revenue, was performed. A t-test was conducted on each variable to determine if there was a significant difference between means. This study found there is a significant statistical difference in operating margin and salaries to net patient revenue between Stage 1 or 2 of Meaningful Use in Washington State Critical Access Hospitals and non-attested Washington State Critical Access Hospitals. The findings represent an opportunity for senior leaders in these non-attested hospitals to integrate a structured EHR platform to increase financial and operational efficiencies.

Study Strengths and Limitations

The use of audited and attested secondary data gives strength to this study. The financial information for this research, retrieved through the Washington State Department of Health data section web portal for statistical reports, is publicly available.

Washington State licensed hospitals are required annually to submit audited financial statements and Medicare Cost Reports to the Department of Health (WSDH, 2020). This information includes financial statements, payer tables, patient volumes, costing information, and wage reports. From these datasets, balance sheets, income statements, and wage reports for the periods 2014 – 2018 are in this study. The Office of the National Coordinator for Health Information Technology (ONC) is the lead Federal Agency tasked with collecting data supporting the HITECH Act. (ONC, 2019). Meaningful use (MU) attestation data for the periods 2014 – 2018 was extracted from the ONC website listing hospitals by assigned National Provider Identifier (NPI).

Comparative analysis utilizing secondary data is common practice in fields of accounting and finance to study quantitative variances in organizational performance. Evaluation of financial statement information is most often associated with horizontal analysis reviewing variations between reporting periods, vertical analysis examining changes within the same reporting period, or through cross-sectional ratio analysis (Ranjan, 2016).

Ratio analysis and measuring percentage change of revenues or expenses between periods are widely accepted applications using secondary data to measure financial performance in Hospitals (Alexander et al., 2006). The ratios selected for this study are available from Flex Monitoring Team research. The Flex Monitoring Team is a consortium of the Rural Health Resource Centers, located at the Universities of Southern Maine, Minnesota, and North Carolina at Chapel Hill. Their ongoing research is financed and supported by the Federal Office of Rural Health Policy. Specific to their objectives are improving quality of care, developing health systems, and increasing the financial

performance of CAH's (Flex, 2005). In their effort to increase financial performance and provide national comparable benchmarking measures, the Flex Monitoring Team created a list of 23 performance indicators that include profitability, labor costs, and liquidity that are in this study.

This study is limited to examining stages of Meaningful Use prior to this program merging into the Medicare Access and CHIP Reauthorization Act (MACRA). As of January 2019, there are an estimated 1,349 Critical Access Hospitals in the United States (RHIHub, 2019), but this research is limited to explicitly examining 39 Critical Access Hospitals in Washington State.

Implications for Theory

Existing research implies there is a direct relationship between effective management of patient account receivables, cash flows, and organizational profitability (Landry & Landry, 2009; Liu et al., 2011). Others suggest there is a link between profitability and firm liquidity, measured through performance indicators (Singh, 2012; Goodspeed, 2006; Upadhyay & Smith, 2016). Critical Access Hospitals can mitigate financial insolvency through examining financial and operational indicators (Joynt et al., 2011; Pink et al., 2009; Flex, 2009). Moreover, these indicators are an early predictor of an eventual closure (Lynn & Wertheim, 1993; Coyne & Singh, 2008; Wishner et al., 2016).

The results of this study support existing scholarly research promoting the use of financial and operational ratios mitigating CAH insolvency through management decisions of implementing EHR initiatives through the HITECH Act of 2009. Implications for theory are:

- Failing to reject the null in this study will benefit future theoretical research. This analysis is limited to 39 Washington State Critical Access Hospitals. A study by the American Hospital Association estimates there are 1,350 Critical Access Hospitals in the United States (AHA, 2018). Sample size can impact statistical outcomes and significance (LeMire, 2010); therefore, replication of this research should include a greater population of Critical Access Hospitals.
- With an increasingly complex healthcare environment, researchers need to be aware of economic impacts of EHR platforms. Adopting EHR initiatives and attesting to Stage 2 of Meaningful Use can lead to increased operating margins in Critical Access Hospitals.
- There is a need in Critical Access Hospital markets to establish a relationship between management decisions to invest in new technologies and understanding the long-term financial impact to mitigate risks of insolvency. Adopting EHR initiatives and attesting to Stage 2 of Meaningful Use can lead to increased liquidity as measured through current ratio, net days in accounts receivables, and days cash on hand.
- Critical Access Hospitals continue struggling with increasing labor costs, decreasing operating margins, and disruption in quality of care for patients. Understanding the financial benefits of attesting to Stage 1 or 2 of Meaningful Use versus non-attesting can lead to increased operating margins and decreased salaries to net patient revenue.

Implications for Practice

All hospitals, including Critical Access Hospitals, depend on a highly skilled labor force that is service-oriented with a willingness to embrace change through the use of new technologies. To sustain competitive advantages with talent management practices, hospitals have adopted features of HPWS to improve financial and operational outcomes (Mihail, & Kloutsiniotis, 2016) and increase quality of care (Scotti et al., 2007) while reducing costs and infection rates (Lee et al., 2012).

Talent management practices in Critical Access Hospitals are limited by financial constraints from adopting broader aspects of HPWS platforms. To compensate, they can selectively align HPWS practices through a Balanced Scorecard framework specifically designed for rural hospitals. This scaled approach considers the interrelationships between (a) engaging and involving leadership; (b) education of internal and external stakeholders; (c) data: gathering, processing, and benchmarking, and (d) building long-term sustainability. To quantify and measure data gathering, processing, and benchmarking, the Flex Monitoring Team developed a CAH financial indicators report, creating a level of standardization for hospitals seeking to benchmark their financial and operational information (Flex, 2005).

The results of this study are useful for healthcare consultants, government agencies, human resource managers, and management teams of Critical Access Hospitals in developing effective strategies to promote organizational performance. These practical uses include:

- Complexities of Federal and State regulations, patient privacy rules, non-standard insurance reimbursements, and quality reporting measures have

intensified the efforts by hospitals to remain profitable. Management teams and human resource managers in Critical Access Hospitals need to understand the impact of using EHR platforms and aligning with HPWS to increase financial and operational efficiencies.

- To stabilize revenues, increase financial margins, and meet the quality of care goals, hospital leaders can use Meaningful Use Stages 1 or 2 to increase their efforts in managing the revenue cycle.
- Healthcare consultants and government agencies need to understand the impact of Meaningful Use attestation policy for Critical Access Hospitals to create financial stability in rural markets.

Future Research

Hospitals continue to close at alarming rates. A study by the American Hospital Association estimated there are 1,350 Critical Access Hospitals in the United States (AHA, 2018). During the years 2010 to 2019, 118 facilities closed, primarily due to financial stress, with negative operating margins and lack of liquidity to service fixed costs and debt (U.S. Government Accountability Office, 2018; NC Rural Health Research Program, 2019).

Existing studies have researched mitigating financial insolvency through financial and operational indicators at Critical Access Hospitals (Joynt, Harris, Orav, & Jha, 2011; Pink, Holmes, Slifkin, & Thompson, 2009; Flex, 2009), but there is minimal research aligning Electronic Health Records (EHR) adoption and Meaningful Use decisions. This study provides additional analysis and data linking EHR initiatives with increasing financial liquidity at Critical Access Hospitals.

Research in this study is limited to explicitly examining 39 Critical Access Hospitals in Washington State. Future research should include replication of this study, analyzing Critical Access Hospitals in other states and regions by reviewing additional performance indicators created by the Flex Monitoring Team (Flex, 2019). This could consist of exploring the dimensions of capital structure, revenue, and utilization by examining the impacts of State and Federal policies on technology initiatives. Additionally, this study could be replicated examining impacts of Covid-19 on financial and operational outcomes in Critical Access Hospitals to influence future healthcare policy bringing stability to rural communities.

Conclusion

The study examines differences between implementing Stage 2 Meaningful Use and increasing operating margin, salaries, and liquidity in Washington State Critical Access Hospitals. With a progressively complex healthcare environment and greater reliance on Medicare and Medicaid revenues in rural communities, Critical Access Hospitals are experiencing increasing pressures to remain financially solvent and competitive. Beyond primary, acute, and specialty care, these facilities provide long-term skilled nursing care, rehabilitation services, and promote overall economic growth in their communities. To mitigate the risk of insolvency, leadership teams at CAH's must understand the dynamics between their decisions to invest in new technologies coordinating patient care and the long-term financial impacts. As Gilley, Shelton, & Gilley (2011) conclude, "ultimately, a leader is responsible for improving performance" (p. 389).

All hospitals, including CAH's, depend on a highly skilled labor force that is service-oriented with a willingness to embrace change through the use of new technologies. To remain competitive in rural communities, hospital leaders must adopt features of HPWS integrating with technology platforms to improve financial and operational outcomes.

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Appendix A

Operating Margin

Washington State CAH Analysis
Operating Margin

Lic #	Hospital	2018	2017	2016	2015	2014
8	KLICKITAT VALLEY HEALTH	-13.16%	-10.05%	-4.93%	-0.50%	-4.60%
21	NEWPORT HOSPITAL & HEALTH SERVICES	-5.34%	-4.91%	-2.96%	1.03%	2.30%
22	LOURDES MEDICAL CENTER	11.71%	3.00%	2.97%	2.41%	-0.60%
23	THREE RIVERS HOSPITAL	1.09%	7.75%	-0.55%	3.84%	-1.81%
35	ST ELIZABETH HOSPITAL	22.40%	20.41%	10.91%	17.13%	17.00%
45	COLUMBIA BASIN HOSPITAL	-3.69%	-5.57%	-0.94%	-7.22%	-5.56%
46	PMH MEDICAL CENTER	0.77%		-0.04%	4.91%	
54	FORKS COMMUNITY HOSPITAL	-1.47%	0.83%	-4.40%	-6.58%	-5.34%
56	WILLAPA HARBOR HOSPITAL	-3.84%	1.99%	2.82%	-1.99%	-1.40%
79	OCEAN BEACH HOSPITAL	2.47%	4.82%	14.31%	11.84%	3.51%
80	ODESSA MEMORIAL HOSPITAL	9.05%	10.07%	-0.58%	-0.28%	-6.38%
82	GARFIELD COUNTY MEMORIAL HOSPITAL		-8.80%	6.83%		-11.19%
85	JEFFERSON HEALTHCARE	2.83%	2.11%	4.82%	4.21%	2.55%
96	SKYLINE HOSPITAL	-8.70%	-7.77%	-0.48%	-0.11%	-6.10%
107	NORTH VALLEY HOSPITAL	-0.42%	-1.23%	7.59%	9.56%	-0.20%
108	TRI-STATE MEMORIAL HOSPITAL	3.81%	5.02%	2.56%	0.86%	4.93%
111	EAST ADAMS RURAL HOSPITAL	-1.40%	-7.72%	-12.97%	17.37%	3.46%
125	OTHELLO COMMUNITY HOSPITAL					
129	QUINCY VALLEY MEDICAL CENTER	-6.12%	5.07%	-10.12%	-5.57%	
137	LINCOLN HOSPITAL		6.81%		-2.17%	1.71%
140	KITTITAS VALLEY HEALTHCARE	2.35%	2.55%	1.58%	5.23%	6.75%
141	DAYTON GENERAL HOSPITAL	-0.27%	3.84%	2.41%	-1.84%	-8.35%
147	MID VALLEY HOSPITAL	-1.79%	-3.10%	1.16%	1.55%	-1.57%
150	COULEE COMMUNITY HOSPITAL	0.02%	-6.77%	-9.46%	-8.18%	-36.19%
152	MASON GENERAL HOSPITAL	2.72%	3.68%	2.01%	3.79%	2.01%
153	WHITMAN HOSPITAL AND MEDICAL CENTER	5.08%	-1.15%	8.84%	6.18%	2.27%
156	WHIDBEY GENERAL HOSPITAL		-0.49%	1.93%	1.76%	-6.07%
158	CASCADE MEDICAL CENTER	-1.22%	-4.91%	0.36%	-1.81%	3.85%
165	LAKE CHELAN COMMUNITY HOSPITAL	-1.40%	-1.29%	-0.43%	-1.65%	0.50%
167	FERRY COUNTY MEMORIAL HOSPITAL	-1.41%	-4.81%	-1.41%	-0.68%	
172	PULLMAN REGIONAL HOSPITAL	7.16%	6.59%	4.37%	5.51%	1.78%
173	MORTON GENERAL HOSPITAL	-0.29%	5.82%	-0.87%	0.01%	0.54%
186	SUMMIT PACIFIC MEDICAL CENTER		-9.67%	10.99%	7.02%	5.74%
193	PROVIDENCE MOUNT CARMEL HOSPITAL	-2.48%	5.60%	5.06%	13.85%	11.78%
194	PROVIDENCE ST JOSEPHS HOSPITAL	-14.54%	-9.60%	-11.75%	-0.31%	-5.21%
195	SNOQUALMIE VALLEY HOSPITAL	0.36%	0.47%	-7.61%	-18.47%	-6.28%
198	SUNNYSIDE COMMUNITY HOSPITAL	11.39%	4.83%	8.41%	8.62%	11.80%
206	PEACEHEALTH UNITED GENERAL MEDICAL CENTER	11.98%	10.91%	-1.58%	6.61%	11.88%
211	PEACEHEALTH PEACE ISLAND	-0.62%	10.86%	2.02%	2.86%	-10.01%

Appendix B

Salaries & Wages To Net Patient Revenue

Washington State CAH Analysis
Salaries & Wages To Net Patient Revenue

#	Hospital	2018	2017	2016	2015	2014
8	KLICKITAT VALLEY HEALTH	69.74%	67.62%	64.39%	59.36%	59.76%
21	NEWPORT HOSPITAL & HEALTH SERVICES	72.06%	73.54%	72.81%	71.65%	71.29%
22	LOURDES MEDICAL CENTER	39.61%	46.41%	44.93%	41.93%	44.67%
23	THREE RIVERS HOSPITAL	62.62%	62.49%	64.38%	66.52%	71.51%
35	ST ELIZABETH HOSPITAL	32.72%	36.21%	34.94%	41.28%	42.57%
45	COLUMBIA BASIN HOSPITAL	55.57%	58.43%	59.46%	62.37%	59.58%
46	PMH MEDICAL CENTER	54.62%		54.51%	53.07%	
54	FORKS COMMUNITY HOSPITAL	70.15%	70.69%	72.59%	72.76%	71.60%
56	WILLAPA HARBOR HOSPITAL	79.74%	75.42%	74.74%	77.39%	77.18%
79	OCEAN BEACH HOSPITAL	57.21%	57.91%	55.49%	57.31%	62.65%
80	ODESSA MEMORIAL HOSPITAL	57.31%	55.36%	62.69%	63.75%	64.04%
82	GARFIELD COUNTY MEMORIAL HOSPITAL		72.14%	64.37%		79.09%
85	JEFFERSON HEALTHCARE	61.59%	63.33%	61.01%	63.31%	65.17%
96	SKYLINE HOSPITAL	65.81%	70.83%	62.78%	61.83%	59.76%
107	NORTH VALLEY HOSPITAL	58.49%	60.74%	55.19%	56.02%	62.78%
108	TRI-STATE MEMORIAL HOSPITAL	47.67%	49.55%	47.84%	46.65%	46.31%
111	EAST ADAMS RURAL HOSPITAL	58.09%	70.61%	75.52%	64.77%	70.72%
125	OTHELLO COMMUNITY HOSPITAL					
129	QUINCY VALLEY MEDICAL CENTER	60.30%	57.03%	65.25%	68.87%	
137	LINCOLN HOSPITAL		67.48%		72.74%	72.32%
140	KITTITAS VALLEY HEALTHCARE	62.80%	67.11%	65.16%	60.86%	58.82%
141	DAYTON GENERAL HOSPITAL	53.45%	54.05%	57.70%	58.05%	63.92%
147	MID VALLEY HOSPITAL	58.99%	65.09%	62.88%	58.86%	63.92%
150	COULEE COMMUNITY HOSPITAL	58.29%	63.24%	71.04%	66.97%	82.61%
152	MASON GENERAL HOSPITAL	64.26%	65.47%	66.76%	65.08%	65.91%
153	WHITMAN HOSPITAL AND MEDICAL CENTER	51.06%	53.43%	47.63%	49.21%	50.16%
156	WHIDBEY GENERAL HOSPITAL		57.77%	57.02%	54.74%	62.49%
158	CASCADE MEDICAL CENTER	74.02%	78.34%	75.27%	78.93%	79.03%
165	LAKE CHELAN COMMUNITY HOSPITAL	77.14%	78.86%	77.78%	79.36%	78.41%
167	FERRY COUNTY MEMORIAL HOSPITAL	56.16%	62.35%	56.16%	61.24%	
172	PULLMAN REGIONAL HOSPITAL	54.37%	55.95%	56.79%	55.10%	56.00%
173	MORTON GENERAL HOSPITAL	66.46%	61.84%	67.64%	67.11%	72.39%
186	SUMMIT PACIFIC MEDICAL CENTER		69.16%	52.46%	54.55%	53.64%
193	PROVIDENCE MOUNT CARMEL HOSPITAL	37.25%	36.83%	35.42%	32.29%	33.66%
194	PROVIDENCE ST JOSEPHS HOSPITAL	53.53%	51.89%	50.54%	46.09%	49.12%
195	SNOQUALMIE VALLEY HOSPITAL	59.27%	59.14%	65.12%	69.70%	81.87%
198	SUNNYSIDE COMMUNITY HOSPITAL	47.62%	45.96%	44.96%	48.18%	47.62%
206	PEACEHEALTH UNITED GENERAL MEDICAL CENTER	40.34%	41.14%	44.52%	40.56%	38.19%
211	PEACEHEALTH PEACE ISLAND	51.63%	47.24%	45.95%	42.79%	62.20%

Appendix C

Current Ratio

Washington State CAH Analysis
Current Ratio

#	Hospital	2018	2017	2016	2015	2014
8	KLICKITAT VALLEY HEALTH	1.49	1.67	1.85	2.43	1.64
21	NEWPORT HOSPITAL & HEALTH SERVICES	1.36	4.67	4.51	3.56	3.67
22	LOURDES MEDICAL CENTER	0.96	0.87	1.13	1.55	1.61
23	THREE RIVERS HOSPITAL	1.89	2.03	1.10	1.04	0.81
35	ST ELIZABETH HOSPITAL	14.64	4.94	6.81	2.22	4.55
45	COLUMBIA BASIN HOSPITAL	1.52	1.75	2.47	2.15	2.31
46	PMH MEDICAL CENTER	4.78		5.03	5.41	
54	FORKS COMMUNITY HOSPITAL	3.73	3.93	3.56	3.58	3.34
56	WILLAPA HARBOR HOSPITAL	2.50	3.81	1.68	1.63	1.68
79	OCEAN BEACH HOSPITAL	3.58	2.29	2.65	2.00	1.07
80	ODESSA MEMORIAL HOSPITAL	8.93	7.81	6.38	4.24	5.10
82	GARFIELD COUNTY MEMORIAL HOSPITAL		5.48	6.16		0.84
85	JEFFERSON HEALTHCARE	2.70	2.79	3.01	2.78	2.10
96	SKYLINE HOSPITAL	2.08	2.38	3.51	3.86	5.75
107	NORTH VALLEY HOSPITAL	2.72	4.25	4.07	4.53	1.97
108	TRI-STATE MEMORIAL HOSPITAL	3.43	3.42	3.55	3.28	2.96
111	EAST ADAMS RURAL HOSPITAL	3.74	2.88	1.98	1.56	1.85
125	OTHELLO COMMUNITY HOSPITAL					
129	QUINCY VALLEY MEDICAL CENTER	0.26	0.34	0.13	0.32	
137	LINCOLN HOSPITAL		2.61		1.80	2.49
140	KITTITAS VALLEY HEALTHCARE	3.09	1.59	2.13	2.51	2.53
141	DAYTON GENERAL HOSPITAL	1.98	2.21	2.74	1.81	2.73
147	MID VALLEY HOSPITAL	1.75	1.50	1.51	2.27	1.72
150	COULEE COMMUNITY HOSPITAL	0.56	0.75	0.79	1.55	1.55
152	MASON GENERAL HOSPITAL	4.17	4.23	4.38	3.98	3.18
153	WHITMAN HOSPITAL AND MEDICAL CENTER	6.00	6.77	7.97	6.52	3.31
156	WHIDBEY GENERAL HOSPITAL		2.31	2.19	1.93	2.06
158	CASCADE MEDICAL CENTER	1.16	1.23	2.84	2.39	2.17
165	LAKE CHELAN COMMUNITY HOSPITAL	2.05	2.36	2.43	2.13	2.80
167	FERRY COUNTY MEMORIAL HOSPITAL	2.45	3.32	2.45	2.45	
172	PULLMAN REGIONAL HOSPITAL	3.32	2.99	2.55	2.69	2.45
173	MORTON GENERAL HOSPITAL	2.05	2.35	2.76	4.58	3.53
186	SUMMIT PACIFIC MEDICAL CENTER		7.27	4.54	3.14	3.12
193	PROVIDENCE MOUNT CARMEL HOSPITAL	5.61	7.25	2.82	10.09	9.36
194	PROVIDENCE ST JOSEPHS HOSPITAL	4.58	6.37	2.33	5.24	2.80
195	SNOQUALMIE VALLEY HOSPITAL	6.68	6.37	4.03	2.61	1.40
198	SUNNYSIDE COMMUNITY HOSPITAL	2.25	2.35	2.19	2.06	2.25
206	PEACEHEALTH UNITED GENERAL MEDICAL CENTER	8.08	2.42	1.48	2.12	1.01
211	PEACEHEALTH PEACE ISLAND					

Appendix D

Days in Accounts Receivables

Washington State CAH Analysis
Days in Accounts Receivables

#	Hospital	2018	2017	2016	2015	2014
8	KLICKITAT VALLEY HEALTH	55	58	52	43	44
21	NEWPORT HOSPITAL & HEALTH SERVICES	51	52	48	46	54
22	LOURDES MEDICAL CENTER	56	47	50	50	57
23	THREE RIVERS HOSPITAL	50	52	54	59	54
35	ST ELIZABETH HOSPITAL	50	65	77	56	47
45	COLUMBIA BASIN HOSPITAL	37	38	46	38	52
46	PMH MEDICAL CENTER	55		58	57	
54	FORKS COMMUNITY HOSPITAL	41	38	46	45	36
56	WILLAPA HARBOR HOSPITAL	40	45	39	38	42
79	OCEAN BEACH HOSPITAL	71	72	65	45	38
80	ODESSA MEMORIAL HOSPITAL	30	73	66	57	25
82	GARFIELD COUNTY MEMORIAL HOSPITAL		37	12		58
85	JEFFERSON HEALTHCARE	45	43	44	42	58
96	SKYLINE HOSPITAL	54	51	45	46	221
107	NORTH VALLEY HOSPITAL	41	32	39	43	40
108	TRI-STATE MEMORIAL HOSPITAL	41	41	38	49	37
111	EAST ADAMS RURAL HOSPITAL	120	149	162	113	179
125	OTHELLO COMMUNITY HOSPITAL					
129	QUINCY VALLEY MEDICAL CENTER	31	34	14	45	
137	LINCOLN HOSPITAL		37		36	35
140	KITTITAS VALLEY HEALTHCARE	84	46	41	38	45
141	DAYTON GENERAL HOSPITAL	73	66	80	47	49
147	MID VALLEY HOSPITAL	44	43	36	49	59
150	COULEE COMMUNITY HOSPITAL	36	48	40	38	47
152	MASON GENERAL HOSPITAL	44	44	46	46	59
153	WHITMAN HOSPITAL AND MEDICAL CENTER	54	62	43	57	49
156	WHIDBEY GENERAL HOSPITAL		61	44	41	42
158	CASCADE MEDICAL CENTER	55	64	73	76	68
165	LAKE CHELAN COMMUNITY HOSPITAL	52	63	64	65	67
167	FERRY COUNTY MEMORIAL HOSPITAL	54	72	54	43	
172	PULLMAN REGIONAL HOSPITAL	38	42	39	41	52
173	MORTON GENERAL HOSPITAL	48	34	68	58	70
186	SUMMIT PACIFIC MEDICAL CENTER		68	50	45	58
193	PROVIDENCE MOUNT CARMEL HOSPITAL	42	37	40	45	47
194	PROVIDENCE ST JOSEPHS HOSPITAL	44	40	42	40	139
195	SNOQUALMIE VALLEY HOSPITAL	49	42	57	74	90
198	SUNNYSIDE COMMUNITY HOSPITAL	61	55	70	60	61
206	PEACEHEALTH UNITED GENERAL MEDICAL CENTER	46	52	63	52	253
211	PEACEHEALTH PEACE ISLAND					

Appendix F

Days Cash On Hand

Washington State CAH Analysis
Days Cash On Hand

#	Hospital	2018	2017	2016	2015	2014
8	KLICKITAT VALLEY HEALTH	35	53	91	67	67
21	NEWPORT HOSPITAL & HEALTH SERVICES	29	23	38	36	21
22	LOURDES MEDICAL CENTER	2	1	2	1	2
23	THREE RIVERS HOSPITAL	19	31	4	8	6
35	ST ELIZABETH HOSPITAL	291	201	33	14	75
45	COLUMBIA BASIN HOSPITAL	25	83	60	48	22
46	PMH MEDICAL CENTER	95		132	109	
54	FORKS COMMUNITY HOSPITAL	51	58	42	67	72
56	WILLAPA HARBOR HOSPITAL	56	31	34	18	32
79	OCEAN BEACH HOSPITAL	92	99	90	59	40
80	ODESSA MEMORIAL HOSPITAL	268	167	130	159	115
82	GARFIELD COUNTY MEMORIAL HOSPITAL		160	132		39
85	JEFFERSON HEALTHCARE	18	20	16	18	20
96	SKYLINE HOSPITAL	21	45	85	101	101
107	NORTH VALLEY HOSPITAL	92	110	102	55	6
108	TRI-STATE MEMORIAL HOSPITAL	81	133	132	106	135
111	EAST ADAMS RURAL HOSPITAL	66	40	41	64	62
125	OTHELLO COMMUNITY HOSPITAL					
129	QUINCY VALLEY MEDICAL CENTER	3	8	4	2	
137	LINCOLN HOSPITAL		48		22	49
140	KITTITAS VALLEY HEALTHCARE	15	15	35	44	45
141	DAYTON GENERAL HOSPITAL	28	40	104	36	58
147	MID VALLEY HOSPITAL	22	16	22	7	4
150	COULEE COMMUNITY HOSPITAL	17	3	5	15	31
152	MASON GENERAL HOSPITAL	210	235	208	218	178
153	WHITMAN HOSPITAL AND MEDICAL CENTER	245	230	243	218	241
156	WHIDBEY GENERAL HOSPITAL		35	44	42	27
158	CASCADE MEDICAL CENTER	60	54	44	17	27
165	LAKE CHELAN COMMUNITY HOSPITAL	14	7	5	11	13
167	FERRY COUNTY MEMORIAL HOSPITAL	40	31	40	46	
172	PULLMAN REGIONAL HOSPITAL	28	28	31	37	29
173	MORTON GENERAL HOSPITAL	51	82	65	45	30
186	SUMMIT PACIFIC MEDICAL CENTER		410	131	170	142
193	PROVIDENCE MOUNT CARMEL HOSPITAL	0	4	0	6	1
194	PROVIDENCE ST JOSEPHS HOSPITAL	0	1	1	4	2
195	SNOQUALMIE VALLEY HOSPITAL	159	156	133	76	21
198	SUNNYSIDE COMMUNITY HOSPITAL	145	20	51	101	145
206	PEACEHEALTH UNITED GENERAL MEDICAL CENTER	12	68	4	11	-

Appendix G

Meaningful Use Stages

Washington State CAH Analysis
Meaningful Use Stages

#	Hospital	Meaningfull Use Stage 2	MU Stage 2 Year	MU Stage 1 Year
8	KLICKITAT VALLEY HEALTH	N/A	N/A	N/A
21	NEWPORT HOSPITAL & HEALTH SERVICES	2	2015	2014
22	LOURDES MEDICAL CENTER	2	2016	2014
23	THREE RIVERS HOSPITAL	2	2016	2014
35	ST ELIZABETH HOSPITAL	2	2014	Prior 2014
45	COLUMBIA BASIN HOSPITAL	2	2016	2014
46	PMH MEDICAL CENTER	2	2015	2014
54	FORKS COMMUNITY HOSPITAL	N/A	N/A	N/A
56	WILLAPA HARBOR HOSPITAL	2	2016	2014
79	OCEAN BEACH HOSPITAL	2	2016	2015
80	ODESSA MEMORIAL HOSPITAL	2	2014	Prior 2014
82	GARFIELD COUNTY MEMORIAL HOSPITAL	N/A	N/A	N/A
85	JEFFERSON HEALTHCARE	2	2015	2014
96	SKYLINE HOSPITAL	2	2014	Prior 2014
107	NORTH VALLEY HOSPITAL	2	2015	2014
108	TRI-STATE MEMORIAL HOSPITAL	2	2014	Prior 2014
111	EAST ADAMS RURAL HOSPITAL	N/A	N/A	N/A
125	OTHELLO COMMUNITY HOSPITAL	2	2014	Prior 2014
129	QUINCY VALLEY MEDICAL CENTER	N/A	N/A	N/A
137	LINCOLN HOSPITAL	N/A	N/A	N/A
140	KITTITAS VALLEY HEALTHCARE	2	2015	2014
141	DAYTON GENERAL HOSPITAL	N/A	N/A	N/A
147	MID VALLEY HOSPITAL	2	2014	Prior 2014
150	COULEE COMMUNITY HOSPITAL	2	2015	2014
152	MASON GENERAL HOSPITAL	2	2014	Prior 2014
153	WHITMAN HOSPITAL AND MEDICAL CENTER	2	2014	Prior 2014
156	WHIDBEY GENERAL HOSPITAL	N/A	N/A	N/A
158	CASCADE MEDICAL CENTER	N/A	N/A	N/A
165	LAKE CHELAN COMMUNITY HOSPITAL	2	2015	2014
167	FERRY COUNTY MEMORIAL HOSPITAL	N/A	N/A	N/A
172	PULLMAN REGIONAL HOSPITAL	2	2014	Prior 2014
173	MORTON GENERAL HOSPITAL	2	2016	2014
186	SUMMIT PACIFIC MEDICAL CENTER	N/A	N/A	N/A
193	PROVIDENCE MOUNT CARMEL HOSPITAL	2	2014	Prior 2014
194	PROVIDENCE ST JOSEPHS HOSPITAL	2	2014	Prior 2014
195	SNOQUALMIE VALLEY HOSPITAL	2	2016	2014
198	SUNNYSIDE COMMUNITY HOSPITAL	2	2015	2014
206	PEACEHEALTH UNITED GENERAL MEDICAL CENTER	2	2016	2014
211	PEACEHEALTH PEACE ISLAND	N/A	N/A	2016