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The Complete Care Model: Improving Diabetic Patient Outcomes in Correctional Facilities

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This is to certify that the doctoral study by

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

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2020

Abstract

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MS, California State University, Bakersfield, 2013

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Abstract

Diabetes is a growing problem, becoming an increasing concern within prisons. Research suggests that as many as 4.9% of the inmate population is diagnosed with diabetes. To provide constitutionally required healthcare to the inmate population, corrections officials must identify a validated diabetes treatment modality geared toward improving diabetes outcomes. The purpose of this quantitative study was to evaluate the impact of a patient centered medical home (PCMH) based model of healthcare within the California Correctional Health Care Services (CCHCS) on diabetic prisoners. Using the social construct theory as the framework, the research questions were focused on determining whether there was a relationship between Hemoglobin A1C and Cholesterol LDL values of diabetic patients after the implementation of the complete care model (CCM) within CCHCS. With a sample size of 142, an ANOVA analysis using SPSS revealed that there was a significant decrease in Hemoglobin A1C values after the implementation of the CCM. However, Cholesterol LDL values did not significantly decrease. There was also a statistically significant increase in referrals to specialty services. The study contributes to positive social change by validating the PCMH model for use in the treatment of diabetes within a structured setting such as a prison system. The results of the study can be used to expand the use of CCM toward improving the health and wellness of inmates as they are rehabilitated for return to the community.

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Dedication

I would like to dedicate this to Travis Williams, my biggest supporter. And to our three boys Shawn, Tievon, and Tristan Williams for letting little dad have quiet time.

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Section 1: Foundation of the Study and Literature Review

Problem Statement

Coordination of care is an important component of an effective delivery model of treatment for patients (Droz, Senn, & Cohidon, 2019). In a correctional setting, this can be exceptionally difficult given the patient population and environment of care within a prison. Noted among some of the struggles with managing diabetes in prison are frequent transfers of patients to different provider panels disrupting their treatment. Additionally, communication among treatment providers is difficult in these types of environments (Booles, 2014). As a result of this struggle, a landmark U.S. Supreme Court case, *Estelle v. Gamble* (1976) set forth the expectation that medical treatment in prisons is a constitutionally mandated requirement under the Eighth Amendment to the Constitution (Sonntag, 2017). This has prompted state correctional departments to make critical decisions about how to provide effective and quality care for patients. The State of California is no exception. Beyond the ruling of *Estelle v. Gamble,* California has experienced other litigation that has necessitated a federal receivership to take over prison healthcare delivery from the California Department of Corrections and Rehabilitation (CDCR; Simon, 2013). In *Plata v. Brown* (2011)*,* the state was mandated to reduce the overcrowded prison population to more effectively focus on the delivery of medical treatment to the chronically ill inmates remanded to the department.

One effort CDCR made was to establish the California Correctional Health Care Services (CCHCS), overseen by the federal receiver, to organize and deliver medical treatment (*Plata v. Schwarzenegger*, 2005). In 2015, CCHCS developed the complete

care model (CCM), based on the patient-centered medical home (PCMH) model of patient delivery, and adopted its policies and procedures (Kelso, 2015). The goal is to develop a treatment model that puts the patient at the center of the treatment team to improve patient care.

The PCMH model has been studied in various settings in the past several decades (Agency for Healthcare Research and Quality [AHRQ], 2013); however, effectiveness has not been studied in a correctional setting. It is important to a have a quality healthcare delivery system given the fact that prisoners have a higher rate of chronic medical conditions when compared to the general population (Rosen, Grodensky, & Holley, 2016). As such, it is important for health care leaders to make a conscious effort to provide effective treatment to patients who can be considered high risk. Patients deemed to be high risk, such as diabetics with high A1C values, can be some of the most difficult patients for any organization to manage and treat effectively, especially adding the fact that the patient population is incarcerated (Reagan & Shelton, 2016). CCHCS is no different than any other health services organization in this regard.

Although the merits of the PCMH model have been studied in many environments, there is a gap in the research on how effective this type of treatment model is within institutionalized settings, such as prisons that prohibit the full range of health care options available to patients. The restrictions placed on inmates incarcerated within a prison system can negatively impact their ability to fully engage in self-care necessary to manage chronic diseases (i.e., diabetes). Further, typical managed care models of

healthcare, like the PCMH model, have litigation problems despite some departments of correction attempting to employ it (Sonntag, 2017).

The demographics of prisons, with an increase in the chronically ill and aging populations (Sonntag, 2017), suggests a need for access to quality health care treatment that has been shown to be effective. Therefore, this study was necessary to promote awareness that will create social change. Without a body of research to support its success in these types of settings, access to this type of treatment model for inmate-patients across the nation is limited.

Purpose of the Study

The purpose of this quantitative study was to identify whether there is a relationship between the low-density lipoprotein cholesterol (LDL) and glycated hemoglobin (A1C) values of diabetic patients and implementation of a PCMH model-based delivery system within CCHCS. I also analyzed the relationship between the CCM implementation and numbers of referrals to specialty services that cannot be provided for within the prison setting and are directly required for management of diabetes. Early identification for the need of specialty care can improve health outcomes for these patients, especially with the CCM of treatment delivery, encouraging collaboration of care for patients. A demonstration of these relationships will exemplify the strengths of the CCM in CCHCS as a treatment for conditions like diabetes within a controlled and institutionalized environment.

Research Questions and Hypotheses

Research Question 1: Will post-CCM implementation A1C values of diabetic patients in 2018 be significantly lower than 2014 A1C values?

$H_0$1: For diabetic patients, the A1C levels will not be significantly lower after the implementation of the patient-centered medical home model.

$H_1$1: For diabetic patients, the A1C levels will be significantly lower after the implementation of the patient-centered medical home model.

Research Question 2: Will post-CCM implementation LDL levels of diabetic patients in 2018 be significantly lower than 2014 LDL levels?

$H_0$2: For diabetic patients, the LDL levels will not be significantly lower after the implementation of the patient-centered medical home model.

$H_1$2: For diabetic patients, the LDL levels will be significantly lower after the implementation of the patient-centered medical home model.

Research Question 3: Is there a decrease in the number of referrals to higher levels of care, defined as outpatient housing unit, correctional treatment center, or community placement hospitalization, for diabetic patients from 2014 to 2018, representing the implementation of the patient-centered medical home model within CCHCS?

$H_0$3: There is no significant change in the number of referrals to a higher level of care for diabetic patients after the implementation of the patient-centered medical home model.

$H_1$3: There are fewer referrals to a higher level of care for diabetic patients after the implementation of the patient-centered medical home model.

Theoretical Framework

The theory of social construction is foundational to understanding the PCMH model of healthcare delivery. Originally conceptualized by Berger and Luckman (1967), the theory of social construction from a health care perspective centers on identifying culturally and socially meaningful ways of interacting with providers and patients. The premise within social construction theory, that contrasting views can be valid in differing circumstances, is important to consider when viewing the CCM. The experiences of each member of the care team, including the patient, enhance the overall quality of treatment, which social construct theory supports by emphasizing the value in the relationship between patient and practitioner. By focusing on this relationship, treatment can center on the needs of the individual patient. Additionally, empathy is significant in this relationship and is also a social construct that is collectively understood (Hirshfield & Underman, 2017). In an environment such as a prison that can take the human nature out of the patient seeking treatment, using a social construction theory can help foster a medical relationship between the care team and the patient. For chronic diseases like diabetes, it is important to take the individual experience of the patient into consideration to employ a treatment that will be acceptable to the patient while also being empirically validated. From the social construction model comes the idea that the patient's experience is the most important in understanding the most effective way to treat his or her medical conditions. Therefore, researching how the PCMH model can impact the

individual health outcomes of patients indicates how treatment can find meaning in often inhumane settings such as prisons.

Additionally, the chronic care model is the theoretical underpinning of the PCMH model and the CCM, which suggests that the most effective care for chronic illness is a team-based approach to treat both the patient and the population (Vallente, 2018). The PMH model is based on the chronic care model because it focuses on primary care clinics as the epicenter for treatment with the patient at the center (Rosland et al., 2018). The focus of this healthcare delivery model is timely access to care, continuity of care, and multidisciplinary teamwork (AHRQ, n.d.). The overarching goal is to create a more comprehensive and patient-centered delivery model. Building on the core concepts of the PCMH model, CCHCS has created a delivery model that allows for open lines of commutation between patients and healthcare staff, with the treatment team being centered on the patient, the patient and the care team sharing in decision-making, and data-informed patient registries being used to improve quality and access to care (AHRQ, n.d.).

The results from this study can provide direction for which variables within the PCMH model should be evaluated to determine if the modified prison-based PCMH model is as effective in improving diabetes care measures as PCMH models found in the community. Because of the limitations within a prison setting in fully developing a comparable PCMH model to community examples, it will be important to determine if these care measures can still be improved (Ackroyd & Wexler, 2014). When evaluating a theory such as the PCMH model, it is important to use secondary data to support its

utilization and to identify specific health outcomes (Low et al., 2015) that are either improved or decreased as a result of the treatment intervention.

Nature of Study

The main premise of this research was centered on whether the CCM, implemented by the CCHCS, has had a positive effect on the health of patients deemed to be medically high-risk, particularly those with a diagnosis of type II diabetes. CDCR has developed numerous registries that track patients with various medical conditions. The diabetes registry, and the data contained within it, documents trends in patients who have this condition and allowed for data collection of historical information related to diabetes care before and after the implementation of the PCMH model. The statistical analysis used for this study was a repeated measures analysis of variance (ANOVA) on the variables of A1C values, LDL variables, and referrals to specialty services pre- and post-implementation of the CCM within CCHCS.

Secondary Data Types and Sources of Information

The data source was archival data from the CCHCS Data Warehouse, which contains historical health information on a large dataset for CDCR, which currently houses over 120,000 inmates, all of whom received some form of healthcare through CCHCS. This data allowed for a review of patient health trends and deeper examination into specific patient classifications. Utilizing health data such as A1C values for diabetic patients allowed for a quantitative analysis of the benefits or contraindications of the PCMH model. These data were also crossed referenced with additional data trends such as patient referrals to higher level of care and readmissions to outside hospitals within 30

days. This allowed me to compare the impacts of prevention medicine and the CCM on health indicators with verifiable aggregated patient level health outcomes.

CCHCS Quality Management has developed patient registries that utilize metrics relevant to various chronic medical conditions. The diabetes registry provides information necessary for the care team to make informed decisions about the progression of treatment for patients with diabetes. For example, this registry provided the most recent A1C values of patients, along with treatment compliance of the patients as defined by medication adherence and other variables. In addition to these registries, CCHCS utilizes an electronic referral for specialty service databases that tracks referrals to specialty treatment. Finally, data were collected on when patients are transferred to a higher level of care due to a medical condition. This information is aggregated and displayed in a healthcare dashboard that is used by institutional Quality Management Committees as a metric for understanding the quality of healthcare within the facility.

Literature Search Strategy and Keywords

I used Google Scholar, Ebscohost, course textbooks, Medline, and ProQuest to find scholarly articles that were related to my topic of study. I also used other resources such as policies and procedures that were found on the CCHCS webpage. Keyword searches such as the *Patient-Centered Medical Home Model, prison health care, diabetes, A1C, LDL*, and *social construction theory* were used. I utilized research with publication dates within the last 5 years unless relevant supporting articles were not available, like various case law references that have served as legal precedence for many years in prison health care law.

Literature Review

Introduction

The World Health Organization (2018) suggests that as many as 422 million people around the world have diabetes, which represents a significant increase from the 108 million who were diagnosed with the disease in 1980. In 2020, the Centers for Disease Control and Prevention estimated that there were over 30 million Americans living with diabetes in 2015. This constitutes roughly 9.4% of the U.S. population. Further, these individuals living with diabetes have experienced health complications such as cardiovascular disease, lower-extremity amputation, and diabetic ketoacidosis. In total, the overall costs of diagnosed diabetes were estimated to be $327 billion in 2017 alone (American Diabetes Association, 2019).

At the end of 2016, there were an estimated 1.5 million individuals incarcerated within Federal and State correctional systems, representing 1 in 38 Americans (Carson, 2018). Within this population, it is estimated that the prevalence of inmates with diabetes is 899 per 100,000 based on statistics from 2011-2012. This rate has doubled from 2014 (Diabetes Behind Bars, 2018). Additionally, based on a study sample from maximum-security prison inmates in New York state, 4.9% of the inmate population carried a diabetes diagnosis compared to 2.4% found in the general population (Bai, Befus, Mukherjee, Lowy, & Larson, 2015).

Treatment Modalities for Diabetes

The American Diabetes Association (2018) has outlined treatment modalities that have been found to be effective for diabetes. The primary treatment modality is known as

diabetes self-management education and support, which focuses on creating an environment that is patient-centered, emphasizes various modalities of educational settings, and uses medical technology to assist with clinical decision-making (Sepers et al., 2015). The goal of any treatment modality for diabetes is to improve overall health outcomes of the patients. Health outcomes have been defined by a multitude of diabetes-associated professional and charitable organizations as the presence of hypoglycemia, hyperglycemia, time in A1C range, diabetic ketoacidosis, and patient-reported outcomes (Agiostratidou et al., 2017).

Patient-Centered Medical Home Model

First theorized in the 1970s by a pediatrician, the PCMH model of healthcare delivery was designed to improve health care quality by enhancing the effectiveness of primary care (AHRQ, n.d.). As the model gained traction in pediatrics, other primary care systems began to look at it as an option to improve quality for their patients. In 2006, the American College of Physicians created a specific policy monograph highlighting the advanced medical home, emphasizing a treatment modality that is patient-centered, physician guided, cost efficient, and longitudinal. In addition, this treatment promotes long-standing relationships that focus on healing and meeting the needs of the patient (American College of Physicians, 2006). With the enactment of the Patient Protection and Affordable Care Act, primary care settings were incentivized to establish and enhance medical homes (Kane, 2019).

There are five primary tenets associated with the PCMH model: comprehensive care, patient-centered care, coordinated care, accessible services, and quality and safety.

In comprehensive care, patients with complex medical conditions can require intensive medical services and multiple providers across several different environments. This can lead to a fractured treatment plan. The PCMH model encourages primary care providers to improve their capacity to treat these complex cases in-house and create a structure that allows for more comprehensive care (AHRQ, 2011).

The second tenet, patient-centered care, can help manage patient health conditions in four primary ways: communication, self-care, partnered decision-making, and improving patient safety (Peikes, Pham, O'Malley, & Maxfield, 2011). Additionally, creating environments where active engagement of patients and families, rather than just focusing on symptoms, can help patients make informed clinical decisions. Patient-centered care can be attained through a three-step process utilizing a strengths assessment, a feedback session, and development of strengths to achieve goals (Kiwanuka, Rad, & Alemayehu, 2019).

Further, coordinated care is for cases where the primary care team cannot provide services to a patient given the need for specialty care. In these cases, efforts should be made to create medical neighborhoods to coordinate care within a structured network. Having a network of specialists that branch out from the primary care setting allows care teams to maintain a flow of information while maintaining accountability for the coordinated care of patients (Taylor, Lake, Nysenbaum, Peterson, & Meyers, 2011). For instance, Sepers et al. (2015) measured the effects of coordinated care in several PCMH models for patients with diabetes and found positive clinical outcomes, particularly with

the reduction of A1C levels, along with patient and staff satisfaction being rated positively.

Accessible care is also an important aspect of a healthcare delivery model. The PCMH model focuses on accessibility as one of the primary components of treatment. If patients cannot access treatment, they will not engage in treatment and ultimately health outcomes decline. Reduced access to comprehensive and continuous services such as those found in a PCMH model may exacerbate chronic conditions. This lack of access can increase emergency department visits and preventable hospitalizations (Almalki, Karami, & Almsoudi, 2018). For example, Cai et al. (2018) surveyed rural residents to determine the best design for a PCMH model in an outlying area in the Midwest United States and found that rural residents preferred an environment that focused on privacy, provided seating or family in the exam room, and provided a space that supports information sharing. Because patients like these must travel longer distances to access health care services, creating an accessible environment is important to ensure they return and engage in their treatment.

Quality and safety are also ensured by a PCMH model through utilizing various decision-support tools, evidence-based care, shared decision-making, and other strategies. By using these types of improvement activities, the PCMH model contributes to a systems-level focus on quality (AHRQ, n.d.). Quality improvement is at the heart of a PCMH model, which primary care settings can accomplish by continuously assessing the processes and identifying problems to improve the overall system (Akinci & Patel, 2014). For example, in a recent study of more than 23,000 primary care practices utilizing the

PCMH delivery model, various aspects of quality improvement were focused on using patient data for care delivery decisions and other practice enhancement efforts (Pereira, Gabriel, & Unruh, 2019).

Finally, a critical component of any health care delivery model is the way in which it is perceived by the patients. The PCMH model has demonstrated positive responses from patients. Platonova, Saunders, Warren-Findlow, and Hutchison (2016) found that patients who received treatment at free clinics utilizing the PCMH model had highly positive impressions of the treatment and would recommend the clinics to others. Furthermore, low-income Spanish-speaking patients have shown positive responses to the PCMH model, which can be attributed to provider communication and interaction, which are hallmarks of the PCMH model's concepts (Platonova et al., 2016). Additionally, the patient experience with a health care system is not exclusive to the medical providers. Ancillary staff, such as receptionists and support staff, contribute to the overall success of the PCMH model. By including these staff in training related to the concepts of quality care, patient satisfaction will improve. In addition, encouraging patient-centered engagement from the support staff improves patient perceptions of the entire care team (Solimeo, Stewart, & Rosenthal, 2016).

Patient-Centered Medical Home Model and Diabetes

The PCMH model has had a demonstrated positive impact on diabetes (Solberg, Carlin, Peterson, & Eder, 2020; Woodard et al., 2018). Clinical outcomes of the PCMH model have shown reduced A1C, cholesterol levels (LDL and HDL levels), and body mass index (Ackroyd & Wexler, 2014; Baker & Laughlin, 2017; Johnson et al., 2010;

Solberg et al., 2020). Further, for patients who are medically vulnerable such as those with low incomes, minority patients, and those who have comorbid medical conditions or reduced access to care, the PCMH model has resulted in greater odds of having well-controlled A1C levels (Kinsell, Hall, Harman, Tewary, & Brickman, 2017). The PCMH model can also integrate self-management education as one of the primary treatments for diabetes control to provide patient-centered, empirically validated treatment for patients with diabetes. Integrating a coordinated care model that combines diabetes self-management education and support with a PCMH model can have positive effects on A1C values and significant improvement of body mass index scores for patients (Sepers et al., 2015).

As a part of improving patient outcomes, some of the five tenets of the PMCH model have been shown to be associated with treatment activation among patients with a diabetes diagnosis. In particular, the quality of provider interactions, as defined as knowledgeable and engaging interactions with patients, is rated as one of the most important attributes of the PCMH model that leads to higher treatment activation. There are also organizational aspects of the PCMH model that lead to patient activation such as the ability to easily and quickly schedule appointments or seek consultation from a member of the care team (Bilello et al., 2018).

The body of literature surrounding the PCMH model and its impacts on diabetes in primary care settings is broad, however, there needs to be more focus on its application in other healthcare settings. Given the expanding industry of healthcare technology, there is a need for research on other methods of treatment delivery such as telehealth. In

addition, with the growing prison population, particularly with inmates who suffer from chronic medical conditions such as diabetes, it is imperative that additional research be conducted on how diabetes is managed in these types of settings. Although California is one of the only states where prison systems have utilized a model based on the PCMH model, if positive outcomes can be demonstrated in this setting, additional states might be willing to adopt the PCMH model to manage chronic care for inmates.

History of Healthcare in Prison

American prisons have been responsible for the health needs of prisoners since the 18th century (Sonntag, 2017). However, it was not until recently that the quality of treatment provided became more of a focus in the judicial system. The current healthcare systems present in many correctional departments across the United States have been implemented as the direct result of legal challenges over the course of several decades, where cases have suggested that prison systems violated the eighth amendment to the Constitution by not providing adequate healthcare for inmates (Sonntag, 2017). The first landmark case challenging the inadequate healthcare in prison was *Estelle v. Gamble* (1976), which suggested that the lack of provisions for healthcare services to inmates in the Texas Department of Corrections amounted to a deliberate indifference. In the years following the *Estelle* decision, other decisions have been made that continued to help form the foundation of the current healthcare systems found in state correctional systems.

More recently, the CDCR has faced legal challenges regarding its provisioning of healthcare services to its inmates. *Plata v. Brown* (2011) is a lawsuit that reached the U.S. Supreme Court that argued that the extreme overcrowding of the California prisons

caused an inability to provide constitutionally adequate healthcare. The case revealed a system of denial that inmates in California prisons were not at all deserving of adequate medical treatment (Simon, 2013). Furthermore, as Simon (2013) suggested, "prisons that do not sicken or kill their prisoners must . . . necessarily be, whether designed or not, an Hospital…" (p. 253). The settlement agreement associated with the *Plata v. Brown* case involved the assignment of a federal receiver to oversee the totality of the health care delivery services within the CDCR. This oversight provided for significant enhancements to the delivery model and has aided in moving California closer to the provisions of constitutionally adequate healthcare. In the years following the receivership, the focus of the CCHCS Department turned to access and quality of care for the inmate-patients. As the system matured, a standard delivery model was adopted to improve the overall healthcare of the patients. In particular, CCHCS moved to formally create a modified version of the PCMH model known as the CCM.

The Complete Care Model in California's Department of Corrections and Rehabilitation

The CCM was implemented within CDCR in 2014, allowing the ability to approach health care services with a team approach, which added an additional layer of patient oversight. The CCM requires CCHCS to establish care teams assigned to oversee coordinated patient panels and allows for a platform for program improvement (CDCR, 2015). The CCM is a tool that allows the teams to communicate patient needs more comprehensively. Additionally, the CCM is a coordinated method to approach patient

care while addressing access to care, health maintenance, and quality improvement through data to better meet regulatory compliance measures (CDCR, 2015).

The concepts of daily use of the CCM require that a set of core team members meet daily to discuss the patients of the day, or the patients that are to be seen that day. In addition, the core team members also discuss a panel of high-risk patients that are assigned to that care team that is tracked and displayed within the CCHCS dashboard. From the patients who are indicated on the dashboard, these patients may be scheduled that day or discussed for future follow as needed (CDCR, 2015). Additionally, the use of population management meetings provides opportunities for the care team to review the CCHCS dashboard in detail ensuring that the data is reviewed in-depth and that specific patients that require interdisciplinary review are spotlighted (CDCR, 2015).

Use of healthcare informatics has allowed the CCM to produce action-oriented improvements to the care delivered to patients remanded to the CDCR. An array of resources has been created to assist with this function—most prominently the CCHCS Health Services Dashboard. With the dashboard, care teams and healthcare leaders at each prison within CDCR can assess the overall health of its system. The dashboard provides consolidated access to metrics developed in consultation with the Healthcare Effectiveness Data and Information Set. The information is typical of what health care organizations would monitor in the community: patient outcomes, access to care, and utilization and cost. The care teams can review these results on a monthly basis and determine areas for improved delivery of care.

Resources for population management activities within the care teams have also been developed. For example, there are a number of patient registries for high-risk medical conditions that allow a care team to look at the patients on their panel who have these conditions as well as relevant medical interventions that should occur to monitor the treatment progression. Each care team is expected to participate in a bi-monthly population management working session. In these sessions, a forum is established where care teams can review new clinical and organizational guidelines, identify barriers to care and any new resource needs, receive feedback on the performance of the clinic work, and manage subpopulations within the patient panel for improving overall patient outcomes (CDCR, 2015).

One of the hallmarks of the CCM is a morning huddle that occurs for each care team to discuss patient issues that occurred yesterday, today, and tomorrow. A report is generated that utilizes data from numerous sources to pre-populate patient information for various queries to be discussed during these huddles. Examples are patients who have returned from a higher level of care, new patients on the panel that have recently arrived, medication concerns (i.e., expiring or expired prescriptions), and the day's schedule for each of the members of the care team.

Coordination of care occurs in each care team through the establishment of a care coordinator. Typically, the care coordinator is a licensed vocational nurse or psychiatric technician assigned to the care team who works collaboratively with specialty care and other ancillary health care services in the facility and in other environments to ensure that

patients who require additional care, care that the care team is not equipped to provide, are treated effectively and efficiently (CDCR, 2015).

Definitions

Care coordination: The deliberate organization of patient care activities between two or more participants involved in a patient's care to facilitate the appropriate delivery of health care services and minimize the danger of care fragmentation.

Care coordinator: A primary care licensed vocational nurse or psychiatric technician who is assigned a group of patients within the patient panel. Normally the patients will be less complex patients in the primary prevention group. The care coordinator uses his/her skills, according to his/her scope of practice, to meet the goals of each patient's care plan. The care coordinator collects data, provides patient education, documents findings and interactions, communicates patient information, and provides input to the registered nurse care manager and other members of the care team.

Care management: A collaborative process of patient assessment, evaluation, advocacy, care planning, facilitation, and coordination. The extent of care management services varies according to the complexity of the patient.

Care team: An interdisciplinary group of health care professionals who combine their expertise and resources to provide care for a panel of patients.

Complete care model (CCM): The CCM is based on the PCMH model and services as a foundation to which health care needs of patients are met in a timely manner. This model is used to reduce hospitalizations, ensure better patient outcomes,

and includes elements such as coordination of care, access to care, preventive care, comprehensive care, and continuous care for patients.

Patient centered medical home (PCMH) model: The PCMH model seeks to coordinate care through a primary provider to help the patient receive the care they need when they need it. This model helps the patient to better understand the care they are receiving in a more efficient way.

Patient panel: A clearly defined group of patients that are assigned to a particular care team. Every care team has one panel of patients, and every patient is assigned to a care team.

Population management: Systematic assessment, monitoring, and management of the health care needs of identified groups of patients.

Primary care team: An interdisciplinary team that organizes and coordinates services, resources, and programs to ensure consistent delivery of appropriate, timely, and patient-centered, evidence-based care to a designated patient panel.

Assumptions

One assumption was that the data provided by CCHCS encompassed all patients who were diagnosed with diabetes prior to the implementation of the CCM in 2014 and diagnosed with diabetes in 2018. By looking at only patients who carry a diagnosis of diabetes, the dataset was not confounded with patients without the diagnosis who did not refuse treatment or who required higher levels of care. If these non-diabetic patients were to be included, their patient outcomes could alter the results of the statistical analyses and create Type I or II errors.

The second assumption was that the patients had been treated according to CCHCS policies and procedures by the assigned care teams. All healthcare staff had been trained, coached, and mentored by regional oversight teams to conduct treatment in accordance with these policies and procedures. Additionally, the CCHCS Quality Management Unit had supplied all staff with standardized resources. As such, the assumption that the clinical staff were employing the CCM treatment modality was important to ensure that treatment was being delivered consistently to all patients. This reduced the likelihood that patients received treatment other than in the manner set forth in the CCM, which otherwise could lead to concerns about whether the CCM had any effect on the patient outcomes. These assumptions are important, as they reduced confounding variables that could have skewed the results of the statistical analyses that were performed in this study.

Delimitations

The data utilized for this study came directly from the CCHCS data warehouse that was maintained using strict privacy protections. No other data was used for this study. The participants were incarcerated individual that have diabetes and who have been under the jurisdiction of CDCR since at least 2014, which was the start of the CCM implementation. In order to establish whether the changes in patient-level outcomes were attributed to the implementation of the CCM, it was important to consider the outcomes of the patients prior to and after the implementation. In alignment with social construct theory, understanding how the patient and the clinical team worked together to improve the health and life of the patient was critical to understand the best method for achieving

this. In this study, the hope was to determine if the CCM was the best treatment modality to enhance communication and improve patient health outcomes within a correctional setting.

Limitations

The PCMH model has been shown to be successful within many community healthcare settings in reducing avoidable hospitalizations and supporting multidisciplinary team approaches (Plewnia, Bengel, & Körner, 2016). It does, however, have its limitations when it comes to patients with complex health care issues that require a specialized approach. Additionally, it has been suggested that rates of hospital readmissions can be reduced if the care team has communication within the first three days of the patient's arrival (Low et al., 2015). A common reason for the lack of success is directly related to team participation, timeliness of interactions, and this three-day "rule." These reasons suggest the need for the care team to not only have multidisciplinary interactions but that these interactions must be timely, which can be difficult in a prison environment. This challenge must be addressed through the CCM within CCHCS.

The PCMH model has allowed various disciplines such as nursing, dental, administrative staff, and behavioral health services to work together to complete a common mission. Additionally, this allows for the disciplines to work cohesively while learning from each other (Costlow, Landsittel, James, Kahn, & Morton, 2015). However, if the disciplines are not properly coordinated, health efforts can be overlooked. There is

a lack of data on the patient-centered model in the prison system which requires additional research to further explore this topic.

Barriers included an understanding that there are several factors that are indicative of successful patient outcomes for diabetes: diabetes self-management education, team-based care, care coordination, case management, and specialty care team members. Ackroyd and Wexler (2014) identified several positive impacts of the PCMH model on outcomes for diabetic patients, such as compliance with specialty appointments and improvement of critical lab values associated with diabetes. It was determined that several factors played a crucial role in the reduction of A1C levels: team changes, case management, promotion of self-management, clinician education, patient education, facilitated relay of information, electronic patient registries, and patient reminders. Additional barriers included an understanding that these results suggest that the various components of the PCMH model can improve diabetes care measures, and as such, from a patient-care perspective, it is an effective model of treatment for managing diabetes.

There were other barriers that were encountered in the logistical development of this study. The CDCR has an Office of Research that oversees and approves all uses of data pertaining to the inmates incarcerated within its institutions. The Office of Research requires that only aggregated information that is population-based, rather than individual patient-level data, be utilized in order to protect the identity of patients.

Significance

The results of this study could have a significant impact on the treatment provided to diabetic patients within correctional settings across the country. The body of literature

on the efficacy of the PCMH model's ability to improve health outcomes for diabetic patients is broad and is often in a community outpatient setting (Dobbins et al., 2018; Plewnia et al., 2016). The PCMH model has shown to not only improve health outcomes, but patient satisfaction related to communication with providers (Janiszewski, O'Brian, & Lipman, 2015). In addition, research on the PCMH model has shown fiscal and operational improvements (Rosland et al., 2018). However, there remains a dearth of research surrounding the use of the PCMH model within correctional settings and it is essential to provide a roadmap to success for chronically ill individuals within prison systems.

The focus of the CCM in relation to this study will allow for a better understanding of how high-risk patient populations can benefit from a team-based approach of health care services, particularly within the context of an incarcerated setting. The PCMH model has been implemented for several decades in other patient contexts but it has not been undertaken in a correctional setting (Berryman, Palmer, Kohl, & Parham, 2013). The CDCR is the first correctional setting to utilize the PCMH model to create a healthcare delivery system which can provide access to outcome measures related to various chronic health conditions. As such, there is little research to suggest it can be implemented successfully within this context. Being able to utilize data within the CDCR to support its use can be beneficial not only for the patients treated within the CDCR, but also for other state and federal correctional systems to use this information to support the implementation of this model in their systems.

If a model like the CCM can demonstrate improved health outcomes for chronically ill inmate-patients, it could be used nationwide to support inmates and their treatment. In an effort to establish the beginnings of a body of research to support this model, this study will attempt to demonstrate how a systemic adoption of a modified PCMH model within a prison setting can improve patient outcomes for individuals with diabetes. These outcomes will be assessed through A1C values, LDL levels, and referrals to higher levels of care for these patients. This approach also required a discussion and review of the definition of a high-risk patient and how this definition is quantified across the spectrum of patients treated within CDCR. Finally, attention was placed on those patients who were high-risk and were diagnosed with diabetes, along with whether or not the CCM had a positive impact on their health outcomes.

Researching how the PCMH model can open communication is crucial as it lends itself to better patient outcomes. Better patient outcomes will lead to improved treatment outcomes (Plewnia et al., 2016). At its core, the PCMH model seeks to put the patient at the center of the healthcare delivery process. The medical team is located where the patient is to ensure that treatment delivery is easily accessible to the patient. Ultimately, this model seeks to reduce access barriers, which is particularly crucial for patients with limited mobility or access to transportation. Overcoming these barriers by effective scheduling and outreach efforts will help reduce the incidences of more expensive and severe conditions in patients because of the increased attention to preventative care that is more easily achieved through effective scheduling and proximity to patients (Grant & Greene, 2012). This, in turn, saves resources that allows the system to address other

issues such as high-risk patients with chronic medical conditions, thus saving the tax payer's money. Patient-centeredness has been found to better support patients in their overall care (Droz et al., 2019). When a patient is actively involved in the decision-making process for their own health care needs, there is more adherence to the treatment plan (Droz et al., 2019). Additionally, when the patient feels involved and heard by his or her healthcare provider, there is more satisfaction with the overall health care provided (Platonova et al., 2016).

From a global perspective, developing a more empirically validated treatment model for healthcare delivery of patients could help the overall population. Given the fact that most of the prisoners incarcerated in the CDCR will be released at some point in the future, having a robust treatment model for chronic medical conditions in prison means upon release, they are less likely to be as sick. It also demonstrates a fundamental shift in the underlying theory and purpose of rehabilitation associated with prison. Historically, prisons have served to house criminals and little else (Sonntag, 2017). Rehabilitation was considered a luxury. As such, many inmates were not treated as humans, but rather as criminals. With a change in this perspective, the quality of healthcare could improve. Additionally, healthier inmates would be able to take a more active role in programs within prison that are geared toward rehabilitation as they prepare for re-entry into society. If inmates are not physically well and are not treated for medical conditions, upon release, they are left uneducated regarding their medical conditions, and are more likely to become the burden of community health facilities, if they are even able to receive treatment at all. Using the PCMH model to educate patients on their health

condition and the best way to maintain a high quality of life, they could be released to society healthier than when they arrived. In addition, they could enter society with a renewed sense of purpose and self-determination to make other positive changes in their lives.

Summary and Conclusion

The use of the PCMH model within a correctional setting could potentially offer a treatment modality that is collaborative, comprehensive, and evidence-based for managing the needs of diabetic patients. The PCMH model has already been a widely accepted treatment modality in numerous settings within community health care (AHRQ, 2013). It has also shown success in improving health outcomes for patients with diabetes (Baker & Laughlin, 2017; Ackroyd & Wexler, 2014). Given the long history of correctional health care litigation, most notably beginning with the landmark *Estelle v. Gamble* (1976) case, it is prudent for correctional systems to identify treatment methods that can meet not only the legal standards of constitutionally adequate treatment, but also the ethical requirements of health care providers to use empirically validated treatment. The CDCR, in collaboration with the CCHCS, has made great strides under Federal Receivership to develop the CCM for health care delivery to the 120,000 inmates housed in California's prisons.

Currently, there is a gap in the literature surrounding the PCMH model and its efficacy within an institutional setting, such as a prison. The CDCR has attempted to modify the PCMH model for use with patients who are diagnosed with chronic medical conditions, such as diabetes. This study sought to shrink the literature gap by analyzing

whether or not the CDCR CCM has any effect on the health outcomes for patients diagnosed with diabetes and who are remanded to the custody of the CDCR.

Section 2: Research Design and Data Collection

Introduction

Research establishing the benefits of using a PCMH model or a modification of the model, such as the CCM, on delivery of treatment within a correctional setting has not been completed. Although the PCMH model is empirically validated as an appropriate treatment for chronic health conditions, using it within this setting has not been fully supported with research. Given the propensity for litigation within the correctional health care systems (Sonntag, 2017), it is important to establish a treatment modality that has research support to provide what has been determined to be constitutionally adequate healthcare for patients remanded to a correctional facility. Therefore, this study was conducted to identify how the implementation of the CCM within CCHCS impacted the treatment of patients with a diagnosis of diabetes. To accomplish this, I analyzed the relationship among patient outcomes, defined as A1C values, LDL values, and referrals to a higher level of care (defined within CCHCS as outpatient housing unit, correctional treatment center, or an outside community hospital, and the implementation of the CCM.

Research Design and Rationale

This study involved a quantitative approach to further understand the impact of the CCM on patients with chronic medical conditions such as diabetes. This is particularly important within an institutional setting, where lifestyle changes consistent with diabetes treatment are restricted. Patient-level outcomes were of primary focus for this research study with an analysis of the rate of transfers to higher levels of care

(hospitalizations), A1C values, and LDL values. The independent variable of this study was the CCM, and the dependent variables were the patients' A1C values, transfers to higher levels of care (hospitalizations), and LDL values. Three research questions were designed to examine the relationships among these variables:

Research Question 1: Will post-CCM implementation A1C values of diabetic patients in 2018 be significantly lower than 2014 A1C values?

$H_0$1: For diabetic patients, the A1C levels will not be significantly lower after the implementation of the patient-centered medical home model.

$H_1$1: For diabetic patients, the A1C levels will be significantly lower after the implementation of the patient-centered medical home model.

Research Question 2: Will post-CCM implementation LDL levels of diabetic patients in 2018 be significantly lower than 2014 LDL levels?

$H_0$2: For diabetic patients, the LDL levels will not be significantly lower after the implementation of the patient-centered medical home model.

$H_1$2: For diabetic patients, the LDL levels will be significantly lower after the implementation of the patient-centered medical home model.

Research Question 3: Is there a decrease in the number of referrals to higher levels of care, defined as outpatient housing unit, correctional treatment center, or community placement hospitalization, for diabetic patients from 2014 to 2018, representing the implementation of the patient-centered medical home model within CCHCS?

$H_0$3: There is no significant change in the number of referrals to a higher level of care for diabetic patients after the implementation of the patient-centered medical home model.

$H_1$3: There are fewer referrals to a higher level of care for diabetic patients after the implementation of the patient-centered medical home model.

To understand the impact of the CCM on the various patient outcomes, it was important to utilize historical data for patients who received treatment prior to the CCM implementation as well as data after the implementation. This type of pre- and post- test analysis has been used in previous studies assessing the effects of various treatment modalities on patient health outcomes (Johnson et al., 2010; Kinsell et al., 2017). This study had no constraints regarding data collection.

Methodology

Population

The target population for this study was male patients who were assigned to the California Medical Facility and who had been housed there consistently since 2014 to ensure they received treatment both before and after the implementation of the CCM. The total population at California Medical Facility was 2,539 as of June 30, 2019 (CDCR, 2019). This correctional institution was chosen given the higher concentration of patients who have long-standing medical conditions, combined with long enough sentences to ensure they received treatment both before and after the implementation of the CCM.

Sampling

A total of 99 participants were proposed through a power analysis, with power set at .80, $\alpha = .05$, and expecting small to moderate effect sizes (Cohen, 1992). The first criterion of the sample was that the patients had to have consistently been housed at CMF between 2014 and 2018, which reflects the implementation of the CCM. Secondly, the participants had to have an official diabetes diagnosis in the electronic health record system.

Data Collection Sources

Patient registries. Data pertaining to A1C and LDL values was supplied by CCHCS, through the relevant diabetes patient registry. Patient registries are utilized by the care teams assigned to panels of patients to monitor relevant aspects of various chronic medical conditions. The registries utilize information that has been entered into the electronic health record system by the providers.

Data warehouse. CCHCS maintains a data repository, known as the data warehouse. Here, all medical information is maintained and accessible for quality management and reporting purposes. For this study, the data warehouse was accessed to pull information related to transfers to a higher level of care. This information is maintained in the data warehouse. The Strategic Offender Management System is custody software that tracks all inmate movement, including when a patient is transferred internally to the outpatient housing unit, correctional treatment center, or to outside hospitals. In addition to this information, the electronic health record system contains

clinical documentation to indicate the reason for the referral to a higher level of care to ensure the transfer was associated with the patient's diagnosis.

Data Access

A request for access to the data was submitted to the CDCR Office of Research, which maintains all requests and permissions for data pertaining to inmates and employees of the CDCR. The CDCR has a separate institutional review board (IRB) application process that requires written proof of educational association and institutional IRB approval. Once Walden University approved the study, the actual data request was processed and the requested information was then sent to the researcher, omitting all patient identifiers.

Data Analysis

Once the data was extracted from the sources discussed above, it will be sorted to separate data points for each of the hypotheses being analyzed. Each dependent variable was assessed using a repeated measures ANOVA to compare the pre- and post-CCM implementation values. A1C values were compared to determine if the CCM implementation had an effect on decreasing these values. The same analysis was completed for LDL values to determine whether the CCM implementation had a statistically significant impact on cholesterol levels for diabetic patients. Transfers to higher levels of care were also compared from pre- and post-CCM implementation. A power analysis was conducted to determine the sample size for this test. A total of 99 participants were proposed through this analysis, with the power set at 0.80, $\alpha = 0.05$, and testing for small to moderate effect sizes (Cohen, 1992).

Threats to Validity

Mitigation of threats to the validity of the current study ensures that the intervention being studied had an impact on the dependent variables outlined above. There are several threats to validity to consider. For example, selection bias was assessed. In this study, selection of patients was contained to one CDCR institution, California Medical Facility, and all patients studied had been at the institution since at least 2014 to ensure they received treatment under the condition of the CCM, as well as prior to its implementation. Second, attrition of participants was mitigated by removing all patients who had paroled, transferred, or died prior to 2018, to ensure that the remaining participants were able to receive treatment both before and after the implementation of the CCM. History was the third threat to validity. Events within the prison system can be difficult to hold constant, and thus may pose some risk to validity. However, by selecting an institution with few *lockdowns*, due to its mission of housing lower-level offenders, meant that there was a less likely chance that treatment would have been interrupted due to problematic correctional concerns such as riots. Finally, the Hawthorne effect was not a concern in the current study, given the use of historical, secondary data. Because the participants did not know that their health outcome measures were being studied, there was no chance that the participants would alter behavior due to knowing that they were being studied.

Ethical Considerations

The data the CCHCS provided was secondary data that had all patient identification removed. As a result of the lack of patient information, there were no risks

for the disclosure of confidential or protected health information in this study. For ethical purposes, the Walden University IRB supervised the data analysis and study conclusions (IRB approval number 12-19-19-0758554). In addition, the CDCR Office of Research authorized the use of the inmate information and monitored the use of the data. The raw data was stored in a confidential manner, specifically without any patient-identifying indicators. All data will be retained for five years after the completion of this doctoral study and will then be destroyed.

Summary

This section described the secondary data that was used to conduct the quantitative analysis of archival data utilizing repeated measures ANOVAs. The purpose of this study was to determine the impact of the implementation of the CCM in the CDCR had on patient health outcomes for diabetic patients remanded to the custody of the CDCR. This section outlined the proposed methodology to be used to conduct this study and Section 3 will provide the statistical results relative to the research questions and hypotheses.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this study was to identify whether there would be a significant decrease in A1C and LDL values for diabetic patients after the implementation of a PCMH-type model within the CCHCS. In addition, I evaluated whether the number of referrals to specialty services, consisting of services that could not be provided within the prison setting and that were directly required for management of diabetes, would decrease after implementation of the PCMH model. The following research questions and hypotheses were proposed to address this purpose:

Research Question 1: Will post-CCM implementation A1C values of diabetic patients in 2018 be significantly lower than 2014 A1C values?

$H_0$1: For diabetic patients, the A1C levels will not be significantly lower after the implementation of the patient-centered medical home model.

$H_1$1: For diabetic patients, the A1C levels will be significantly lower after the implementation of the patient-centered medical home model.

Research Question 2: Will post-CCM implementation LDL levels of diabetic patients in 2018 be significantly lower than 2014 LDL levels?

$H_0$2: For diabetic patients, the LDL levels will not be significantly lower after the implementation of the patient-centered medical home model.

$H_1$2: For diabetic patients, the LDL levels will be significantly lower after the implementation of the patient-centered medical home model.

Research Question 3: Is there a decrease in the number of referrals to higher levels of care, defined as outpatient housing unit, correctional treatment center, or community placement hospitalization, for diabetic patients from 2014 to 2018, representing the implementation of the patient-centered medical home model within CCHCS?

$H_0$3: There is no significant change in the number of referrals to a higher level of care for diabetic patients after the implementation of the patient-centered medical home model.

$H_1$3: There are fewer referrals to a higher level of care for diabetic patients after the implementation of the patient centered-medical home model.

The remainder of this section will be comprised of a description of the data collection of the secondary data set, including recruitment and response rates, along with a detailed review of the statistical results organized by research question. Statistical assumptions for each of the analyses will also be discussed. The section will conclude with a summary.

Data Collection of Secondary Data Set

For the current study, archival data were used. Participants for this study consisted of males within the prison system who were assigned to the California Medical Facility (CMF). The time frame for the data points were from 2014 and 2018 to ensure data points were available prior to the CCM implementation and after it had been fully established. There was a total of 150 participants that met the screening criteria. For the current study, a power analysis showed that 99 participants were needed. After IRB

approval was obtained, access to the data occurred over several days. There were no discrepancies regarding the data set plan discussed in Section 2.

A total of 150 participants were recruited for the analyses. While running the statistical assumptions, seven participants were removed due to the data points being outliers (additional details regarding the removal of these participants are provided in the following subsection). Therefore, a total of 143 participants were used for the analyses. Of the 143 participants, a total of 48.3% were African American (n = 69), 23.1% were Caucasian (n = 33), 19.6% were Hispanic (n = 28), 0.7% were American Indian (n = 1), and 8.3% were classified as Other (n = 12). The ages of the participants ranged from 30 to 85 years old, with a median age of 63.00 and a mean age of 62.45 years old (standard deviation [SD] = 10.42).

The population of interest for the current study was male prisoners diagnosed with diabetes. In 2011-2012, it was reported that within the United States, 899 per 100,000 inmates were diagnosed with diabetes (Bureau of Justice Statistics, 2018). Research has also shown that this rate has doubled from 2014 (Diabetes Behind Bars, 2018). The ethnicity with the highest rates of diabetes in the prison population is among African American men (Nowotny, Rogers, & Boardman, 2017). Due to time restraints and the probable inability to obtain access to all of these individuals, one prison was focused on for the current study.

Results

Each of the three research questions were addressed by running a repeated measures ANOVA. First, the statistical assumptions of a repeated measures ANOVA

were assessed. After the statistical assumptions were addressed, descriptive statistics were run, followed by the primary analyses for each research question. In the following section, the statistical assumptions are reviewed first. Next, the descriptive statistics and primary analyses will be discussed and organized by research question.

Statistical Assumptions

There are three statistical assumptions for the repeated measures ANOVA. First, there should not be significant outliers in any level of the independent variable. Second, the dependent variable should have an approximate normal distribution for each level of the independent variable. Third, the assumption of sphericity needs to be met, which refers to equal variances of the differences between all combinations of levels of the independent variable (Warner, 2013). For each of the three repeated measures ANOVAs, these three statistical assumptions were assessed.

To determine whether there were outliers, boxplots were computed and then examined. SPSS identifies outliers in a boxplot by highlighting the outliers that are 1.50 and 3.00 box lengths away from the edge using a circle or asterisk, respectively (Warner, 2013; see Figures 1, 2, and 3).

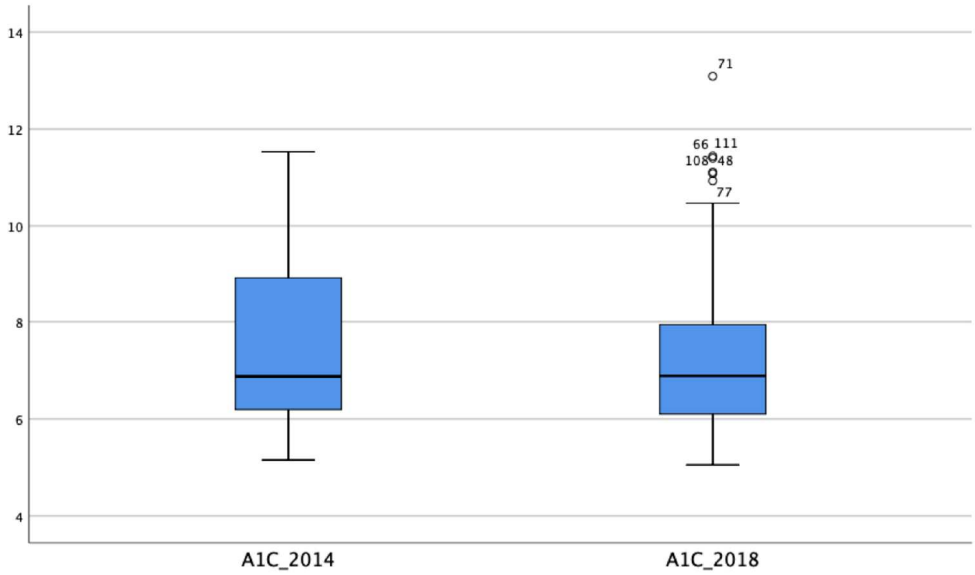

Figure 1. Boxplot for A1C levels for 2014 and 2018.

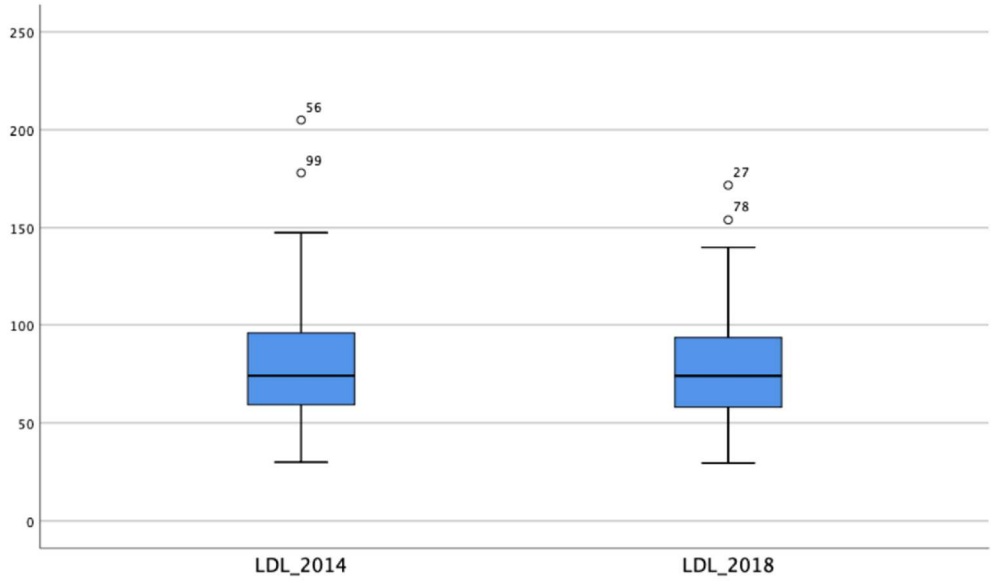

Figure 2. Boxplot for LDL levels for 2014 and 2018.

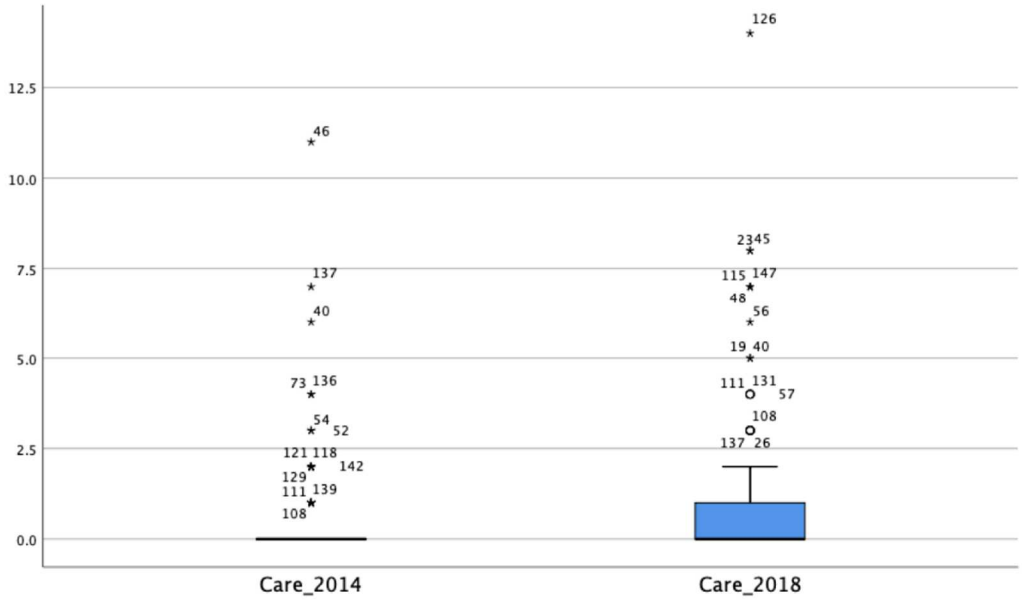

Figure 3. Boxplot for referrals for 2014 and 2018.

All of the highlighted outliers were considered for removal. To determine which outliers were removed, the researcher reviewed the participants' specific values of the variables to determine whether to include or remove the outliers. Only extreme outliers were removed (Warner, 2013). From the interpretation of the A1C boxplot, one outlier was removed. For the LDL boxplot, four outliers were removed. For the care referral analysis, a total of two outliers were removed. Therefore, a total of seven outliers were removed before moving forward to testing the assumption of normality ($N = 143$).

Normality was assessed using the Shapiro-Wilks test of normality for each repeated measures ANOVA. Normality was determined based on significance level, where values above .05 indicated that normality had been met (Warner, 2013). For the A1C, LDL, and referrals analyses, the assumption of normality was not met, as no significance values were above .05. However, since repeated measures ANOVAs are

robust to violations of normality (Warner 2013), the analysis was continued without data transformation.

To test for the assumption of sphericity, no additional tests were needed, as sphericity values are automatically generated in SPSS when the repeated measures ANOVA is performed (Warner, 2013). Sphericity is assessed based on the significance value, where values above .05 indicate this assumption has been met (Warner, 2013). For each of the repeated measures ANOVA, sphericity was not met ($p < .05$). Therefore, the Greenhouse-Geisser values will be interpreted from the SPSS output to account for this violation (Warner, 2013).

Research Question 1

To address research question one, "Will post-CCM implementation A1C values of diabetic patients in 2018 be significantly lower than 2014 A1C values?", a repeated measures ANOVA was performed. A repeated measures ANOVA was deemed most appropriate as ANOVAs provide a comparison between groups (Warner, 2013). In particular, a repeated measures ANOVA allows for a comparison of two or more observation points for the same group, often referred to as a within-subjects analysis (Warner, 2013). Using a repeated measures ANOVA allowed for a comparison of A1C levels before and after the implementation of the PCMH model. For this first analysis, the independent variable was time (before and after the intervention), while the dependent variable was A1C levels. Prior to running the repeated measures ANOVA, descriptive statistics for the A1C levels were performed. Table 1 presents the mean, *SD*, and range

for both the pre- and post-A1C scores. The mean A1C pre-scores were $M = 7.43$ ($SD = 1.62$), while the mean A1C post-scores were $M = 7.19$ ($SD = 1.37$).

Table 1

Descriptive Statistics for the Pre- and Post-A1C Scores

Variable	Range	Mean	*SD*
2014 A1C	5.15-11.53	7.43	1.62
2018 A1C	5.05-11.44	7.19	1.37

The results of the repeated measures ANOVA showed that there was a statistically significant decrease in A1C values from 2014 ($M = 7.43$, $SD = 1.62$) to 2018 ($M = 7.19$, $SD = 1.37$), $F(1.00, 142.00) = 4.68$, $p = .032$ (see Table 2). The mean difference was 0.24 with a 95% confidence interval ranging from 0.09 to 0.52. The effect size was determined by calculating the eta squared value (eta squared = .032) and this value indicates a small effect size (.06 is considered a moderate effect size; Warner, 2013). For research question one, the null hypothesis was rejected ($p = .032$). These results indicate that A1C levels were significantly lower after the implementation of the PCMH model.

Table 2

Results for the Repeated Measures ANOVA for A1C Levels

Variables	*F*-value	Mean Difference	95% Confidence Intervals	Effect Size	Sig. Value
A1C Levels	4.68	0.24	0.021 to 0.469	0.032	.032*

Note. Sig. = Significance; $p < .05$*

Research Question 2

For research question two, "Will post-CCM implementation LDL levels of diabetic patients in 2018 be significantly lower than 2014 LDL levels?", another repeated measures ANOVA was performed. For this analysis, the independent variable was time (before and after the intervention), while the dependent variable was LDL values. Prior to running the repeated measures ANOVA, descriptive statistics for the pre- and post-LDL levels were performed (see Table 3). For the LDL scores, the pre-score mean was M = 77.99 (SD = 25.34) and the post-score mean was M = 77.87 (SD = 26.54).

Table 3

Descriptive Statistics for the Pre- and Post-LDL Scores

Variable	Range	Mean	*SD*
2014 LDL	30.00-147.50	77.99	25.34
2018 LDL	29.50-154.00	77.87	26.54

The results of the repeated measures ANOVA showed that there was not a statistically significant decrease in LDL values from 2014 (M = 77.99, SD = 25.34) to 2018 (M = 77.87, SD = 26.54), $F(1.00, 142.00) = 0.003$, $p = .959$ (see Table 4). The mean difference was 0.12 with a 95% confidence interval ranging from -4.30 to 4.53. The effect size was determined by calculating the eta squared value (eta squared = .00) and this value indicates a small effect size (Warner, 2013). For research question two, the null hypothesis was accepted ($p = .959$). These results indicate that the LDL levels were not significantly lower after the implementation of the PCMH model.

Table 4

Results for the Repeated Measures ANOVA for LDL Levels

Variables	*t*-value	Mean Difference	95% Confidence Intervals	Effect Size	Sig. Value
LDL Levels	.003	0.12	-4.30 to -4.53	0.00	0.959

Note. Sig. = Significance; $p < .05$*

Research Question 3

For research question three, "Is there a decrease in the number of referrals to higher levels of care, defined as Outpatient Housing Unit, Correctional Treatment Center, or community placement hospitalization, for diabetic patients from 2014 to 2018, representing the implementation of the Patient Centered Medical Home model within CCHCS?", another repeated measures ANOVA was performed. For this analysis, the independent variable was time (before and after the intervention), while the dependent variable was the number of referrals.

Prior to running the repeated measures ANOVA, descriptive statistics for the pre- and post-referral scores were performed. Table 5 presents the mean, *SD*, and range for the pre- and post-referral scores. The referral pre-score was $M = 0.40$ ($SD = 1.06$), while the post-score was $M = 0.80$ ($SD = 1.65$).

Table 5

Descriptive Statistics for the Pre- and Post-Referral Scores

Variable	Range	Mean	*SD*
2014 Referral	0.00-7.00	0.40	1.06
2018 Referral	0.00-8.00	0.80	1.65

The results of the repeated measures ANOVA showed that there was a statistically significant increase in referrals from 2014 (M = 0.40, SD = 1,06) to 2018 (M = 0.80, SD = 1.65), F(1.00, 142.00) = 8.14, p = .005 (see Table 6). The mean difference was -0.40 with a 95% confidence interval ranging from -0.687 to -.125. The effect size was determined by calculating the eta squared value (eta squared = .054) and this value indicates a small, bordering on moderate effect size (Warner, 2013). For research question three, the null hypothesis was rejected (p = .005). However, the results were in the opposite direction than predicted. In particular, these results indicated that there were significantly more referrals to higher levels of care (i.e., the Outpatient Housing Unit, the Correctional Treatment Center, or community placement hospitalization) after the implementation of the PCMH model.

Table 6

Results for the Repeated Measures ANOVA for Pre- and Post-Referral Scores

Variables	*t*-value	Mean Difference	95% Confidence Intervals	Effect Size	Sig. Value
Referrals	8.14	-0.40	-0.687 to -0.125	0.054	.005*

Note. Sig. = Significance; $p < .05$*

Summary

Three overarching research questions were proposed and addressed in the current study. For research question one, the alternative hypothesis was accepted (p = .032), and the results showed that A1C levels were significantly lower after the implementation of

the PCMH model. For research question two, the alternative hypothesis was rejected (p = .959). The results of research question two suggest that LDL levels did not significantly decrease after the implementation of the PCMH model. Finally, for research question three, the alternative hypothesis was accepted (p = .005), suggesting that there were significantly more referrals to higher levels of care (i.e., the Outpatient Housing Unit, the Correctional Treatment Center, or community placement hospitalization) after the implementation of the PCMH model, which could be due to increased oversight of patients due to implementation of the CCM. When a care team is able to more closely monitor a patient, concerning health indicators can be identified quickly and decisions to place in an inpatient setting can be made to reduce the negative impacts on the patient. However, although the null hypothesis was rejected, the results of research question three were in the opposite direction that was initially predicted, as the researcher predicted referrals would decrease after implementation of the PCMH model, and they increased. To summarize, although A1C levels were significantly lower after the intervention, LDL levels did not differ, and the number of referrals to higher levels of care were significantly higher after the intervention.

Section three provided a detailed account of the statistical results used to address the three research questions. In Section 4 of the dissertation, an interpretation of these findings will be presented. Specifically, whether the findings confirmed or disconfirmed the previous literature and relevant theories will be discussed. How these findings extend the current knowledge in this discipline will also be highlighted, along with a discussion of the limitations of the current study and future research recommendations. Implications

for how the results of this study could impact positive social change will also be discussed.

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

Introduction

The objective of this study was to determine whether there was a relationship between the LDL and A1C values of diabetic patients and the implementation of the PCMH model within the CCHCS through secondary quantitative data. Additionally, I analyzed the relationship between the CCM implementation and the numbers of referrals to specialty services, consisting of services that cannot be provided within the prison setting and that are directly required for management of diabetes. Early identification of the need for specialty care can positively improve health outcomes for these patients, and the CCM of treatment delivery advocates for collaboration of care for patients. A demonstration of these relationships will exemplify the strengths of the CCM in CCHCS within a controlled and institutionalized environment for chronic medical conditions such as diabetes.

Further, administrators can use the PCMH model for coordination of care of the chronically medically ill patients. However, without empirical research showing that within a prison setting the PCMH model can reduce the impacts of chronic illnesses, there is no validated evidence to support its use. Additionally, typical managed care models of healthcare involve litigation problems, despite some departments of correction attempting to employ them (Sonntag, 2017).

Interpretation of the Findings

The findings show that after the implementation of the CCM, A1C values, on average, were lower among the patients sampled. Although LDL values were not

statistically lower after the implementation of the CCM, the data trended in the correct direction. When reviewing referrals to a high level of care from 2014-2018, there was a significant increase in referrals over the timeframe, which is opposite of what was anticipated. Initially, it was expected that the CCM would reduce referrals to specialty services as a result of the creation of electronic registries that can assist care teams in identifying patients who are out of range for specific diabetic markers. The increase in referrals might demonstrate that the CCM is functioning as intended by maintaining increased oversight of the assigned patient panels to care teams, who are able to recognize patients that require expedited referrals to treatment regimens not readily available within the correctional setting.

Limitations of the Study

Although the results of the study were positive, there are limitations regarding the generalizability of the findings. First, the sample was pulled from a single institution within the CDCR—the California Medical Facility, which houses inmates who have significant medical and mental health concerns. The California Medical Facility inmate population may present confounding variables that make the management of diabetes difficult. Such confounds include comorbid medical and mental health issues and a large number of inmates being on medications that may have side effects that impact diabetes management.

A second limitation to the findings of this study was that the implementation of the CCM continues to be in its infancy. Although the CCM has been in place for nearly 4 years, the size of the enterprise of the CCHCS makes adoption of large initiatives such as

the CCM an extended process. As the CCM evolved, more resources and tools have become available and continue to be in production to assist care teams. Thus, it may have been beneficial to look at the change in A1C and LDL values at the start of implementation of the CCM and then again at intervals, as the CCM has been evolving and improving.

Due to the permissions given by CDCR, the sample size was 143 participants. After conducting the power analysis, this sample is identified as being small to medium. Had more CDCR institutions been included in the study, the power of the sample size would have been larger. However, introducing other institutions into the study would have also introduced more confounds that would have had to be accounted for in the statistics. The use of participants only at the California Medical Facility reduced the likelihood that patients would have transferred to other prison facilities, which would have incorporated an additional confound that would need to be studied

Recommendations

Further research is needed to understand the practicality and efficacy of the CCM within correctional settings. There are myriad other chronic illnesses that will require the same level of analysis to determine if the CCM is an effective treatment modality. In addition, to understand how the CCM can improve chronic illness, it is important to consider the long-term impact of the CCM on maintaining improved healthcare indicators in correctional settings. As such, it is recommended that longitudinal studies should be utilized to see how effective the CCM is over time. In addition, with an aging population, understanding the long-term benefits of a treatment modality is critical.

As noted in the limitations, this study was conducted with a sample of patients housed in a medical facility within the CDCR. Thus, there was a larger proportion of patients with chronic illness housed in that institution, which could skew outcome measures. This sample was also only a small minority of the overall population in California prisons. Conducting this type of research on less chronically ill patients at other institutions within the CDCR could help assess the reliability of the CCM across the prison population.

Implications for Professional Practice and Social Change

Professional Practice

This study suggests that the CCM is a valuable treatment modality to consider within institutionalized settings. Given the limitations of medical practice in prison, the fact that the CCM is able to demonstrate some success for chronic illness, such as diabetes, suggests that this model could be used effectively. Although the structure of prison can have limitations, the physical layout and structure of many prisons allows for an implementation of a treatment delivery model like the CCM for patient paneling, in particular. However, and more importantly, the implementation of the CCM would allow the care teams to be close to the living environment of the patients which can help the care team members better understand the way of life of the patients. Education is also more readily accessible by patients, as well, given their close proximity to care providers. For correctional entities struggling to manage chronic illnesses, such as diabetes, the CCM may be important to consider to help stabilize these patients.

The social construct theory in healthcare focuses on the relationships developed between provider and patient (Hirshfield & Underman, 2017). The CCM helps foster this theory through the creation of care teams that are dedicated to treating specific patient who are grouped into panels to which providers are assigned. These care teams follow patients for extended periods of time, which helps the care team learn about the unique needs of the individual patients on their panel. By creating a framework for routinely working collaboratively as a team, the CCM in prison settings fosters an environment of humanizing inmates and attending to the medical needs in a humane and ethical manner. The more correctional agencies that consider implementing the CCM, the better providers are able to care for more inmates across the country that inevitably reenter society.

Positive Social Change

Although there is a subset of individuals incarcerated in California prisons, many more have release dates. Because of this fact, it is important to develop a treatment modality for individuals while incarcerated that can effectively treat and manage medical conditions and prepare these inmates for a healthy life in the community. A key component of the CCM is education (Janiszewski et. al., 2015). By providing effective treatment coupled with education on healthy lifestyle choices, paroling inmates can gain control of their health and make appropriate choices based on a foundational education provided by the medical staff within the prison setting.

Additionally, a healthy inmate population is indicative of a culture that promotes health to all facets of the population. Although inmates have committed crimes, they are making amends to the community through their incarceration. Unnecessary suffering

while making those amends is unconstitutional and demonstrative of cruel and unusual punishment. Conversely, ensuring constitutionally adequate healthcare for all inmates represents a commitment to ethical and humane behavior.

Using the CCM, and educating the patients on their health condition and the best way to maintain a quality of life, inmates are able to release to society healthier than when they arrived with a renewed sense of purpose and self-determination to make other positive changes in their lives. Healthy individuals are able to focus attention on attending to treatment and rehabilitative programs that can assist in making the changes necessary to lead successful lives when they are returned to the community.

Conclusion

In conclusion, the results of this study show a positive change in the delivery of medical treatment for some of the most disenfranchised individuals of society. Incarcerated individuals deserve an opportunity to receive constitutionally adequate medical care while serving sentences for crimes they committed. Historically, inmates were not provided the opportunity to receive treatment for chronic illness (Sonntag, 2017). This proved to perpetuate a financial burden into the community, as prisoners were released with uncontrolled illnesses and would then seek treatment in emergency departments in the community because most lacked medical insurance Sonntag, 2017). Although it may be controversial to spend large amounts of money on inmates, the positive changes seen in the health of individuals who are ostensibly being rehabilitated for reentry into society are priceless.

When left untreated, inmates are forced to needlessly suffer from chronic illnesses that are readily managed by individuals in the community. This suffering leads to increased costs to the correctional systems as well as the community at large because funds must be reallocated from other agencies to support skyrocketing costs of inadequate and ineffective medical treatment (Kelso, 2015). By continuing to enhance the treatment delivery to inmates, inmates are able to focus their attention on positive programming behind the prison walls to prepare themselves for successful reentry into the community.

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