A Population-Wide Evaluation of Comprehensive Annual Care Plans by Physicians and Pharmacists in Alberta

by

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ABSTRACT

Background: Chronic diseases are growing in prevalence worldwide and are the largest drivers of healthcare costs due to physician visits, emergency department (ED) visits and hospital admissions. In 2009 and 2012, the Government of Alberta introduced a remuneration model for physicians and pharmacists, respectively, to develop a comprehensive annual care plan (CACP) for patients with complex needs.

Objectives: 1) Characterize the population of patients in Alberta who received: a) physician-billed CACPs since 2009 and b) pharmacist-billed CACPs since 2012; 2) Evaluate changes in healthcare utilization, including all-cause and ambulatory care sensitive condition (ACSC)-related hospital admissions, ED visits, and physician visits in the above populations; and 3) Explore the impact of the CACP programs on patient perceptions of quality of chronic illness care provided by their physicians and pharmacists.

Methods: To evaluate changes in healthcare utilization resulting from the CACP program, administrative health data were used to identify all individuals in Alberta who received a physician-billed CACP between 2009 to 2015 and a pharmacist-billed CACP between 2012 to 2015. Up to two control patients were matched to each CACP patient based on age, sex, provider, date of service and qualifying medical conditions. Controlled interrupted time series analyses were used to evaluate changes in physician visits, all-cause and ACSC-related hospitalizations and ED visits in the 12 months before and after a CACP in the physician group and the pharmacist group. To explore the impact of the CACP program on patient perception of chronic illness care, individuals and up to two matched controls (matched on the same criteria as above) who received a physician-billed or pharmacist-billed CACP in the previous 3 months were invited to complete an online questionnaire consisting of the 11-item Patient Assessment of

Chronic Illness Care (PACIC) tool, with 3 additional questions added to further examine chronic illness and collaborative care. Health status, health literacy and demographics were also explored.

Results: Between 2009 to 2015, 308,717 patients who received a physician-billed CACP were identified along with 549,479 matched controls. Likewise, 137,178 patients who received a pharmacist-billed CACP between 2012 to 2015 were matched to 241,658 control patients. In the physician CACP group, an overall increase in all-cause hospitalizations, ACSC-related hospitalizations, all-cause ED visits, and ACSC-related ED visits by 429.6 (95% CI: 337.1 to 522.1; $p<0.05$), 26.3 (95% CI: 14.8 to 37.8; $p<0.05$), 1548.3 (95% CI: 971.5 to 2125.2; $p<0.05$), and 95.4 (95% CI: 34.4 to 156.5; $p<0.05$) visits per 10,000 people in those who received a physician-billed CACP compared to controls was found. A non-significant decrease in physician visits by 1060.5 (95% CI: -2334.0 to 218.0; $p>0.05$) visits per 10,000 people in CACP patients vs. controls was also noted. In the pharmacy CACP group, CACP implementation was associated with an overall decrease in 180.5 (95% CI: -205.1 to 1-155.8; $p<0.05$), 144.2 (95% CI: -238.0 to -50.4; $p<0.05$), and 1,206.0 (95% CI: -1859.2 to -552.8; $p<0.05$) events per 10,000 people in all-cause hospitalizations, ACSC-related ED visits, and physician visits, respectively, in those who received a CACP compared to controls. Increases by 40.1 (95% CI: -379.0 to 459.2; $p>0.05$) and 8.0 (95% CI: 0.3 to 15.7; $p<0.05$) visits per 10,000 people in all-cause ED visits and ACSC-related hospitalizations ($p<0.05$), respectively, in those who received a pharmacist-billed CACP were also noted. With respect to patient perspectives on chronic illness care, few statistically significant differences were noted across all areas of care in those who received a physician billed CACP compared to controls. Few differences in care were noted between those who received a pharmacist-billed CACP compared to controls, with controls reporting statistically

higher PACIC scores than CACP patients across 4 of the 14 questions. Sensitivity analyses in both the physician and pharmacy groups suggest that increased patient engagement in the CACP process leads to improved perceptions of chronic illness care.

Conclusion: Overall, the physician and pharmacist CACP programs in Alberta have demonstrated minimal impact on perceived chronic illness care by patients as well as on healthcare utilization at an individual level; effect on healthcare utilization from a health system level may be interpreted as more meaningful. Improved design and implementation of these remuneration models, including required patient follow-up, are needed to better realize the long-term goals of improved chronic disease management.

PREFACE

This thesis is an original work by Candace Necyk. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name "Evaluation of Comprehensive Annual Care Plan for Complex Patients by Family Physicians and Pharmacists in Alberta", No. 00060499, November 6, 2015 and Project Name "Exploring the Impact of Pharmacist and Physician Comprehensive Annual Care Plans on Perceived Quality of Care by Patients in Alberta", No. 00083926, October 5, 2018.

Some of the research conducted for this thesis forms part of a provincial research collaboration, led by Dr. Jeff Johnson and Dr. Dean Eurich at the University of Alberta. The study designs in Chapters 2 and 4 were designed in collaboration with Dr.'s Johnson and Eurich with consultation from the CACP Steering Committee. Jasjeet Minhas-Sandhu assisted with data analyses for Chapters 2 and 4. The survey design and data analysis in Chapters 3 and 5 are my original work, as well as Chapters 1 and 6.

A version of Chapter 4 has been accepted for publication at the American Pharmacists Association Journal: "*Necyk C, Johnson J.A., Minhas-Sandhu J, Tsuyuki R.T., Eurich D.T. Evaluation of Pharmacist's Comprehensive Annual Care Plans for Patients with Complex Conditions in Alberta, Canada".*

A version of Chapter 5 has been accepted for publication at the Canadian Pharmacists Journal: "*Necyk C, Johnson J.A., Tsuyuki R.T., Eurich D.T. Exploring the Impact of Pharmacist Comprehensive Annual Care Plans on Perceived Quality of Chronic Illness Care by Patients in Alberta, Canada".*

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LIST OF ABBREVIATIONS

AG – Auditor General

ACSC – Ambulatory Care Sensitive Condition

CCM – Chronic Care Model

CDM – Chronic Disease Management

CACP – Comprehensive Annual Care Plan

CI – Confidence Interval

CITS – Controlled Interrupted Time Series

COPD – Chronic Obstructive Pulmonary Disease

ED – Emergency Department

FFS – Fee-for-service

GAD-2 – 2-item Generalized Anxiety Disorder Scale

ICD – International Classification of Diseases

ICD-9-CM – International Classification of Diseases, Ninth Revision, Clinical Modification

ITS – Interrupted Time Series

PACIC – Patient Assessment of Care for Chronic Conditions

PACIC-11 – 11-item Patient Assessment of Care for Chronic Conditions

PFP – Pay-for-performance

PHN – Personal Health Number

PHQ-2 – 2-item Patient Health Questionnaire

RCT – Randomized Controlled Trial

SD – Standard Deviation

UK – United Kingdom

VAS – Visual Analogue Scale

WHO – World Health Organization

CHAPTER 1. Introduction

1.1. INTRODUCTION

1.1.1. Chronic Diseases and Chronic Disease Management

The World Health Organization (WHO) describes chronic diseases as "pandemic," particularly prominent chronic diseases like diabetes, cardiovascular diseases, mental illness and respiratory disease.[1] Currently 63% of all deaths worldwide are due to underlying chronic disease and it is anticipated that soon, chronic diseases will account for 73% of all deaths worldwide and 60% of the global burden of disease.[2] The Chronic Disease Prevention Alliance reports that chronic diseases account for two-thirds of all deaths in Canada, and an even greater proportion of total disability.[2, 3] Not surprisingly, chronic diseases are also the largest drivers of healthcare costs; they are the most common cause of hospitalizations and emergency department (ED) visits, and the most common reason for family physician and pharmacy visits.[3, 4] Given the increasing demands to the healthcare system, innovative and effective strategies to better manage chronic diseases are important to the population health of Canada and the sustainability of our healthcare system.[5]

Individuals living with chronic diseases require care that is multifaceted and involves multiple health care providers.[6] For example, diabetes is a chronic disease that involves medication use, regular laboratory monitoring, eye and foot exams, as well as numerous lifestyle modifications (diet, exercise, tobacco cessation) to best manage it; indeed, those with diabetes may also need to see an endocrinologist in addition to their family physician.[7] The Chronic Care Model (CCM) was proposed by Wagner et al. to help clinicians and healthcare systems address the multifaceted aspect of chronic diseases and to provide more comprehensive care to those living with chronic diseases and improve patient outcomes.[8] The CCM is evidence-based and proposes care that is patient-centered, proactive, and planned, as well as embodying collaborative goal setting, problem solving and follow-up support.[8] Wagner et al. suggested that the implementation of such a model leads to an "informed, activated patient" who is better equipped to participate in the management of their condition.[8] Evidence also demonstrates improved health outcomes associated with the CCM.[9]

Comprehensive care programs based on the CCM, often referred to as chronic disease management (CDM), are increasingly trialed around the world to improve the care and outcomes of those living with chronic diseases.[10-12] Various CDM initiatives have been evaluated in different research settings and involving different healthcare providers. However, although intuitively these programs should be beneficial to patients and the health system, evidence to support these initiatives has been lacking in the real world.

With respect to pharmacists, few real-world assessments of CDM have been undertaken. Randomized controlled trials (RCT) have explored the potential role of pharmacists in the management of conditions such as hypertension, hyperlipidemia, and heart failure[13-16]; while benefits were demonstrated, whether these results can be generalized outside of the RCT setting to real-world practice where there are issues which include lack of expectations around regular pharmacist follow-up, unclear patient eligibility criteria, lack of remuneration, and poor program evaluation is unclear.[17] Outside of a research setting, in the few studies that have assessed different aspects of the CDM approach by pharmacists, the results have been varied.[17] One such example is the population-level implementation of medication reviews by pharmacists which has been assessed in British Columbia and Ontario; in both cases, minimal impact was found and people taking a higher number of medications (indicating more complex needs) were actually less likely to be offered a medication review within the Ontario MedsCheck program.[17, 18]

Physician-based fee-for-service (FFS; defined as payment for delivery of a clinical service) and other remuneration models to incentivize improved chronic illness care delivery have also been enacted and evaluated around the world.[12, 19-22] One example is the United Kingdom (UK) Quality and Outcomes Framework implemented in 2004; under this framework, general practitioners are rewarded in the form of payment for the quality of care they provide to their patients.[19] This type of model is referred to as a pay-for-performance (FFS) model.[19] When evaluating quality of care under this framework, research concluded that the quality of care for patients with target chronic diseases (i.e., asthma, hypertension) did not significantly increase compared to the rate it was improving prior to the implementation of this framework.[12] Indeed, further research in the UK found that patients perceived a reduction in the continuity of their care after the implementation of this program.[23] In British Columbia, the Complex Care Initiative was introduced in 2007 to compensate family physicians for their time spent managing those with 2

or more chronic diseases; also required in this initiative was the development of an annual care plan.[20] Initial research analyzing this program found a slight reduction in total healthcare costs for patients with chronic heart failure, chronic obstructive pulmonary disease and hypertension, but not for those with diabetes.[24] It did find, however, an overall reduction in hospital admissions and durations of stay.[24] Further research on the British Columbia physician incentive program utilized a more rigorous interrupted time series (ITS) study design – a strong quasi-experimental study design that further reduces both known and potentially unknown within-group biases and allows for interpretation of results in the context of the already occurring pre-intervention trend in the outcome(s) of interest.[20, 25] Using this method and accounting for pre-intervention trends already taking place, Lavergne et al. determined that those individuals who received a care plan from a physician through the incentive model did not demonstrate any significant changes in the number of physician visits, hospital admissions, or emergency department (ED) visits in the 24 months post-intervention.[20] Similarly, other research based out of the United States found insignificant changes in patient care costs across 86 primary care clinics who initiated similar incentive programs.[26] Taken together, research to date has demonstrated inconclusive results around the impact of population wide CDM initiatives; in fact, such approaches have been suggested to be experimental only at this point and not evidence-based.[21]

Despite this paucity of evidence demonstrating benefit, the Government of Alberta initiated two remuneration models in the form of comprehensive annual care plans (CACP) to improve chronic illness care in Alberta– one for physicians and one for community pharmacists.[27] Care plans are considered an important component of effective CDM, linking the self-management role patients must take on in managing their chronic disease and the services provided to them by healthcare professionals.[27] In fact, evidence demonstrates that good care planning can improve outcomes for individuals living with chronic disease, reducing the frequency and duration of ED visits and hospital admissions–outcomes that also save the healthcare system considerable amounts of money.[27] Each CACP initiative will be discussed in more detail below.

1.1.2. Physician Comprehensive Annual Care Plans in Alberta

The Alberta Government introduced a new billing code (03.04.J) in 2009 for physicians in Alberta to provide a yearly CACP to individuals with 2 or more qualifying chronic diseases,

or 1 qualifying chronic disease and additional risk-factors.[27] Specifically, patients qualify for a physician CACP if they have 2 or more Category A conditions, including hypertensive disease, diabetes mellitus, chronic obstructive pulmonary disease (COPD), asthma, heart failure, coronary artery disease, or chronic renal failure (added in 2014).[27] Alternatively, a patient may have 1 Category A condition as well as at least 1 of the following Category B conditions that are considered additional risk-factors: mental health disorders, obesity, addiction, or tobacco use.[27]

A CACP is a single written document that includes important information on the patient's medical history, current therapies, health challenges, information about other healthcare providers involved in the patient's care, and other relevant information that may affect the patient's health or treatment options.[27] The CACP must include clearly defined goals, which have been mutually agreed-upon by the patient (or the patient's agent) and the healthcare provider (physician).[27] The CACP is prepared in collaboration with the patient, so that it can consider the patient's values and personal health goals as they relate to their complex health care needs.[27] Once prepared, the CACP is signed by both the patient and their physician.[27] The CACP is intended to help patients better understand the management of their complex medical conditions, to assist patients to navigate through the health care system, to improve the patient's access to the team of healthcare professionals, and to serve as a self-management tool to help patients create new short to long-term goals as they manage their chronic health conditions.[27] Of note, the single yearly assessment and care plan development is all that is required of the physician in order to receive payment; no follow-up visits are required. The initial uptake of this service was substantial, with over 500,000 physician-billed CACPs billed between 2009 to 2014 at a cost of approximately $113.7 million to the Alberta Government.[27] Each year in Alberta, approximately 28,500 people become eligible for a CACP based on having two or more of the above Group A conditions.[27]

Recognizing that some patients may receive similar care plans for which their physician does not submit a billing claim to Alberta Health, we use the term "physician-billed CACP" to indicate those that have been remunerated by Alberta Health.

1.1.3. Pharmacist Comprehensive Annual Care Plans in Alberta

In Alberta, pharmacists have the most advanced scope of practice in Canada that includes ordering laboratory tests and initial access prescribing.[17] In 2012, the Government of Alberta introduced a similar CACP remuneration program for community pharmacists to that introduced for family physicians in 2009.[27] Under this program, pharmacists can submit claims to Alberta Heath for the preparation of a CACP for patients with complex needs.[27] The components of a pharmacist CACP are identical to that of a physician CACP, including the collaborative nature with the patient and the requirement for both parties to sign the document.[27] A pharmacist CACP, however, was intended to complement a physician CACP, with a focus on drug therapy.[27] A patient is eligible for a pharmacist CACP if they have two or more of the following Category A conditions: asthma, diabetes, chronic obstructive pulmonary disease (COPD), heart disease, heart failure, hypertension or mental health disorders.[27] Alternatively, a patient could qualify if they have one of the above conditions combined with obesity, addiction disorder, or tobacco use (Category B conditions).[27] The uptake of this pharmacy service has grown dramatically since its introduction; in fiscal year 2014-2015, almost 528,000 Albertans received CACPs from pharmacists at the cost to the Alberta Government of over $21 million.[27]

Recognizing that some patients may receive similar care plans for which their pharmacist does not submit a billing claim to Alberta Health, we use the term "pharmacist-billed CACP" to indicate those that have been remunerated by Alberta Health. It is also important to clarify that the term "pharmacist-billed CACP" was selected due to the fact that an individual pharmacist submits the CACP claim to Alberta Health under their specific prescribing ID and license number, despite the fact that it is the pharmacy itself that receives remuneration from the government and not the individual pharmacist.

Although both the physician and pharmacy CACP programs have been operationalized for several years with relatively rapid uptake, no formal evaluation of the program has been undertaken. Indeed, it remains unknown whether CACPs have reduced healthcare costs or utilization of major health services, such as physician visits, hospitalizations, or ED visits, for those patients who receive one. This gap in evaluation was emphasized in the Alberta's Auditor General (AG) 2014 report on CDM, stating that despite considerable cost to the public healthcare

system, CACPs have not been well implemented or evaluated.[27] The AG recommended a plan to evaluate the effectiveness of care plans on an ongoing basis.[27]

Given that CACPs were designed to improve care and ultimately, health outcomes, assessment of healthcare utilization would be an important aspect of evaluating effectiveness of care plans, including hospitalizations, ED visits, and physician visits. Intuitively, a person would require less frequent ED visits and hospitalizations related to their chronic disease the better managed it is in the primary care setting. The frequency of physician visits, however, may be less clear; the delivery of a CACP may increase physician visits moving forward due to closer follow-up but may also decrease if the condition is better managed and the patient is better informed on how to self-manage their condition. As a result, physician visits may be more difficult to evaluate within the CACP context but is still an important outcome to explore at this time to gain a comprehensive picture of program impact.

1.1.4. Ambulatory Care Sensitive Conditions

While all-cause hospitalizations and ED visits are important outcomes to assess the impact of a CACP against, it is also prudent to consider ED visits and hospital admissions directly related to certain medical conditions that can be well-managed in a primary care setting and potentially more likely to be impacted by a CACP. Hospitalizations related to the majority of the qualifying medical conditions within both the physician and pharmacy CACP programs, including diabetes, COPD, asthma, heart failure, hypertension, and angina, are potentially preventable, as defined by the Long-Term Quality Alliance to describe hospitalizations that are preventable, avoidable, unnecessary, or discretionary.[28] In fact, individuals with at least one chronic disease are seven times more likely to be hospitalized with a potentially preventable hospitalization compared to adults without a chronic disease.[28] Moreover, it is estimated that 75% of such hospitalizations begin in the ED prior to being admitted.[28] Given that many of the short-term and long-term complications related to the conditions that qualify a patient for a CACP can be managed in the community, and hospitalizations are largely avoidable, these chronic diseases are considered ambulatory care sensitive conditions (ACSC).[29-31] Similarly, many of these conditions are considered patient medical home indicator conditions, in which primary care is likely to demonstrate a significant impact on.[32] An important aspect of evaluating the effectiveness of the CACP remuneration programs in Alberta should ultimately include evaluating its effects on subsequent ACSC-related health care utilization; indeed, if these

conditions are better managed in the community by primary care providers, ED visits and hospitalizations directly related to qualifying conditions should decrease over time.

1.1.5. Patient Perceptions of Quality of Chronic Illness Care

Patient engagement is a key element of care planning and effective CDM.[27] Individuals living with chronic disease spend the majority of their time self-managing their condition based on the advice, tools, and services provided to them by healthcare professionals.[27] Therefore, an important aspect of evaluating the physician and pharmacist CACP programs is to explore the patient perspective of their chronic illness care. With respect to chronic care initiatives by physicians, some comprehensive care models implemented around the world have demonstrated positive patient satisfaction and reported benefits by patients including an improved ability to self-manage their chronic disease and access essential health services.[6] Such results were demonstrated in patients with complicated diabetes as well as those with multimordidity.[6] However, Campbell et al. demonstrated a reduced perception of quality of care by patients with various chronic diseases under the UK Quality and Outcomes Framework.[23]

Similarly, pharmacist-led CDM programs have demonstrated improved patient satisfaction, increased perceptions around self-managing their condition, and better knowledge on their disease state.[33, 34] However, many of these studies have been disease state specific (i.e., diabetes, cardiovascular disease) in a controlled research setting rather than evaluating a population-wide intervention. Schindel et al. qualitatively explored patient experience with the pharmacist CACP process in Alberta and found that the CACP process did not necessarily clarify treatment goals for all patients who participated; for those who did leave with a clear understanding of their treatment goals, however, an increased drive to participate in their chronic illness care was reported.[35] Likewise, Hughes et al. found that patients who received a pharmacist CACP reported gained knowledge about their medical conditions and medications as well as encouragement and support to achieve their health goals.[36] However, patients included in these studies were selected by their pharmacist and the reasons why a pharmacist would select a particular patient to receive a CACP in this research setting and why patients would accept or reject the service are unknown and may impact the interpretation of the benefits reported.

1.2. SUMMARY

To tackle the growing prevalence and negative sequalae of chronic diseases in Alberta, the provincial government introduced a CACP remuneration model for physicians and pharmacists in 2009 and 2012, respectively.[27] Since their introduction, the uptake has been substantial and at a considerable cost to the provincial government.[27] Population-wide CDM initiatives by pharmacists and physicians worldwide have demonstrated minimal impact overall on patient outcomes to date[17, 20-22]; however, the effectiveness of CACPs in Alberta have not yet been evaluated. Given increased utilization rates of major healthcare services, such as hospitalizations, ED visits, and physician visits, by those with chronic diseases[27, 28], it is important to explore the impact of CACP delivery on subsequent healthcare utilization by individuals with chronic diseases. Moreover, taking into consideration the patient perspective of chronic illness care and potential benefits of the service is an important aspect of evaluating the CACP model fully.

1.3. THESIS OBJECTIVES AND PROGRAM OF RESEARCH

The objectives of this thesis proposal are to: 1) characterize (age, sex, qualifying conditions, comorbidity) the patients who have received a) physician-billed CACPs in Alberta since 2009 and b) pharmacist-billed CACPs in Alberta since 2012; 2) evaluate changes in healthcare utilization, including both all-cause and ACSC-related hospital admissions, ED visits, and physician visits in all patients who received a) physician-billed CACPs since 2009 and b) pharmacist-billed CACPs since 2012; and 3) to assess the patient perspective of chronic illness care provided by their a) physician in patients who received a physician-billed CACP in Alberta since 2009 and b) pharmacist in patients who received a pharmacist-billed CACP since 2012.

The overarching hypotheses of my thesis are: 1) patients who receive a physician-billed or pharmacist-billed CACP will have reduced utilization of major healthcare services (all-cause and ACSC-related hospital admissions, ED visits, and physician visits) compared to patients who do not receive a CACP; and 2) patients who receive a physician-billed or pharmacist-billed CACP will have an increase in perceived quality of chronic illness care compared to those who do not.

The outlined objectives were realized through a series of four inter-related studies. Specifically:

Chapter 2: Evaluation of Comprehensive Annual Care Plans by Physicians in Alberta.

Objectives:

1) Characterize (in terms of age, sex, qualifying conditions and comorbidity burden) the population of patients who received a physician-billed CACP in Alberta since 2009; and
2) Evaluate changes in the utilization of health services (including all-cause and ACSC-related hospitalizations and ED visits, and physician visits) for such patients.

Chapter 3: Exploring the Impact of a Physician Comprehensive Annual Care Plan on Perceived Chronic Illness Care by Patients.

Objectives:

1) Evaluate the impact of a physician-billed CACP on patients' perspective of their chronic illness care in Alberta.

Chapter 4: Evaluation of Comprehensive Annual Care Plans by Pharmacists in Alberta.

Objectives:

1) Characterize (in terms of age, sex, qualifying conditions and comorbidity burden) the patients who have received a pharmacist-billed CACP in Alberta since 2012; and
2) Evaluate changes in healthcare utilization (including all-cause and ACSC-related hospitalizations and ED visits, and physician visits) in such patients.

Chapter 5: Exploring the Impact of a Pharmacist Comprehensive Annual Care Plan on Perceived Chronic Illness Care by Patients.

Objectives:

1) Evaluate the impact of a pharmacist-billed CACP on patients' perspective of their chronic illness care in Alberta.

A final chapter which discusses the overall findings of the research program and its implications for clinical practice and future research is also provided.

Chapter 6: Conclusion

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CHAPTER 2. Evaluation of Comprehensive Annual Care Plans by Physicians in Alberta

2.1. INTRODUCTION

Chronic diseases, such as diabetes mellitus and hypertension, are a growing concern globally due to their increasing prevalence and associated burden on the healthcare system.[1, 2] They are the main drivers of hospital admission, emergency department (ED) visits and primary care physician visits worldwide.[1, 3, 4] Many countries are largely focused on finding effective strategies to better manage chronic conditions, both to improve the health outcomes of patients living with them and to ensure sustainability of their healthcare systems.[5] Chronic disease management (CDM) strategies are often influenced by the Chronic Care Model (CCM) which proposes multiple steps, including self-management support and the use of clinical information systems, with the aim of providing comprehensive patient care to individuals living with chronic diseases.[5, 6]

Care planning is a critical component of CDM, as it is aimed to engage the patient in their own disease management and better connect them to the health care system and the different health professionals involved in their care.[5] Research has demonstrated that an activated, engaged patient has been found to improve health outcomes.[7] In 2009, the Government of Alberta, Canada introduced a remuneration model for primary care physicians to develop a comprehensive annual care plan (CACP) once annually for individuals under their care living with more than one chronic disease; in turn, the billing code 03.04J allows the physician to be paid for the delivery of this service.[4] Patients are eligible to receive this service if they have 2 or more of the following conditions (defined Category A conditions): hypertensive disease, diabetes mellitus, chronic obstructive pulmonary disease (COPD), asthma, heart failure, coronary artery disease, or chronic renal failure (added in 2014). Likewise, a patient could also qualify if they have at least one Type A condition listed above in addition to one of the following risk factors (defined Category B conditions): mental health disorders, obesity, addiction, or tobacco use.[4]

The CACP program was proposed as a collaborative effort between the physician and patient to better engage the patient in the role they must also play in self-managing their condition(s) as well as to better educate them and link them to critical services.[4] Similar CDM

models have been implemented around the world, including the United Kingdom (UK) Quality and Outcomes Framework [8] as well as a complex care billing fee for family physicians in British Columbia, Canada to develop a personalized care plan for their patients living with chronic diseases.[9] There is also a similar CACP program for pharmacists in Alberta, but has yet to be evaluated. Overall, research on these initiatives has not demonstrated a significant effect on patient health outcomes and therefore, the impact of such policies remains unclear.[8-10]

Study Objectives

Since its introduction, the uptake of this clinical service has been considerable, with over 500,000 care plans billed between 2009 to 2014.[4] Despite the significant uptake of the physician CACP program, little evaluation on health outcomes has occurred to date. The Alberta Auditor General highlighted this gap in evidence in their 2014 report on CDM and recommended an ongoing plan to evaluate the effectiveness of physician CACPs.[4] Therefore, the objectives of this study are: 1) to describe the characteristics (age, sex, qualifying chronic diseases) of the patient population who have received a physician-billed CACP in Alberta since 2009; and 2) to evaluate changes in the utilization of health services for such patients. We hypothesize that those individuals who receive a physician CACP will have reduced utilization of major health services, such as hospital admissions, ED visits and physician visits, compared to those who did not receive a CACP.

2.2. METHODS

The Human Research and Ethics Board at the University of Alberta provided approval for this study (Pro00083926).

Setting

To evaluate Alberta's physician CACP program, the following de-identified administrative databases from Alberta Health were used to collect data from 2008 to 2016, linked by personal health number (PHN): 1) Alberta Physician Claims Data which includes billing and ICD-9 codes associated with physician claims, as well as procedures and physician specialty; 2) The Ambulatory Care Classification System which provides data on all services, duration of stay, diagnosis (up to 24 fields of ICD-9 or -10 codes), and procedures performed

while under the care of the ED; 3) Discharge Abstract Database which provides similar data but pertaining to inpatient hospital admissions; and 4) The Provincial Registry for patient demographics (age, sex).

Patients

Exposed Population

All patients who had a CACP billed under the billing code 03.04J by a physician in Alberta between 2009 to 2015 were identified. The index date was defined as the first occurrence of a CACP within the administrative data. The qualifying conditions by which a patient was deemed eligible for a CACP were collected based on The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes attached to the physician claim (i.e., the qualifying conditions must be submitted by physicians during the claim process). Individuals who did not have at least 1 year of data available prior to and following the CACP were excluded. Recognizing that some patients may receive similar care plans for which their physician does not submit a billing claim to Alberta Health, we use the term "physician-billed CACP" to indicate those that have been remunerated by Alberta Health.

Unexposed Population

Up to two controls were identified for each exposed patient, matched by age (within 5 years), sex, physician, date of service (within 1 year) and qualifying medical conditions (chronic renal failure was not added as a qualifying condition until 2014, therefore was not a matching criteria). By doing this, we essentially selected control patients of similar age and sex, who visited the same physician and qualified for a CACP based on the same medical conditions but did not receive a CACP. Alberta Health completed all matching for the study. The index date of the matched CACP patient served as each respective control's pseudo-index CACP date. Similar to the exposed population, those without a minimum of 1 year of data available prior and following the pseudo-index CACP date were excluded.

Study Design

We used a controlled interrupted time series (CITS) design to explore our study objectives. CITS is a strong observational study design to compare population-level data before

and after an intervention since it accounts for trends in the outcome that were occurring prior to the intervention[11]; moreover, both known and unknown time-invariant differences between groups are limited and adding a control group further adjusts for other confounding variables that may vary over time, including other events or population-wide interventions that may occur alongside the intervention being studied.[12] Similar study designs have been used by others in the evaluation of population-level health outcomes and in the evaluation of similar physician programs[8, 9, 13, 14] ;however, majority do not use a comparator group as we undertook.

Study Outcomes

To evaluate the impact of the CACP program on healthcare utilization, we sought to assess changes in all-cause physician visits, hospitalizations, and ED visits. We further evaluated hospitalizations and ED visits related to ambulatory care sensitive conditions (ACSC), since the majority of the CACP qualifying medical conditions are defined as ACSC; in other words, they are conditions that primary care can manage to prevent the need for hospital visits.[15] ACSC-related visits were identified using the Alberta Health Services indicator definition[16], as has been used by others.[17, 18] (Appendix 2-1, Table 2-1-1)

Statistical Analysis

For our first objective, we conducted a descriptive analysis for all patients who received a physician-billed CACP in Alberta. Descriptions of this population included age, sex and CACP qualifying conditions determined at the time of the index CACP, or pseudo-index CACP date in the control group, as well as the Elixhauser Comorbidity Index to estimate the burden of comorbidity in all individuals in the CACP and control populations; this method has been validated to measure disease burden and is also effective in measuring morbidity and future healthcare costs and utilization.[19] T-tests and chi-square tests were used to explore the association between continuous and categorical patient characteristics, respectively, according to cohort.

CITS analyses were used to explore patterns of healthcare utilization before and after the delivery of a physician-billed CACP. Individual level utilization data for each outcome were aggregated into 30-day intervals, 12 intervals before the CACP index date and 12 intervals after. Generalized least squares models were used to run separate interrupted time series (ITS) analyses

for each outcome (all-cause physician visits, and all-cause and ACSC-related hospitalizations and ED visits) in both the exposed and unexposed study populations; correlation over time was controlled for using autoregressive terms. Pre- and post-CACP indicators were used to assess changes in level and monthly intervals were used to assess changes in trend. Since individual ITS for each group only compare utilization rates to their counterfactual post-intervention trends (an estimate of the pre-intervention trend projected forwards), it is difficult to interpret the true difference in effect between the exposed and unexposed groups. Therefore, we calculated and modeled the difference in each outcome between CACP and control cohorts and used these differences to run a final ITS model using the same methods as above.[20] By doing this, differences in healthcare utilization that occurred in the control group during the same time period and the trends in healthcare utilization over time in both groups are controlled for; therefore, a clear effect of the intervention can be seen in the exposed cohort after implementation of the CACP. Next, we estimated the absolute effect of the CACP program at 12 months post-intervention for each outcome using our final ITS model which accounts for both the immediate level change and the change in trend over the 12 months of follow up; multivariate delta method was used to construct 95% confidence intervals around the absolute change.[21] All analyses were completed using SAS (Cary, NC: SAS Institute. Inc. SAS® 9.4).

2.3. RESULTS

Descriptive Analyses

We identified a valid index physician-billed CACP claim for 308,717 patients during our study period and 549,479 matched controls. The average age of the study population was 58 years in the CACP cohort and 60 years in the control cohort; females represented 48% of both groups. Qualifying medical conditions were similar across both groups, with the exception of tobacco use, which was significantly more prevalent in the CACP cohort (28% vs. 18% in controls; $p<0.001$). Over 70% of both cohorts had hypertension as a qualifying condition, with mental health disorders (38%), obesity (36%) and diabetes mellitus (35%) as most prevalent comorbidities. The Elixhauser Comorbidity Index was marginally higher in the control group (0.08) than the CACP group (0.04), but overall both scores were very low. (Table 2-1)

Interrupted Time-Series Analyses

Physician Visits

Immediately following delivery of a physician-billed CACP, the mean difference in number of physician visits increased by 270.3 visits per 10,000 people per month in CACP patients compared to controls (level change, p=0.26) but then decreased by 110.9 visits per 10,000 people per month over the following 12 months post-CACP (slope change, p<0.01). (Table 2-2, Figure 2-1) When estimating the absolute effect of the CACP program, we found that the mean difference in number of physician visits decreased by 1060.5 (95% CI: -2334.0 to 218.0; p>0.05) visits per 10,000 people in CACP patients vs. controls after the CACP was implemented, compared to what it would have been without the CACP; this absolute difference was not statistically significant. (Table 2-2, Figure 2-4)

All-Cause Hospitalizations

The mean difference in all-cause hospitalizations increased by 132.4 per 10,000 people per month in CACP patients compared to controls immediately following a physician-billed CACP (level change, p<0.001); the month-to-month trend in the mean difference in CACP patients compared to controls also increased by 24.8 hospitalizations per 10,000 people in the year following a CACP (slope change, p<0.001). (Table 2-2, Figure 2-2(a)) Overall, we found that the mean difference in the number of all-cause hospitalizations increased by 429.6 (95% CI: 337.1 to 522.1; p<0.05) per 10,000 people in CACP patients vs. controls compared to what it would have been without CACP implementation. (Table 2-2, Figure 2-4)

ACSC-related Hospitalizations

The difference in mean number of hospitalizations related to ACSC conditions increased by 8.8 visits per 10,000 patients per month (level change, p<0.001) in CACP patients compared to controls immediately following CACP introduction, and continued to increase month-to-month over the next 12 months (slope change; p=0.01). (Table 2-2, Figure 2-2(b)) The absolute effect of the CACP program demonstrates that the overall difference in mean ACSC-related hospitalizations after CACP was implemented increased by 26.3 per 10,000 patients (95% CI: 14.8 to 37.8; p<0.05), when comparing CACP patients to controls, compared to what it would have been without CACP. (Table 2-2, Figure 2-4)

All-Cause ED Visits

Immediately following physician-billed CACP, an increase in the mean difference of all-cause ED visits was observed in the CACP patients compared to the controls (323.7 visits per 10,000 patients per month; p=0.01) (level change) in as well as in the month-to-month trend of the mean differences post-CACP (slope change; p<001). (Table 2-2, Figure 2-3(a)) The absolute effect of the CACP initiative demonstrates that the overall difference in mean all-cause ED visits in those who received a CACP increased by 1548.3 visits per 10,000 people (95% CI: 971.5 to 2125.2; p<0.05) compared to controls, compared to what it would have been without CACP. (Table 2-2, Figure 2-4)

ACSC-related ED Visits

Patients receiving a physician-billed CACP demonstrated an immediate reduction in ACSC-related ED visits by 4.0 visits per 10,000 people post-CACP compared to the control group (level change; p=0.01). (Table 2-2, Figure 2-3(b)) The monthly trend in the mean difference number of visits per month per 10,000 people then increased by 40.2 visits per month in CACP patients vs. controls (slope change; p<0.01). When considering the absolute effect of the CACP program at the end of the year following a CACP, the mean difference in number of ACSC-related ED visits increased by 95.4 visits (95% CI: 34.4 to 156.5; p<0.05) in those who received a CACP compared to those who did not. (Table 2-2, Figure 2-4)

2.4. DISCUSSION

Our study demonstrates that after controlling for pre-intervention trends that were occurring prior to initiation of the CACP program in Alberta, there were minimal reductions in major healthcare utilization outcomes in the year following a physician-billed CACP. In fact, all-cause, as well as ACSC-related, hospitalizations and ED visits increased following a physician-billed CACP. While these changes were statistically significant, they may not be clinically meaningful given the small difference in monthly events identified per person between CACP patients and controls, with the potential exception of all-cause ED visits which moderately increased. At a population level, however, these results may increase in importance.

Our research findings, notably the lack of reduction of healthcare utilization, are consistent with previous literature evaluating population-wide payment models to incentivize physicians to better manage chronic diseases.[8, 9] In-depth reviews of population-based physician fee-for-service models generally demonstrate minimal impact on quality of care indicators and clinical outcomes[10, 22]; indeed, higher quality interrupted time series analyses out of the United Kingdom and British Columbia that account for secular trends occurring in the healthcare system prior to introduction of the payment model generally indicate lack of benefit of the model itself.[8,9]

While positive impact has been noted in the literature, important limitations in study design, such as a lack of control group and failure to account for pre-intervention trends, prevents generalizable and conclusive results to be drawn.[9, 13, 14, 23, 24] Furthermore, majority of studies focus on specific indicators of quality care, including laboratory monitoring or vaccination rates[25, 26], and often only examine specific disease states such as diabetes or coronary artery disease.[13, 14, 27] These results are difficult to apply to the Alberta physician model which broadly aimed to improve chronic illness care across over 6 common chronic disease states in addition to multiple high-risk factors. Despite the fact that reasonable caution against widespread implementation of fee-for-service models has been suggested by extensive reviews of the literature, declaring such models to not yet be evidence-based[10, 22], a similar model was initiated in Alberta without clear direction on how to evaluate the program. Although it has been suggested that effective care planning can reduce the frequency and duration of ED visits and hospital stays[4], our results did not demonstrate any such improvement in healthcare utilization.

Important strengths of our study should be noted. First, our results highlight an evaluation of all individuals in Alberta who received a physician-billed CACP between 2009 to 2015, limiting potential bias that may arise from evaluating only a sample of the population. Next, we undertook an interrupted time series analysis of the data and included a concurrent comparison group matched on important factors, including age, sex, physician and qualifying medical conditions that may other bias the results; a CITS is a strong quasi-experimental study design that provides generalizable, high-quality evidence.[10-12] The use of a CITS enabled us to further control for known and unknown, as well as time invariant and time-varying, confounders which increases the robustness of our results.[11, 12]

Our study is not without limitations, however. While we evaluated all individuals who received a CACP between 2009 to 2015, we only explored outcomes that occurred in the following one year of a CACP. We recognize that this is a relatively short follow-up period, but since the majority of qualifying conditions are considered ACSC, improvements in hospital admissions, ED visits and frequency of physician visits would still likely occur in this timeframe as conditions become better managed and the patient is engaged in their own disease management. Predicting the direction of change in physician visits is difficult, as a physician-billed CACP may also lead to increased follow-up visits. It may also be proposed that patients may become more aware of concerning disease symptoms which may precipitate an increase in ED visits or hospital admissions as we saw. It is also important to consider that given hypertension was the most prevalent qualifying condition, further research around improvements in guideline-recommended care, such as laboratory monitoring and appropriate medication use, as well as treatment targets, would further strengthen the evaluation of this program as reductions in major healthcare utilization outcomes may be more difficult to realize within 1 year.

The physician CACP program in Alberta likely requires redesign (including more specific aspects of care) and closer monitoring (of quality indicators and guideline recommended care) to attain the intended goals. Indeed, the program only required a single yearly development of a care plan without further expectations of follow up or achieving disease targets—this is inconsistent with the CCM and is unlikely to improve outcomes. While the billing code (03.04.J) for this clinical service has been recently removed due to budget constraints of the current Alberta government, these data are critical to better inform renegotiations by the physicians' professional body in Alberta, as well as other jurisdictions in Canada and worldwide that seek to undertake similar models for improved chronic disease care.

Conclusion

Our in-depth evaluation of the physician CACP program in Alberta demonstrated minimal impact at an individual level on hospital admissions and physician visits overall, and a potentially clinically important increase in all-cause ED visits. At a population level, however, these results may all increase in importance and require further interpretation. Despite the elimination of this program by the current Alberta Government, our results are an important

contribution to the literature around effectiveness of physician fee-for-service models. Renegotiations by Alberta physicians, and other jurisdictions around the world considering similar incentive programs for chronic illness care, should carefully ensure such a program is better designed prior to implementation and set careful evaluation parameters to monitor and inform its impact.

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Table 2-1. Qualifying conditions, comorbidity burden, and demographics of study population.

Characteristic	**Matched Controls (n=549, 479)**	**CACP Cohort (n=308, 717)**	**p-value**
Age, yr (mean, SD)	60 (15)	58 (15)	<0.001
Sex			
Female	266 247 (48%)	148 504 (48%)	<0.01
Male	283 232 (52%)	160 213 (52%)	
Qualifying Conditions			
Hypertension	397 046 (72%)	224 217 (73%)	<0.01
Diabetes Mellitus	190 267 (35%)	108 471 (35%)	<0.001
Chronic obstructive pulmonary disease	44 178 (8.0%)	26 070 (8.4%)	<0.001
Asthma	83 166 (15%)	45 166 (15%)	<0.001
Chronic Heart Failure	10 040 (1.8%)	6 393 (2.1%)	<0.001
Ischemic Heart Disease	66 237 (12%)	38 726 (13%)	<0.001
Mental Health Disorder	209 505 (38%)	116 054 (38%)	<0.001
Obesity	197 984 (36%)	108 715 (35%)	<0.001
Addiction	8 116 (1.5%)	4 532 (1.5%)	0.74
Tobacco	97 683 (18%)	53 985 (28%)	<0.001
Elixhauser Score (mean, SD)	0.083 (0.31)	0.044 (0.21)	<0.001

Table 2-2. Interrupted time series model estimates and associated 95% confidence intervals for mean differences per 10,000 patients in healthcare utilization outcomes in patients who received a physician CACP compared to controls.

Variable	Physician visits [a]	Hospitalizations [a]		Emergency Department Visits [a]	
		Total	*ACSC*	*Total*	*ACSC*
Intercept 12 months before index CACP [b]	-1142 (-1583.2 to -700.8)	-10.1 (-26.0 to 5.8)	-6.0 (-11.4 to -0.6)	-754.0 (-889.0 to -619.0)	-15.3 (-29.9 to -0.7)
Pre-incentive trend [c]	89.5 (21.3 to 157.6)	-20.3 (-24.7 to -15.8)	-1.3 (-2.0 to -0.7)	-67.3 (-96.0 to -38.6)	-4.0 (-7.2 to -0.9)
Level change after CACP implementation [d]	270.3 (-203.6 to 744.2)	132.4 (93.2 to 171.5)	8.8 (2.2 to 15.5)	323.7 (85.9 to 561.5)	40.2 (13.5 to 7.7)
Trend change after CACP implementation [e]	-110.9 (-190.1 to -31.7)	24.8 (20.2 to 29.3)	1.4 (0.9 to 2.0)	102.1 (69.1 to 135.0)	4.6 (1.5 to 7.7)
Overall CACP effect [f]	-1060.5 (-2338.9 to 218.0)	429.6 (337.1 to 522.1)	26.3 (14.8 to 37.8)	1548.3 (971.5 to 2125.2)	95.4 (34.4 to 156.5)

[a] All reported values indicate the average difference in the mean number of events in those who received a CACP compared to those who did not (CACP minus control)

[b] Model intercept 12 months before CACP introduction

[c] Rate of change in the outcome over time prior to CACP introduction

[d] Immediate change in outcome following CACP introduction

[e] Month-to-month change in rate or slope after CACP introduction, relative to the pre-incentive difference in trend

[f] The overall CACP effect is the difference in the total number of events over the 12 month post-CACP period, compared to the counterfactual difference in trends had the CACP not occurred (i.e., pre-incentive difference in trends projected forward)

Figure 2-1. Difference in mean monthly physician visits per 10,000 patients in CACP patients compared to controls.

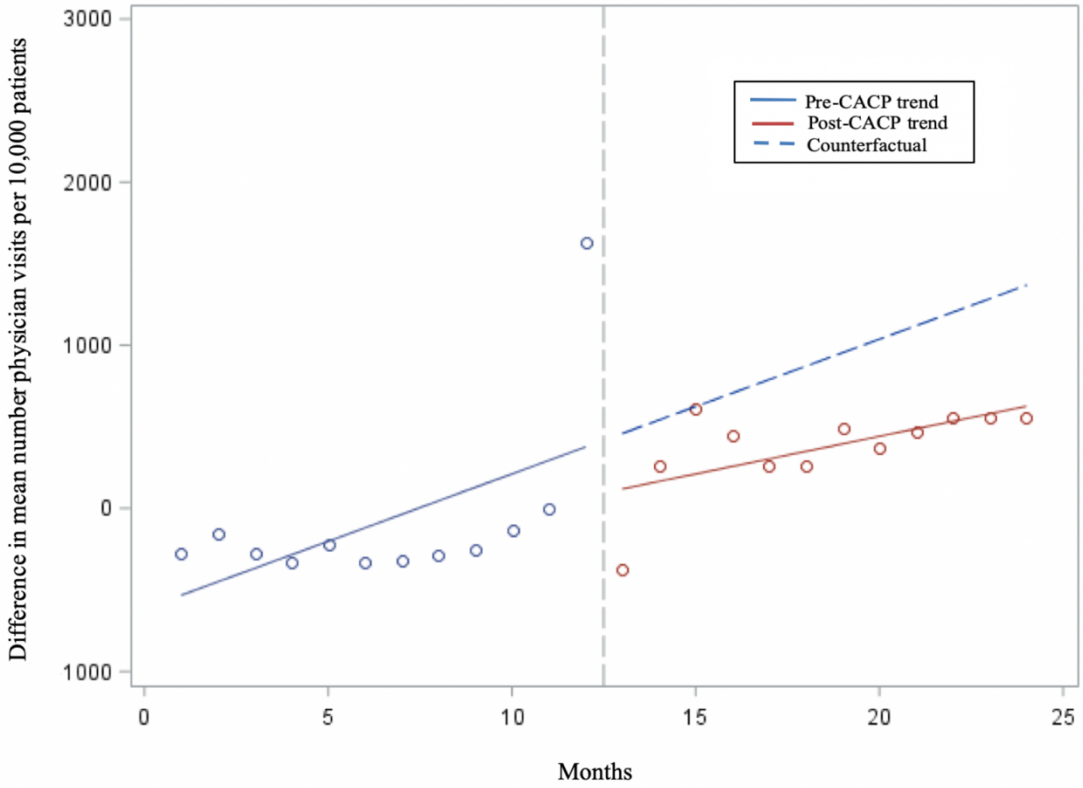


Figure 2-2. Difference in mean monthly all-cause (A) and ACSC (B) hospitalizations per 10,000 patients in CACP cohort compared to control cohort.

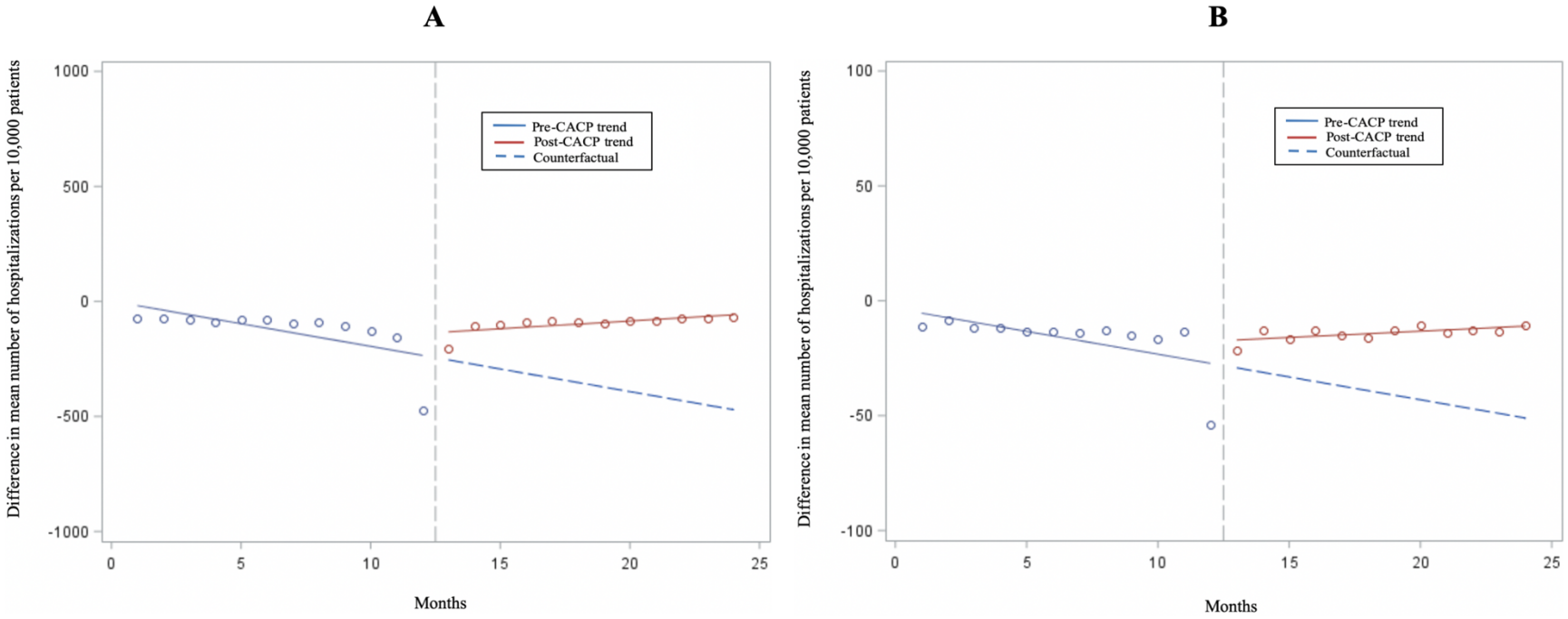


Figure 2-3. Difference in mean monthly all-cause (A) and ACSC (B) emergency department visits per 10,000 patients in CACP cohort compared to control cohort.

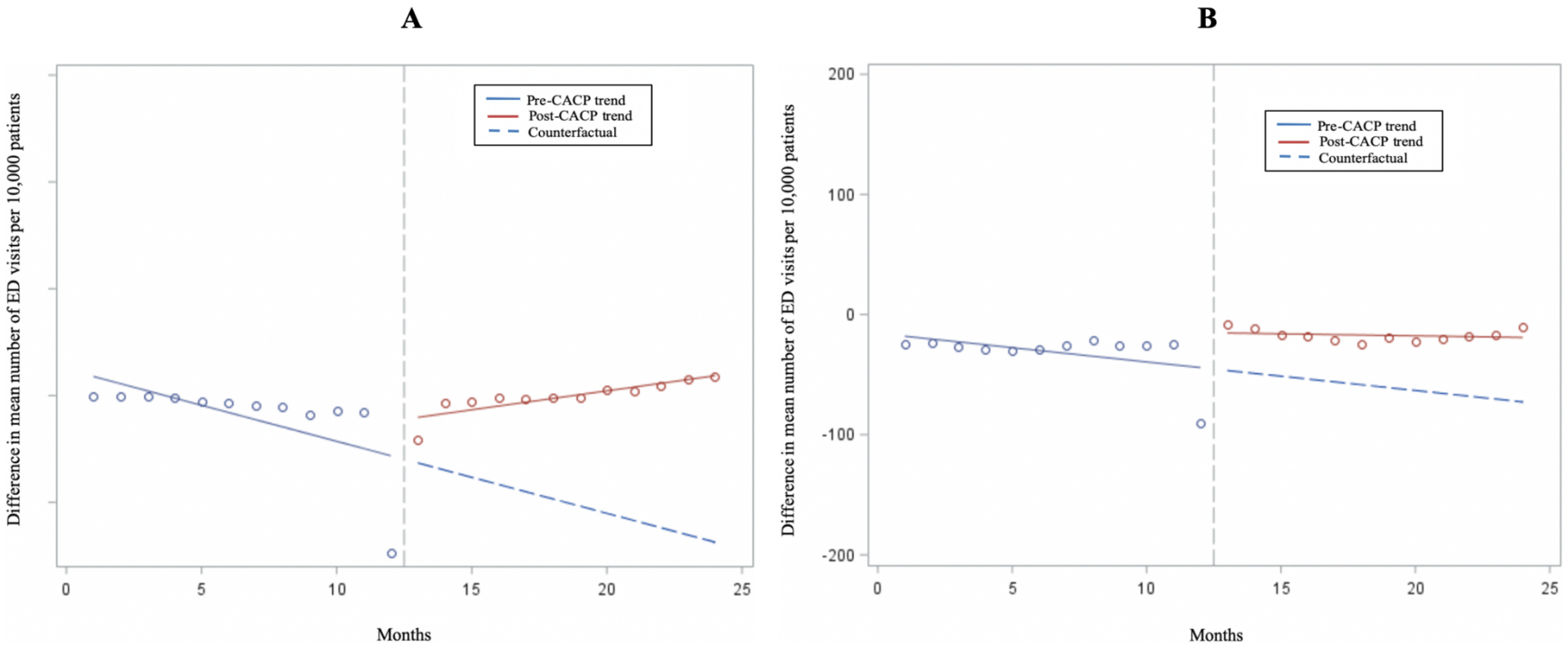
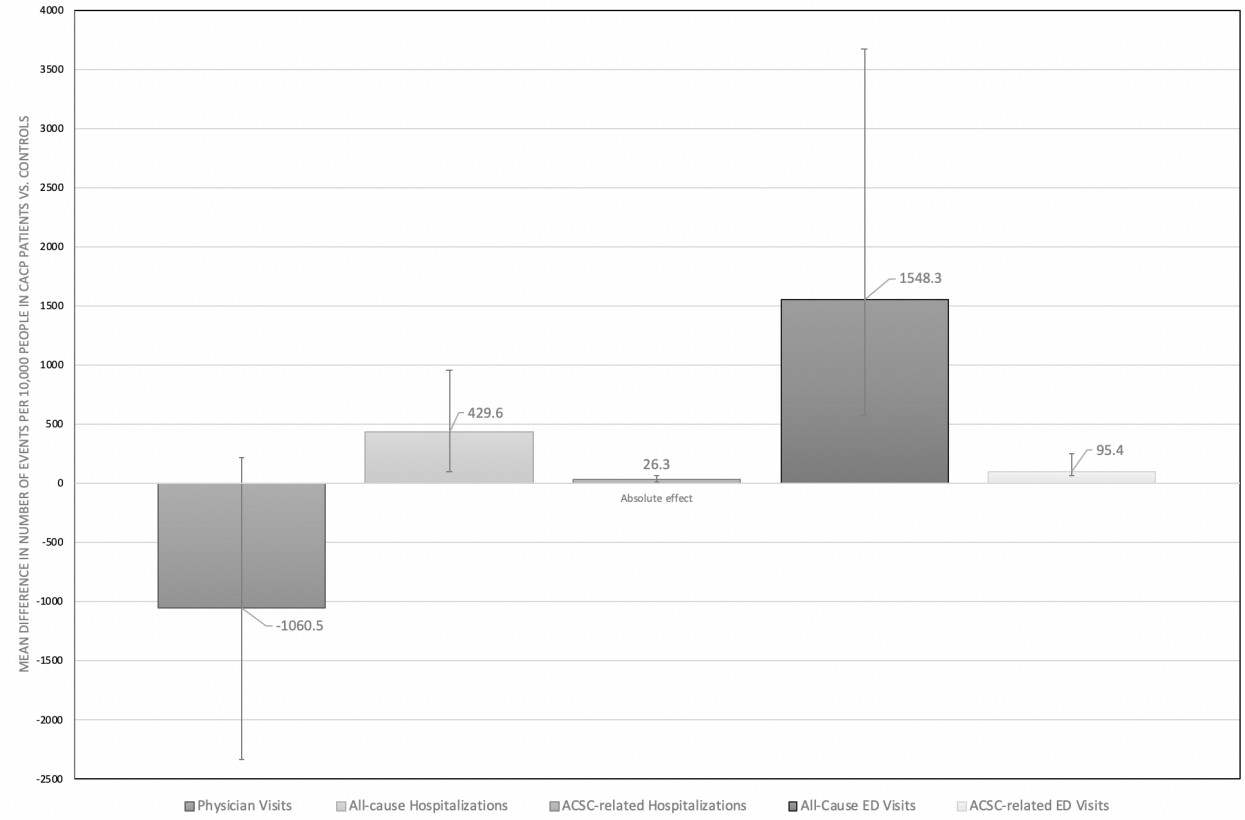


Figure 2-4. Absolute effect of CACP program on physician visits, all-cause and ACSC-related hospitalizations, and all-cause and ACSC-related emergency department visits per 10,000 people in CACP patients compared to controls.



APPENDIX 2-1. Ambulatory Care Sensitive Condition Indicator Definition

Table 2-1-1. Ambulatory Care Sensitive Condition Indicator Definition.[1-3]

ACSC Condition	ICD-10-CA Codes (most responsible diagnosis code of:)
Grand mal status and other epileptic convulsions	G40, G41
Chronic obstructive pulmonary diseases	J41, J42, J43, J44, J47 MRDx of Acute lower respiratory infection (J10.0, J11.0, J12-J16, J18, J20, J21, J22), only when a secondary diagnosis of J44
Asthma	J45
Diabetes	E10.0, E10.1, E10.63, E10.9, E11.0, E11.1, E11.63, E11.9, E13.0, E13.1, E13.63, E13.9, E14.0, E14.1, E14.63, E14.9
Heart failure and pulmonary edema	I50, J81 *Excluding cases with cardiac procedures
Hypertension	I10.0, I10.1, I11 *Excluding cases with cardiac procedures
Angina	I20, I23.82, I24.0, I24.8, I24.9 *Excluding cases with cardiac procedures

*cardiac procedure codes identified using CCI coding:
1HA58, 1HA80, 1HA87, 1HB53, 1HB54, 1HB55, 1HB87, 1HD53, 1HD54, 1HD55, 1HH59, 1HH71, 1HJ76, 1HJ82, 1HM57, 1HM78, 1HM80, 1HN71, 1HN80, 1HN87, 1HP76, 1HP78, 1HP80, 1HP82, 1HP83, 1HP87, 1HR71, 1HR80, 1HR84, 1HR87, 1HS80, 1HS90, 1HT80, 1HT89, 1HT90, 1HU80, 1HU90, 1HV80, 1HV90, 1HW78, 1HW79, 1HX71, 1HX78, 1HX79, 1HX80, 1HX83, 1HX86, 1HX87, 1HY85, 1HZ53 rubric (except 1HZ53LAKP), 1HZ54, 1HZ55 rubric (except 1HZ55LAKP), 1HZ56, 1HZ57, 1HZ59, 1HZ80, 1HZ85, 1HZ87, 1IF83, 1IJ50, 1IJ54GQAZ, 1IJ55, 1IJ57, 1IJ76, 1IJ80, 1IK57, 1IK80, 1IK87, 1IN84, 1LA84, 1LC84, 1LD84, 1YY54LANJ

[1]Indicator Definition (Admissions for Ambulatory Care Sensitive Conditions). Alberta Health Services. June 2011. [Accessed March 25, 2020]. Available at: https://www.albertahealthservices.ca/Publications/ahs-pub-pr-def-amb-care-sensitive-cond.pdf
[2]Billings J, Anderson GM, Newman LS. Recent findings on preventable hospitalizations. Health Affairs 1996; 15(3):239-249.
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CHAPTER 3. Exploring the Impact of a Physician Comprehensive Annual Care Plan on Perceived Chronic Illness Care by Patients

3.1. INTRODUCTION

Chronic diseases significantly impact the lives of people worldwide. With ageing of the world population and longer lifespans of people with chronic diseases, we are experiencing an increasing prevalence of individuals living with these long-term diseases such as diabetes mellitus, ischemic heart disease, and chronic pulmonary disorders.[1, 2] Indeed, with increasing age brings a higher risk of multimorbidity which is defined as the co-occurrence of multiple chronic conditions in an individual.[3] By 2030, it is estimated that 52 million deaths will be related to chronic diseases worldwide.[4] Additionally, chronic diseases lead to detrimental sequelae such as increased physician and emergency department (ED) visits, hospital admissions, reliance on prescription drug use, and inability to work.[5]

The care of individuals with chronic diseases is complex and often requires multiple healthcare providers.[6] Healthcare systems worldwide are increasingly implementing comprehensive care programs, such as chronic disease management (CDM), to tackle the growing burden of chronic diseases.[7, 8] Such programs often incorporate elements of the Chronic Care Model proposed by Wagner et al., who envisioned "an informed, activated patient interacting with a prepared, proactive practice team" that leads to improved patient satisfaction of care and health outcomes.[9, 10] Patients themselves must adopt the role of primary caregiver when diagnosed with a chronic disease, since lifestyle changes (diet, exercise), medication use, and daily monitoring is required, and majority of their time is spent outside of the physician's office.[6, 11] As such, patient engagement in the CDM process is critical. One way to engage the patient in their chronic illness care is through the development of a care plan.[5] Care planning is considered to be an important part of effective CDM since it links the crucial roles that healthcare teams, services, and patients all play in managing chronic diseases.[5] Care plans have been found to be both cost-effective and beneficial in improving patient outcomes.[5]

In Alberta, a fee-for-service model was implemented for primary care physicians in 2009 to improve the care and outcomes of patients living with chronic diseases.[5] This program includes remuneration for the development of a comprehensive annual care plan (CACP) once annually for patients with 2 or more of the following conditions: hypertensive disease, diabetes mellitus, COPD, asthma, heart failure, coronary artery disease, and chronic renal failure.[5] Alternatively, patients may be eligible to receive this service if they have one of the conditions listed above in addition to mental health issues, obesity, addiction, or are a tobacco user.[5] The CACP is intended to be completed in partnership with the patient in order to gain the patient's perspective in their chronic illness care and engage them in their medical care.[5] Recognizing that some patients may receive similar care plans for which their physician does not submit a claim to Alberta Health, we use the term "physician-billed CACP" to indicate those that have been remunerated by Alberta Health.

The uptake of the physician CACP program has been substantial, with $113.7 million spent by the Alberta government between 2009-2014.[5] To date, no evaluation has occurred on the impact of physician CACP on patient's perceived satisfaction of chronic illness care. Our objective was to evaluate the impact of a physician-billed CACP on patients' perceptions of their chronic illness care. We hypothesized that those individuals who received a physician-billed CACP would perceive the level of their chronic illness care to be higher than those who did not.

3.2. METHODS

A cross-sectional survey design was implemented to compare patient perspectives of chronic illness care between those who received a physician-billed CACP and those who did not. Alberta Health (the provincial funder of universal health care in Alberta, Canada) identified individuals between February 2019 to October 2019 who were over the age of 18 years and received a physician-billed CACP in the previous 3 months, based on the billing code 03.04J. To establish a control group for the study, up to two matched controls who did not receive a physician-billed CACP were identified for each CACP patient based on age (within 5 years), sex, qualifying CACP conditions, physician, and date of service (within 1 year).

A cover letter which contained detailed study information and a link to access the online survey for either the CACP or control group were mailed out to all selected participants. To maintain the confidentiality of personal health information of the participants, their selection, matching, and mail distribution was completed by Alberta Health. Individuals were only invited to participate once and were excluded from further survey distributions to prevent repeated data from the same participant. Survey responses were collected in Qualtrics XM Platform which upheld anonymity of all participants. The study was approved by the University of Alberta Human Research and Ethics Board (Pro00083926).

Survey Measures

The primary outcome measure was the 11-item Patient Assessment of Care for Chronic Conditions (PACIC) questionnaire.[12] The PACIC was originally developed and validated as a 20-item questionnaire to evaluate from a patient's perspective the extent to which the care they receive for their chronic illness(es) is aligned with the CCM model[13]; it has been widely implemented across many chronic disease states.[14, 15] The 11-item version of the PACIC was later developed and validated and asks patients to consider recent physician visits and report the extent to which they have received specific care and services related to their chronic disease.[12] Guigi et al. categorized responses into low, medium, and high (0-30%=low, 40-60%=medium, 70-100%=high)[12]; since our questionnaire allowed for selection by 1 unit by respondents, we adapted the categories to 0-39%=low, 40-69%=moderate, and 70-100%=high. In some disease states, higher PACIC scores have been associated with improved patient care. For example, in patients with diabetes, a higher total score of the PACIC is predictive of improved patient education, laboratory monitoring and implemented lifestyle improvements such as physical activity.[16] In addition to the PACIC-11, we added 3 questions, with similar format, which targeted care practices not otherwise highlighted, including: *"Given enough time to talk about your medical conditions or medications", "Told how visits with other types of health professionals would help your treatment," and "Told your physician would work together with other health professionals to coordinate your care".*

A standard deviation of 25.0 for the PACIC-11 total score was approximated based on previous experience using this tool. No pre-defined minimally important difference in total

scores has been published for the PACIC-11, therefore an absolute difference of 7.5 (effect size 0.3) was arbitrarily set as an important difference by our team. As such, we calculated a required sample size of 131 CACP patients and 262 control patients to reach 80% power and a 5% probability of type 1 error. Anticipating a 35% response rate for the survey (based on recent population surveys completed by Alberta Health), we estimated needing to invite 374 CACP patients and 749 controls.

Secondary measures included in the survey were directed at overall health status of the participants. Individuals were asked to complete the 5-level EQ-5D and visual analogue scale (VAS) to quantify their overall health status.[17, 18] We also included the 2-item Patient Health Questionnaire (PHQ-2) and Generalized Anxiety Disorder Scale (GAD-2) to further evaluate the mental health status of the participants. Both are validated self-report tools to screen for these conditions, with a score of 3 or greater being highly specific and sensitive for the presence of each condition.[19, 20]

Participants were asked to rate their overall satisfaction of care by their physician using a 6-point Likert scale ranging from 1=very dissatisfied to 6=very satisfied. Furthermore, they were asked two questions (yes/no) to ascertain whether they were aware they received this care plan service and whether they were asked to sign the care plan document, which is a formal requirement of the CACP program. Seven questions related to sociodemographic characteristics of the participants (age, sex, marital status, education level, annual income, ethnicity) and qualifying chronic diseases for a CACP were asked at the end of the survey to fully describe the study population and to allow for adjustment of unbalanced characteristics in our analysis if needed. The Single Item Literacy Screener was included to enable us to explore the impact of health literacy on our survey measures.[21] This measure is a 5 item Likert scale ranging from 1=never to 5=always). The complete questionnaire is available in Appendix 3-1.

Statistical Analysis

All categorized demographic variables were calculated and reported as proportions. Means and standard deviations (SD) were calculated for age, VAS score, satisfaction of care by physician, and Single Item Literacy Screener. Proportions and 95% confidence intervals (CI)

were calculated to describe patient recall on receiving and signing a care plan, as well as for the PHQ-2 and GAD-2, dichotomized by scores of 3 or greater and less than 3.[19, 20] An index value and standard deviation for the EQ-5D-5L was calculated using the Canadian EQ-5D-5L value set.[22]

Reported survey responses between CACP and control groups were compared using t-tests and chi-square tests for continuous and categorical variables, respectively. Only 39% of respondents in each cohort responded to all PACIC-11 items, and 36% and 38% of CACP patients and controls responded to all 14 PACIC-like items (the 11-item validated PACIC survey plus the additional 3 questions), respectively. Since complete case analysis would significantly reduce the sample size for analysis, we opted against calculating a total PACIC score. Instead, individual PACIC question means and SD were calculated, and multivariate linear regression was used to explore the association between responses to individual PACIC questions according to CACP status. Further multivariate models were explored based on statistically significant differences in baseline characteristics, including those variables with reasonable univariate associations ($p<0.1$) with each individual PACIC question. If a variable was reasonably associated with any of the PACIC questions, the multivariate model including that variable was run for all PACIC questions for consistency. All analyses were completed using Stata 14 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.)

Sensitivity Analysis

A post-hoc sensitivity analysis was completed to explore responses to the 14 PACIC-like items. The subgroup analysis included patients in the CACP cohort who answered 'yes' to the following question "*In the last 3 months, did you spend time with your physician to review your medical conditions in order to create a detailed treatment plan?*" and patients in the control cohort who answered 'no' to the above question. The purpose of this sensitivity analysis was twofold; first, it served to eliminate responses from those patients who may have received a CACP but did not have the service billed through Alberta Health, as this practice has been reported by family physicians in Alberta who do not feel the need to bill for a service they already provide in their routine care.[5] Likewise, it would remove responses from patients who received a thorough discussion or treatment plan similar to a CACP but was not a CACP per se.

Second, it eliminates those patients who had a CACP billed by their physician, but were not sufficiently engaged in the process, as set out by the program requirements.

3.3. RESULTS

Overall, 3,500 individuals in the CACP cohort and 7,000 in the control cohort were sent letters with an invitation to participate in the study; the selection and distribution process occurred 3 times (February 2019, June 2019, October 2019). After accounting for letters that did not reach the intended participant, the final mail distribution samples were 3,367 CACP patients and 6,729 controls. In total, 6.7% (n=221) and 6.9% (n=463) of CACP patients and controls, respectively, responded to the survey. While response rates were less than anticipated, we were still able to achieve our target sample size through additional mailouts.

The average age of respondents in the CACP and control cohort was 65 and 64 years, respectively, and 44% were female across both groups. (Table 3-1) Socioeconomic characteristics of both cohorts were similar, with the majority of participants reporting being Caucasian (>80%), married or common law (~70%), completed college or technical school (~40%), and over one-third reporting an income of $50,000 or greater. The health literacy status of both groups was similar and indicate that on average, respondents never to rarely require help with written health information.[21] The proportion of reported qualifying medical conditions were also similar across the two groups, with hypertension (45% in CACP group; 46% in controls) and diabetes mellitus (44% in CACP group; 42% in controls) being the most prevalent; the only exception was mental health disorder which was more prevalent in the control group compared to the CACP group (23% vs. 15%; p=0.04).

The overall health status of CACP participants and controls was similar, with an EQ-5D-5L index value of 0.75 (SD 0.2) and 0.73 (SD 0.2), respectively (p=0.35). The VAS, however, was reported slightly higher in the CACP group at 69 (SD 19) compared to 65 (SD 20) in the control group (p=0.01). A significantly higher proportion of respondents in the control group reported a PHQ-2 score of 3 or greater (23% vs. 15% in CACP cohort; p=0.03). A higher proportion of controls also reported a GAD-2 score of 3 or greater than CACP patients (19% vs. 15%), but this difference did not reach statistical significance (p=0.14). (Table 3-2)

Participants in both cohorts reported relatively high satisfaction of care from their physician (5.1 (SD 1.3) and 5.0 (SD 1.4) in CACP and control groups, respectively; p=0.21). (Table 3-3) When asked about receiving a care plan from their physician, 73% of patients who received a physician-billed CACP recalled receiving one and 40% reported signing the treatment plan. In the control group, 64% still reported receiving a care plan and 22% report signing one.

Response rates to all 14 PACIC-like items were similar between the 2 groups and ranged from 48% to 85%. (Table 3-4) Only 38% and 39% of the CACP and control group, respectively, answered all questions on the validated PACIC-11; similarly, 38% and 36% of CACP patients and controls, respectively, responded to all 14 items. Within the PACIC-11, 8 of 11 questions were scored as moderate (between 40-69%) by participants in both groups in terms of the care they received for their chronic illness. One question ("*contacted after a visit to see how things were going"*) was rated as low (between 0-39%) in both groups and one question was rated as high (between 70-100%) level of perceived care ("*satisfied that your care was well organized*"). The average mean scores of the 3 additional questions ranged between moderate to high for both cohorts, with the highest scores (76% and 73% in CACP patients and controls, respectively) related to perceived time to talk about medical conditions and medications. Overall, patients who received a CACP from their physician reported slightly higher PACIC scores compared to those who did not. Females generally rated PACIC questions lower than males but the differences did not meet statistical significance except for item 11 where females rated it 11 points lower ($p<0.01$). However, statistical significance was met for only 2 of these questions; the questions were "*given a copy of your treatment plan*" (58% vs. 46%; p=0.01) and "*helped to plan ahead so you could take care of your condition even in hard times"* (54% vs. 45%; p=0.049).

As differences were noted on the PHQ-2, the comparison of PACIC scores were adjusted based on PHQ-2 score (score of <3 or ≥ 3) given its significant association with 6 of the 14 PACIC questions. (Appendix 3-2, Table 3-2-1) After adjustment, PACIC scores were generally lower in both cohorts for majority of the questions in those individuals with a PHQ-2 score of 3 or greater. Moreover, after adjustment for the PHQ-2 score, difference for 7 of the PACIC questions were statistically significant, with the CACP patients reporting higher scores on all of these questions relative to controls.

Sensitivity Analyses

The subgroup of participants in the CACP group who recalled receiving a CACP and controls who indicated they did not receive a CACP included 160 CACP patients and 166 control patients (73% and 26% of each cohort, respectively). Demographics and health status did not differ significantly from the entire cohort, nor did response rates to each PACIC item. (Appendix 3-3, Table 3-3-1, Table 3-3-2) In this subgroup, those who received a CACP perceived a statistically significant higher level of chronic illness care across all adapted 14 PACIC-like questions ($p<0.001$ for all). The majority of responses were rated as moderate in the CACP cohort, while 2 were rated as high. In the control group, all but 2 items were reported as low. (Table 3-5)

3.4. DISCUSSION

We found that, overall, individuals perceived a moderate level of chronic illness care from their family physician, regardless of whether they received a CACP from their physician or not. Moreover, individuals with who screened positive on the PHQ-2 (indicating a higher likelihood of depression) perceived care to be lower overall. This is perhaps not surprising, given that patients with mental health disorders tend to distrust their primary care providers and that physicians report difficulties in treating mental illness and may not give it the same weight as other chronic diseases.[23, 24] Our sensitivity analysis further demonstrated that patients who are likely more engaged in the CACP process with their physician perceive a markedly higher level of care than their control counterparts; despite these differences, patients in the CACP cohort within this subgroup remained only moderately satisfied with their chronic illness care from physicians in Alberta.

A systematic review of comprehensive care models around the world undertaken by de Bruin et al. demonstrated that there is moderate evidence to support positive patient satisfaction and quality of care received from such models, reporting perceived benefits such as being better able to manage their disease and improved access to health services.[6] However, studies included in this review were not evaluating population-based initiatives and focused on a narrow subset of individuals (i.e., hospitalized, specific chronic diseases) and are difficult to compare to our

results. More recently, similar population level remuneration initiatives for physician care of patients with complex needs have been implemented and evaluated.[25-27] The majority of studies evaluating these programs have focused on health care outcomes such as changes in healthcare utilization and delivery of specific services based on chronic disease guidelines; overall, these initiatives have demonstrated inconsistent benefits related to the outcomes studied. Few programs have been evaluated from the perspective of the patient. Patient experience related to the United Kingdom Quality and Outcomes Framework implemented in 2004 was explored by Campbell et al.[28, 29] This framework introduced payment to physicians for care plan development for individuals with chronic diseases, similar to the physician model in Alberta. However, they found a reduction in perceived continuity and satisfaction of care by patients following its introduction. Our study, which was not designed to capture a before-after difference, demonstrated a higher level of perceived care by those who received a physician-billed CACP, however, it is unclear if the CACP itself is responsible for the higher level of perceived care.

What constitutes comprehensive care can vary greatly amongst program initiatives, but generally should include all aspects of the CCM.[6] Developing a CACP and engaging a patient in the process are integral components of providing comprehensive care, and indeed our sensitivity analysis demonstrated that those patients who recalled collaborating with their physician in this process perceived better care. Even with patient engagement, however, the CACP program may not include enough aspects of the full CCM to achieve the synergistic effect it was designed to realize.[6] For example, physicians are not required to follow-up with patients following a CACP, nor work in an interdisciplinary team which likely undercuts the level of care and benefits that could be achieved by care planning for someone with multiple chronic diseases. In other words, remuneration should not just be based on the completion of a single CACP document, but also reliant on active follow-up and implementation of jointly created care plans with other health professionals involved in a patient's care.

Strengths and Limitations

A strength of our study was the ability to select a sample from all individuals who received a physician-billed CACP in the previous 3 months in Alberta. The inclusion of a matched control group also allowed us to compare perceived care in those who received a

physician-billed CACP from those who receive usual care in Alberta; moreover, our close matching process reduced potential confounding variables such as age, sex, provider and chronic diseases that qualified someone for a CACP. Given that physicians likely have very individual practices with varying levels of care and services provided, identifying individuals who visited the same provider and were eligible for a CACP but did not receive one was important in evaluating the effect of the CACP itself. The questions in our survey were comprehensive and allowed us to compare overall health status, mental health status, and socioeconomic differences between the groups; as well, we were able to analyze a smaller subgroup of the study population who were likely more engaged in the CACP process to further explore our study results.

The cross-sectional design of our study is an inherent limitation to the interpretation of our data, as we are unable to determine if the difference in perceived care we saw between the groups was a direct result of the CACP or not. Recall bias is another limitation of a survey design; we tried to further reduce this risk by limiting the time period of the survey questions to the previous 3 months despite the 11-item PACIC tool being validated for a 6 month recall time frame.

Our response rate to the survey was quite low, and completion of all 14 PACIC-like questions remained quite low even in those who completed the entire survey. Therefore, it is difficult to generalize our study results to the entire Albertan population. It may also indicate that the PACIC-11 does not capture the correct elements of a CACP, or that the delivery of a CACP does not necessarily align with the CCM. Differences in those individuals who responded to the survey compared to those who did not remain unknown, and we recognize that the online survey may have provided an additional challenge to those without Internet or computer literacy, but was required to protect the health information of the survey participants. Perceived chronic illness care and health behaviors may also differ based on sex and this association was not explored in our analysis; while study participants self-reported their sex, it was also a variable used to match exposed participants to controls and therefore could not be further stratified without introducing bias. Next, we were unable to assess the quality of the care plans directly, nor could we account for the fundamental differences that may exist between individuals who are offered a CACP or not, or those who chose to accept or reject a CACP from their physician. We

were also unable to account for individuals receiving care plans that were not a physician-billed CACP, given that 64% of control patients reported receipt of a care plan. Finally, it is important to highlight that a physician-billed CACP is a single point of care and we were unable to evaluate further follow-up visits that are not a requirement of the program but may have occurred and impacted the level of care. Further research focused on a prospective evaluation of the effect of the CACP on satisfaction of care would be of benefit.

Conclusion

Overall, our study demonstrates that based on the PACIC, individuals in Alberta perceive a moderate level of chronic illness care from their physicians, but this does not differ between those who receive a physician-billed CACP compared to those who did not. The difference in perceived level of care seems to be greater when patients are more engaged in the care plan development process. The physician CACP program in Alberta may be enhanced by more guidance, structure and accountability in order to realize the full benefits comprehensive care can offer.

3.5. REFERENCES

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Table 3-1. Demographics of Study Population.

Characteristic *(number of respondents in CACP group; number of respondents in control group)*	**CACP Group (n=221)**	**Control Group (n=463)**	**p-value**
Age (n=164; 341) years, mean (SD)	65 (12)	64 (12)	0.20
Sex (n=193; 397)			0.95
Female	44%	44%	
Male	56%	56%	
Marital Status (n=193; 398)			0.58
Single/never married	5%	10%	
Married/common law	73%	69%	
Separated/Divorced	14%	12%	
Widowed	7%	7%	
Prefer not to respond	1%	2%	
Education Level (n=193; 399)			0.92
Less than high school	7%	7%	
High school	23%	20%	
College/technical school	37%	40%	
Post-secondary	21%	20%	
Post-graduate	6%	9%	
Prefer not to respond	2%	2%	
Annual Income (n=193; 398)			0.41
<$20,000	9%	10%	
$20,000-$49,999	28%	29%	
$50,000-$99,999	30%	25%	
>$100,000	22%	17%	
Prefer not to respond	11%	19%	
Ethnicity (n=193; 398)			0.19
Caucasian	82%	86%	
Aboriginal/Indigenous	2%	1%	
African	0.5%	0.5%	
Hispanic/Latino	0.5%	0.8%	
Caribbean	0.5%	0.5%	
East Asian	2%	3%	
South Asian	3%	2%	
Middle Eastern	0.5%	0.8%	
Prefer not to respond	4%	3%	

Qualifying Conditions (n=149; 329)			
Asthma	28%	24%	0.41
Chronic obstructive pulmonary disease	13%	10%	0.32
Ischemic heart disease	11%	9%	0.37
Hypertensive disease	45%	46%	0.85
Heart failure	9%	9%	0.81
Diabetes mellitus	44%	42%	0.63
Chronic kidney disease	7%	7%	0.99
Mental health disorder	15%	23%	0.04

Table 3-2. Health and literacy status of study population.

Survey Question *(number of respondents in CACP group; number of respondents in control group)*	**CACP Group (n=178)**	**Control Group (n=341)**	**p-value**
EQ-5D-5L Index Value* (n=191; 397)	0.75 (0.2)	0.73 (0.2)	0.35
EQ-5D-5L Visual Analogue Scale Score* (n=190; 394)	69 (19)	65 (20)	0.01
Single Item Literacy Screener* (n=192; 396)	1.6 (1.0)	1.7 (1.1)	0.32
PHQ-2 Score** (n=186; 394) Equal to or greater than 3	15% (11% to 21%)	23% (19% to 27%)	0.03
GAD-2 Score** (n=187; 392) Equal to or greater than 3	14% (10% to 20%)	19% (15% to 23%)	0.14

*Values reported as mean (SD)

**Values reported as proportions (95% CI)

Table 3-3. PACIC scores in total study population.

PACIC-11 Survey Questions *(number of respondents in CACP group; respondents in control group)*	**CACP Group (n=221)**	**Control Group (n=463)**	**p-value**
Given choices about treatment to think about (n=175;349)	62 (36)	57 (37)	0.13
Satisfied that your care was well organized (n=187; 377)	76 (30)	73 (33)	0.29
Helped to set specific goals to improve your eating or exercise (n=166; 327)	57 (38)	51 (38)	0.08
Given a copy of your treatment plan (n=142; 278)	58 (45)	46 (45)	0.01
Encouraged to go to a specific group or class to help you cope with your chronic condition (n=116; 246)	40 (38)	34 (39)	0.15
Asked questions, either directly or on a survey, about your health habits (n=145; 300)	60 (40)	53 (40)	0.07
Helped to make a treatment plan that you could carryout in your daily life (n=133; 282)	59 (40)	51 (42)	0.06
Helped to plan ahead so you could take care of your condition even in hard (n=120;274)	54 (40)	45 (41)	0.049
Asked how your chronic condition affects your life (n=130;292)	60 (40)	54 (41)	0.19
Contacted after a visit to see how things were going (n=106;233)	36 (41)	34 (40)	0.68
Told how visits with other types of doctors, like an eye doctor or surgeon, would help your treatment (n=128;268)	51 (41)	50 (42)	0.93
Additional Survey Questions *(number of respondents in CACP group; respondents in control group)*			
Told how visits with other types of health professionals would help your treatment (n=126;268)	50 (41)	52 (41)	0.64
Given enough time to talk about your medical conditions or medications (n=170;360)	76 (32)	73 (35)	0.23
Told your physician would work together with other health professionals to coordinate your care (n=133; 278)	60 (40)	58 (42)	0.66

*Values reported as mean (SD)

Table 3-4. Satisfaction of physician care and care plan awareness of study population.

Survey Question *(number of respondents in CACP group; respondents in control group)*	**CACP Group (n=221)**	**Control Group (n=463)**	**p-value**
Satisfaction with care from physician* (n=193; 397)	5.1 (1.3)	5.0 (1.4)	0.21
Participants reporting they received a care plan** (n=220; 461)	73% (66% to 78%)	64% (32% to 41%)	0.02
Participants reporting they signed a care plan** (n=215; 453)	40% (33% to 46%)	22% (19% to 26%)	<0.001

*Values reported as mean (SD)

**Values reported as proportions (95% CI)

Table 3-5. PACIC scores in sensitivity analysis.

PACIC-11 Survey Questions[**] *(number of respondents in CACP group; respondents in control group)*	**CACP Group (n=160)**	**Control Group (n=166)**	**p-value**
Given choices about treatment to think about (n=134;106)	68 (32)	37 (37)	<0.001
Satisfied that your care was well organized (n=140;125)	81 (25)	60 (36)	<0.001
Helped to set specific goals to improve your eating or exercise (n=128;99)	66 (34)	31 (35)	<0.001
Given a copy of your treatment plan (n=110;82)	65 (42)	23 (38)	<0.001
Encouraged to go to a specific group or class to help you cope with your chronic condition (n=85;77)	48 (39)	21 (34)	<0.001
Asked questions, either directly or on a survey, about your health habits (n=113;88)	68 (36)	33 (37)	<0.001
Helped to make a treatment plan that you could carryout in your daily life (n=106;76)	66 (36)	24 (36)	<0.001
Helped to plan ahead so you could take care of your condition even in hard (n=95;78)	62 (37)	24 (35)	<0.001
Asked how your chronic condition affects your life (n=103;80)	67 (36)	36 (40)	<0.001
Contacted after a visit to see how things were going (n=81;67)	45 (43)	18 (33)	<0.001
Told how visits with other types of doctors, like an eye doctor or surgeon, would help your treatment (n=98;73)	58 (39)	34 (39)	<0.001
Additional Survey Questions *(number of respondents in CACP group; respondents in control group)*			
Told how visits with other types of health professionals would help your treatment (n=96;72)	57 (40)	33 (39)	<0.001
Given enough time to talk about your medical conditions or medications (n=131;113)	82 (28)	64 (38)	<0.001
Told your physician would work together with other health professionals to coordinate your care (n=103;77)	68 (36)	37 (43)	<0.001

[*]Sensitivity Cohort: CACP cohort includes individuals who were billed for a CACP by a physician and answered 'yes' to the question "In the last 3 months, did you spend time with your physician to review your medical conditions in order to create a detailed treatment plan?" Control cohort includes individuals who were not billed for a CACP and answered 'no' to the question "In the last 3 months, did you spend time with your physician to review your medical conditions in order to create a detailed treatment plan?"

[**]Values reported as mean (SD)

APPENDIX 3-1. Patient Questionnaire

You have been invited to participate in a research study on chronic disease care being conducted by investigators from the School of Public Health at the University of Alberta.

Study Title: *Exploring the Impact of Physician Comprehensive Annual Care Plans on Perceived Quality of Care by Patients in Alberta*

For this project, you are asked to complete a survey, providing information about yourself, including how you rate your physical and mental health and your recent experiences with health services in Alberta. This brief survey should take about 10-15 minutes to complete.

Thank you.

Q1 In the last 3 months, did you spend time with your physician to review your medical conditions in order to create a detailed treatment plan?

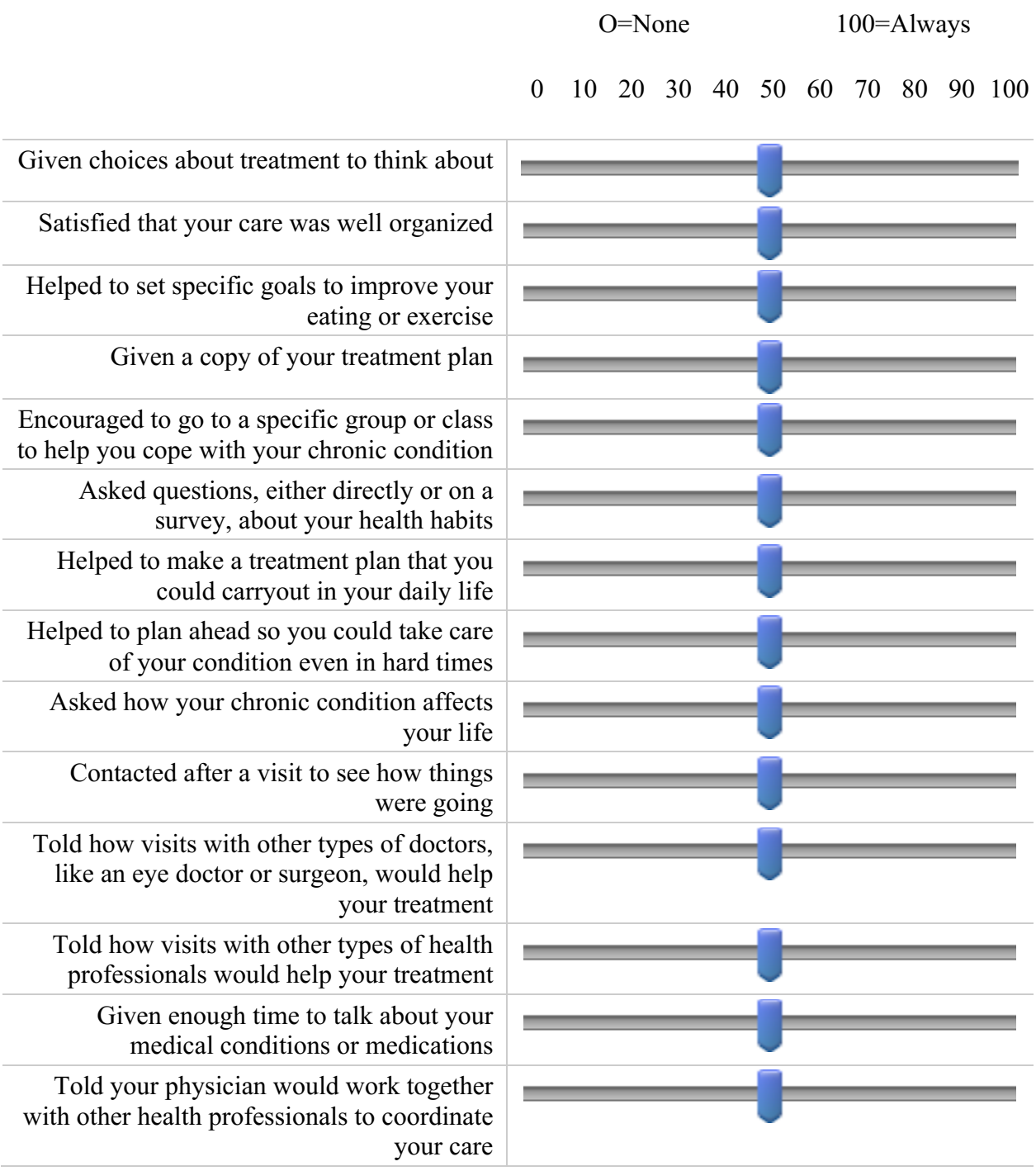
- ○ Yes
- ○ No

Q2 In the last 3 months, do you recall signing a treatment plan at your family physician's office?

- ○ Yes
- ○ No

Q3 **Patient Assessment of Chronic Illness Care (PACIC-11)**

Considering your recent visits to your family physician in the last 3 months to receive care and services for your chronic medical conditions, what percentage of the time were you:



Q4 Please answer the following statement.

	Extremely satisfied	Moderately satisfied	Somewhat satisfied	Somewhat dissatisfied	Moderately dissatisfied	Extremely dissatisfied
Overall, how satisfied are you with the care you receive by your family physician?	○	○	○	○	○	○

The following SIX questions explore your health-related quality of life using a validated tool called the: EQ-5D-5L

Q5 Please click the ONE box that best describes your health TODAY.

MOBILITY

- ○ I have no problems in walking about
- ○ I have slight problems in walking about
- ○ I have moderate problems in walking about
- ○ I have severe problems in walking about
- ○ I am unable to walk about

Q6 Please click the ONE box that best describes your health TODAY.

SELF-CARE

- ○ I have no problems washing or dressing myself
- ○ I have slight problems washing or dressing myself
- ○ I have moderate problems washing or dressing myself
- ○ I have severe problems washing or dressing myself
- ○ I am unable to wash or dress myself

Q7 Please click the ONE box that best describes your health TODAY.

USUAL ACTIVITIES *(e.g. work, study, housework, family or leisure activities*)

- ○ I have no problems doing my usual activities
- ○ I have slight problems doing my usual activities
- ○ I have moderate problems doing my usual activities
- ○ I have severe problems doing my usual activities
- ○ I am unable to do my usual activities

Q8 Please click the ONE box that best describes your health TODAY.

PAIN / DISCOMFORT

- ○ I have no pain or discomfort
- ○ I have slight pain or discomfort
- ○ I have moderate pain or discomfort
- ○ I have severe pain or discomfort
- ○ I have extreme pain or discomfort

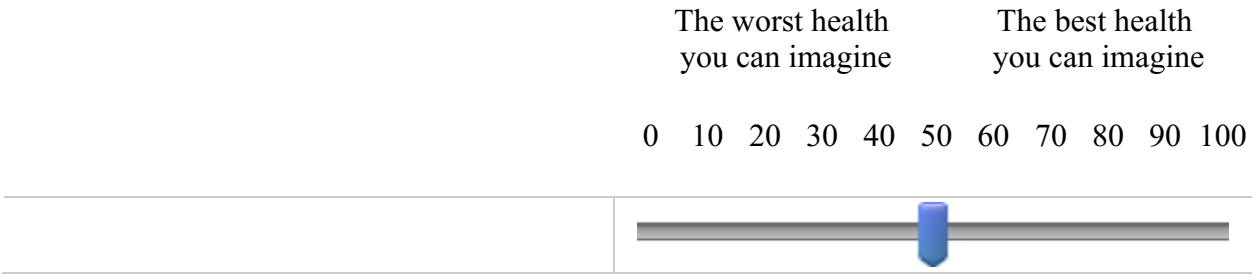
Q9 Please click the ONE box that best describes your health TODAY.

ANXIETY / DEPRESSION

- ○ I am not anxious or depressed
- ○ I am slightly anxious or depressed
- ○ I am moderately anxious or depressed
- ○ I am severely anxious or depressed
- ○ I am extremely anxious or depressed

Q10
We would like to know how good or bad your health is TODAY. The following scale is numbered from 0-100.

100 means the best health you can imagine.
0 means the worst health you can imagine.
Please click on the scale to indicate how your health is TODAY.



Q11 (PHQ-2) Over the past 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
Little interest or pleasure in doing things	○	○	○	○
Feeling down, depressed or hopeless	○	○	○	○

Q12 (GAD-2) Over the last 2 weeks, how often have you been bothered by any of the following problems:

	Not at all	Several days	More than half of the days	Nearly every day
Feeling nervous, anxious, or on edge	○	○	○	○
Not being able to stop or control worrying	○	○	○	○

Q13 (Single Item Literacy Screener) How often do you have someone like a family member, friend, hospital or clinic worker or caregiver help you read health plan materials (such as written information about your health or care you are offered)?

- ○ All of the time
- ○ Most of the time
- ○ Some of the time
- ○ Little of the time
- ○ None of the time

Q14 Please select your sex

- ○ Male
- ○ Female

Q15 Please select your YEAR of birth.

Q16 What is your current marital status?

- ○ Single – never married
- ○ Married/common law
- ○ Separated/Divorce
- ○ Widowed
- ○ Prefer not to respond

Q17 What is the highest level of education you have completed?

- ○ Less than high school
- ○ Completed high school (or equivalent)
- ○ Completed college or technical school (diploma)
- ○ Completed post-secondary training (bachelor's degree)
- ○ Post-graduate degree (Master's, PhD, MD)
- ○ Prefer not to respond

Q18 What is your current employment status?

- ○ Employed
- ○ Unemployed
- ○ Retired
- ○ Prefer not to respond

Q19 Which of the following categories best describes your total annual household income?

- ○ Less than $20,000
- ○ $20,000 to $49,999
- ○ $50,000 to $99,999
- ○ More than $100,000
- ○ Prefer not to respond

Q20 Which of the following best describes your ethnicity?

- ○ Caucasian
- ○ Aboriginal/Indigenous
- ○ African
- ○ Hispanic/Latino
- ○ Caribbean
- ○ East Asian
- ○ South Asian
- ○ Middle Eastern
- ○ Prefer not to respond

Q21 Do you have any of the following medical conditions that have been diagnosed by a health professional? (Check all that apply)

- [ ] Asthma
- [ ] Chronic Obstructive Pulmonary Disorder
- [ ] Ischemic Heart Disease
- [ ] Hypertensive Disease
- [ ] Heart Failure
- [ ] Diabetes Mellitus
- [ ] Mental Health Disorder
- [ ] Chronic Kidney Disease

Thank you for taking the time to complete this survey.

APPENDIX 3-2. Adjusted PACIC Scores Based on PHQ-2

Table 3-2-1. Adjusted PACIC scores based on depression (PHQ-2) scores.

PACIC-11 Survey Questions *(number of respondents in CACP group; respondents in control group)*	**CACP Cohort**		**Control Cohort**		**Adjusted p-value**
	PHQ-2 score<3 (n=158)	*PHQ-2 score ≥3 (n=28)*	*PHQ-2 score<3 (n=305)*	*PHQ-2 score ≥3 (n=89)*	
Given choices about treatment to think about	61 (36)	61 (37)	59 (37)	50 (36)	<0.01
Satisfied that your care was well organized	76 (29)	66 (34)	76 (31)	60 (36)	<0.001
Helped to set specific goals to improve your eating or exercise	57 (38)	51 (39)	53 (38)	43 (36)	0.04
Given a copy of your treatment plan	57 (45)	55 (44)	48 (45)	35 (41)	0.09
Encouraged to go to a specific group or class to help you cope with your chronic condition	37 (39)	43 (36)	34 (39)	32 (37)	0.57
Asked questions, either directly or on a survey, about your health habits	60 (40)	57 (40)	64 (40)	47 (41)	0.01
Helped to make a treatment plan that you could carryout in your daily life	61 (40)	42 (40)	53 (42)	41 (39)	<0.01
Helped to plan ahead so you could take care of your condition even in hard	55 (42)	43 (31)	47 (41)	37 (39)	0.03
Asked how your chronic condition affects your life	58 (40)	62 (42)	57 (41)	44 (40)	0.10
Contacted after a visit to see how things were going	34 (41)	32 (45)	37 (41)	22 (35)	0.12
Told how visits with other types of doctors, like an eye doctor or surgeon, would help your treatment	49 (41)	48 (44)	52 (42)	47 (41)	0.76
Additional Survey Questions *(number of respondents in CACP group; respondents in control group)*					
Told how visits with other types of health professionals would help your treatment	48 (41)	46 (45)	53 (42)	46 (40)	0.36
Given enough time to talk about your medical conditions or medications	78 (30)	68 (40)	76 (33)	60 (40)	<0.001
Told your physician would work together with other health professionals to coordinate your care	61 (39)	51 (44)	60 (42)	53 (41)	0.34

*Values reported as mean (SD)

APPENDIX 3-3. Sensitivity Analysis

Table 3-3-1. Demographics of sensitivity analysis subgroup.

Characteristic *(number of respondents in CACP group; number of respondents in control group)*	**CACP Group (n=160)**	**Control Group (n=166)**	**p-value**
Age (n=120;111)*	66 (11)	65 (12)	0.44
Sex (n=140;137)			
Female	43%	45%	0.69
Male	57%	55%	
Marital Status (n=140; 137)			0.49
Single/never married	4%	10%	
Married/common law	71%	72%	
Separated/Divorced	17%	7%	
Widowed	8%	8%	
Prefer not to respond	0.7%	4%	
Education Level (n=140;138)			0.52
Less than high school	8%	9%	
High school	25%	17%	
College/technical school	35%	41%	
Post-secondary	21%	17%	
Post-graduate	6%	11%	
Prefer not to respond	3%	4%	
Annual Income (n=140; 137)			0.39
<$20,000	9%	9%	
$20,000-$49,999	30%	27%	
$50,000-$99,999	29%	38%	
>$100,000	20%	18%	
Prefer not to respond	11%	18%	
Ethnicity (n=140; 137)			0.60
Caucasian	81%	84%	
Aboriginal/Indigenous	1%	0%	
African	0.7%	0.7%	
Hispanic/Latino	0.7%	0.7%	
Caribbean	0%	0.7%	
East Asian	2%	3%	
South Asian	4%	0.7%	
Middle Eastern	0%	0.7%	
Prefer not to respond	7%	6%	

Qualifying Conditions (n=108;111)			
Asthma	27%	23%	0.56
Chronic obstructive pulmonary disease	14%	12%	0.64
Ischemic heart disease	11%	13%	0.73
Hypertensive disease	45%	47%	0.83
Heart failure	8%	5%	0.25
Diabetes mellitus	47%	41%	0.32
Mental health disorder	14%	21%	0.18
Chronic Kidney Disease	6%	6%	0.96

*Values reported as mean (SD)

Table 3-3-2. Health and literacy status of sensitivity analysis subgroup.

Survey Question *(number of respondents in CACP group; number of respondents in control group)*	**CACP Group (n=160)**	**Control Group (n=166)**	**p-value**
EQ-5D-5L Index Value* (n=138;138)	0.76 (0.20)	0.74 (0.20)	0.43
EQ-5D-5L Visual Analogue Scale Score* (n=135; 137)	70 (18)	65 (20)	0.04
Single Item Literacy Screener* (n=137;139)	1.6 (1.1)	1.5 (1.1)	0.55
PHQ-2 Score** (n=134;137) Equal to or greater than 3	14% (9% to 21%)	21% (15% to 29%)	0.13
GAD-2 Score** (n=135;136) Equal to or greater than 3	13% (9% to 20%)	19% (13% to 27%)	0.20

*Values reported as mean (SD)

**Values reported as proportions (95% CI)

Table 3-3-3. Satisfaction of physician care and care plan awareness of sensitivity analysis subgroup.

Survey Question *(number of respondents in CACP group; respondents in control group)*	**CACP Group (n=178)**	**Control Group (n=341)**	**p-value**
Satisfaction with care from pharmacist* (n=139;138)	5.1 (1.3)	4.8 (1.4)	0.10
Participants reporting they received a care plan**(n=160;166)	100%	0	
Participants reporting they signed a care plan** (n=157;161)	52% (44% to 59%)	4% (2% to 8%)	<0.001

*Values reported as mean (SD)

**Values reported as proportions (95% CI)

CHAPTER 4. Evaluation of Comprehensive Annual Care Plans by Pharmacists in Alberta

4.1. INTRODUCTION

Chronic diseases are large drivers of both morbidity and mortality worldwide; it is estimated that chronic diseases will be the leading cause of 73% of deaths and 60% of the burden of disease globally by 2020.[1] Indeed, chronic diseases are the most common reason for hospitalizations, emergency department (ED) visits, as well as family physician visits worldwide.[2, 3] Within Canada, The Chronic Disease Prevention Alliance reports that chronic diseases account for 2/3 of all deaths, and an even greater proportion of total disability.[3, 4] Effective strategies to manage chronic diseases is therefore critical to the overall health of Canadians and the long-term sustainability of our publicly funded healthcare system.

To deal with this increasing burden on the healthcare system, various forms of chronic disease management (CDM) strategies have been trialed and implemented around the world.[5-7] Many of these strategies have involved payment schemes for health professionals to incentivize care planning—a crucial component of CDM that links the services available to patients living with chronic diseases to the self-management role they must also take on to best manage their condition. Since 2012, pharmacists in Alberta can submit claims for remuneration to Alberta Heath, Alberta's provincial funder for universal healthcare, for the implementation of a comprehensive annual care plan (CACP) for patients with complex medical conditions.[8] Development of a CACP was a component of a new compensation model for pharmacy services implemented in 2012, which was intended to support the continued development of CDM, with the expectation of improving patient care, health outcomes, access to and sustainability of the health care system.[9] A similar model was introduced in 2009 for physicians in Alberta.[8]

A CACP is a written document that is prepared in collaboration with the patient and outlines important information such as a patient's medical history, current therapies, health challenges, and other health care professionals involved in the patient's care; clearly defined goals for short term and long term management of the patient's chronic disease(s) are set while outlining the role of different health care professionals and the patient in achieving these goals. Of note, a pharmacist CACP should include all of the above information, similar to a physician

CACP, but with a particular focus on medication therapies.[8] Once completed, both the pharmacist and the patient are required to sign the document and both parties receive a copy of the treatment plan. [8] The care plan is then kept on the patient's file and, ideally, used periodically throughout the year to review progress with the patient, review disease targets and adjust the plan if needed.[8] It is also recommended that the pharmacist inquire from the patient whether they have also received a physician CACP and try and obtain a copy of it; ideally, the physician and pharmacist work together to create one cohesive care plan.[8] However, there are few requirements set out to ensure that transparency and document sharing occurs (i.e., it is not required that CACPs are posted on the patient's provincial electronic health record). A patient is eligible for a CACP if they have two or more of the following chronic diseases: asthma, diabetes, chronic obstructive pulmonary disease (COPD), heart disease, heart failure, hypertension or a mental health disorder[8]; each of these conditions is also classified as an ambulatory care sensitive condition (ACSC) which are defined as conditions in which related hospitalizations can often be prevented by interventions in primary care settings.[10] Other jurisdictions in Canada are exploring various CDM initiatives to tackle growing costs associated with chronic diseases; to date, only Nova Scotia, British Columbia, and Alberta have implemented a remuneration model for programs involving care plans for complex patients; both models are aimed at physicians, however, and not pharmacists.[6,10,11] In British Columbia, initial research on this remuneration model for physicians found an overall reduction in hospital admissions and durations of stay.[12] However, Lavergne et al. completed a more rigorous analysis in 2016 and found no significant impact on ED visits or hospitalizations in those with qualifying chronic diseases.[6] Alberta is the only jurisdiction currently with such an incentive model for pharmacists.[13]

Objectives

Although the pharmacist CACP remuneration model has been operationalized for several years in Alberta, little evaluation of the program has been undertaken. Moreover, whether the CACPs have improved patterns of health care and outcomes for patients remains unknown. This lack of evidence of effectiveness was highlighted by the Alberta's Auditor General (AG) 2014 report on CDM who recommended an ongoing plan to evaluate the effectiveness of pharmacist-billed care plans.[8] Thus, the objectives of this study are: 1) to characterize (in terms of age, sex, and qualifying comorbidities) the population of patients who received a pharmacist-billed CACP in Alberta; 2) to evaluate any changes in health care utilization for such patients. We hypothesize

that compared to controls, patients who receive a pharmacist-billed CACP will have reduced utilization of major health services (such as hospitalizations, ED visits and physician visits).

4.2 METHODS

This study was approved by the Human Research and Ethics Board at the University of Alberta (Pro00083926).

Setting

We evaluated Alberta's CACP initiative, which remunerates pharmacists for the provision of a CACP to patients with complex conditions.[8] We used five de-identified administrative databases from Alberta Health from 2007-2016, linked by personal health number (PHN) including: 1) The Provincial Registry for basic demographic information (age, sex) 2) Discharge Abstract Database which includes data on all hospital services, length of stay, diagnosis (up to 24 ICD-9 or -10 based diagnoses), and procedure interventions while in hospital; 3) The Ambulatory Care Classification System which provides similar data as the Discharge Abstract Database but pertaining to ED visits; 4) Alberta Physician Claims Data which includes physician claims, ICD codes associated with claims, procedures and the specialty of the physician; and 5) Alberta Blue Cross which captures all CACP claims by pharmacists.

Patients

Exposed Population

We identified all patients who had a pharmacist-billed CACP in Alberta, based on the billing codes (00071114/00081114)[13] between 2012 to 2015. As pharmacists do not provide diagnostic codes for billing purposes, the potential qualifying conditions for which the CACP was billed for was based on prior ICD codes within the administrative data, either for one hospitalization or 2 physician visits related to that condition; a 5-year history of ICD codes was used within the administrative data to identify all potential qualifying diagnoses (from 2007 onwards). The first occurrence of a CACP served as the index date for the exposed population.

Unexposed Population

Up to two controls were matched using risk-set sampling to each exposed patient based on age (within 5 years), sex, pharmacy, and date of service (within same year). In addition, each control was matched on the same CACP qualifying conditions based on the same 5-year history within the administrative data. In essence, we selected up to two controls of similar age and sex, who visited the same pharmacy, within the same year, who had the same qualifying CACP conditions as the exposed individual, but never received a pharmacist-billed CACP. The index date of a CACP in the matched exposed individual served as the pseudo-index date for the control. All matching was completed by Alberta Health.

Study Design

A controlled interrupted time series (CITS) design was selected for its effectiveness in the comparison of population-level health trends in an outcome before and after an intervention, and provides clear differentiation in these trends in the pre- and post-intervention periods.[14] CITS limits both known and unknown time-invariant between-group differences; addition of a control group further controls for time-varying confounders such as other events occurring concurrently with the intervention.[15] This study design is similar to that reported by Lavergne et al.[6]

Outcomes

We considered the following outcomes to assess the overall impact of a CACP on healthcare resources utilization between 2012-2015: all-cause physician visits, all-cause hospitalization, and all-cause emergency department (ED) visits. In addition, since pharmacy CACP qualifying conditions are all considered ACSC conditions, we further evaluated ACSC-related hospitalizations and ED visits. The Alberta Health Services ACSC indicator definition was used to identify ACSC-related visits as the ACSC conditions included most closely relate to the qualifying medical conditions for a CACP and thus, are most relevant to our patient population.[16] This ACSC indicator definition has also been used extensively by Canadian Institute for Health Information and others.[17-19] (Appendix 2-1, Table 2-1-1)

Statistical Analysis

Characteristics of the study population, including age, sex and CACP qualifying conditions were determined at the time of the index CACP, or pseudo-index CACP for the control group. Age was calculated as a mean and standard deviation (SD), while sex and

qualifying conditions were calculated as proportions; t-tests and chi-square tests were conducted to explore the association between the above variables, respectively. The Elixhauser Comorbidity Index was used to estimate overall comorbidity burden in all individuals within the exposed and unexposed groups, as it has been shown to be effective in predicting future health care costs, health care utilization, morbidity and is widely used due to its known validity for measuring disease burden.[20] The Elixhauser score was calculated as a mean and SD and a t-test was used for the test of association.

To assess the effect of a CACP on healthcare utilization, CITS analyses were used to assess for changes in health resource utilization. Individual level utilization data was aggregated into monthly intervals, 12 intervals before the CACP index date, or pseudo-index date in the control group, and 12 intervals after. We performed the ITS analyses separately for the patients exposed to the CACP and the matched controls not exposed to a CACP for each outcome using generalized least squares models; pre- and post-CACP indicator variables were used to assess level (immediate) changes and monthly intervals were used to assess slope (trend) changes.[22] Autoregressive terms were used in the models to control for correlation over time. Next, the difference in outcome between exposed and unexposed patients was computed and modeled to assess for differences in both immediate and gradual changes after the implementation of the CACP, while also controlling for trends that may have been occurring over time in each group.[22] By modeling the outcomes this way, a clear interpretation of effects can be observed: the joint trend of CACP exposure relative to controls which accounts for the trends in the CACP and control groups individually; rather than just relative effects between each group and their counterfactual post-intervention trend (predicted based on their pre-intervention trend projected forwards) where the true drivers of any differences may be difficult to interpret. A separate CITS model was used for each outcome of interest (all-cause and ACSC-specific ED visits and hospitalizations, and all-cause physician visits). Next, the absolute effect of the CACP program on each outcome was calculated and multivariate delta method was used to construct 95% confidence intervals around the estimate.[23] All analyses were completed using SAS (Cary, NC: SAS Institute. Inc. SAS® 9.4).

4.3. RESULTS

Descriptive Analyses

Between July 1, 2012 to March 31, 2015, 188,640 pharmacy CACPs were billed. Of these, we identified 137,178 eligible patients and 241,658 matched controls based on age, sex, qualifying conditions, and date of service. Those who received a pharmacist-billed CACP were slightly younger and had a lower comorbidity burden than the control group based on the Elixhauser Comorbidity Index and the prevalence of qualifying chronic diseases at baseline. (Table 2-1)

Hypertensive disease was the most common qualifying condition for a pharmacist-billed CACP (83% of patients), followed by mental health disorder (72%) and diabetes (50%). Since patients qualify for a CACP based on two eligible medical conditions, we explored combinations of diagnoses which likely qualified patients to receive a pharmacist-billed CACP. The most prevalent combination was hypertensive disease and mental health disorder (57%), followed by hypertensive disease and diabetes (42%) and diabetes and mental health disorders (31%).

Interrupted Time-Series Analyses

Physician Visits

After controlling for pre-intervention trends prior to CACP implementation, the mean difference in physician visits in the month immediately following the CACP decreased by 407.7 visits per 10, 000 patients (level change, $p=0.04$) in CACP patients compared to controls; a decrease in the month-to-month trend in the mean difference of physician visits post-CACP by 66.5 visits per 10,000 patients per month was also seen (slope change, $p<0.01$). (Table 2-2, Figure 2-1) The absolute effect of the CACP program indicates that the overall difference in mean physician visits in those who received a pharmacist-billed CACP decreased by 1,206 per 10,000 patients compared to controls after CACP was implemented, compared to what it would have been without CACP ($p<0.05$). (Table 2-2, Figure 2-4)

All-Cause Hospitalizations

Immediately following CACP implementation, a reduction in the mean difference of all-cause hospitalizations was observed in the CACP patients compared to the controls (-99.5 visits per 10,000 patients per month; $p<0.001$) (level change) in as well as in the month-to-month trend of the mean differences post-CACP (slope change; $p<0.001$). (Table 2-2, Figure 2-3 (A)) The absolute effect of the CACP program indicates that the overall difference in mean hospitalizations in the CACP group compared to controls decreased by 180.5 hospitalizations per 10,000 patients after CACP was implemented, compared to what it would have been without CACP ($p<0.05$). (Table 2-2, Figure 2-4)

ACSC-related Hospitalizations

In the month following CACP introduction, an immediate decrease in the mean difference in ACSC hospitalizations was observed in CACP patients versus controls (-3.8 hospitalizations per 10,000 patients per month; $p<0.01$) (level change) while a small increase in the month-to-month trend in mean differences in ACSC hospitalizations was noted over the 12 months following CACP (slope change; $p<0.001$). (Table 2-2, Figure 2-3 (B)) When considering the absolute CACP effect, the overall difference in mean ACSC hospitalizations in CACP patients compared to controls increased by 8.0 hospitalizations per 10,000 patients after CACP was implemented, compared to what it would have been without a CACP ($p<0.05$). (Table 2-2, Figure 2-4)

All-Cause Emergency Department Visits

The difference in mean number of all-cause ED visits increased by 116.2 visits per 10,000 patients per month ($p=0.51$) in CACP patients compared to controls in the month immediately following CACP introduction (level change), while an overall decrease in the month-to-month trend in the mean differences was observed over the following 12 months (slope change; $p=0.80$). (Table 2-2, Figure 2-4 (A)) The absolute effect of the CACP program demonstrates that the overall difference in mean ED visits increased by 40.1 visits per 10,000 patients, when comparing CACP patients to controls after CACP was implemented, compared to what it would have been without CACP ($p>0.05$). (Table 2-2, Figure 2-4)

ACSC-related Emergency Department Visits

Immediately following CACP introduction, the mean difference in ACSC-related ED visits decreased by 48 visits per 10,000 patients (level change, p=0.16) in CACP patients compared to controls; the trend in the mean differences in ACSC-related ED visits also decreased following a CACP (slope change; p=0.14). (Table 2-2, Figure 2-4 (B)) Overall, the absolute effect of the CACP program indicates that the total difference in mean ACSC-related ED visits between CACP group and controls decreased by 144.2 visits per 10,000 patients after CACP was implemented, compared to what it would have been without CACP ($p<0.05$). (Table 2-2, Figure 2-4)

4.4. DISCUSSION

This is the first population-level study that has been undertaken to evaluate the impact of a chronic disease incentive program for pharmacists in Canada. The overall uptake of this program has been extensive since its introduction in 2012. Overall, we observed decreases in health care utilization, including ACSC-related ED visits, all-cause hospitalizations and physician visits in those who were provided a CACP by a pharmacist. Conversely, increases in all-cause ED visits and ACSC-related hospitalizations were noted. Taken together, we demonstrated that the uptake of a single yearly assessment for complex patients by pharmacists was rapid but had varying impact on healthcare utilization. Given the nature of chronic diseases, longer term and more structured interventions need to be incentivized in order to generate health system impacts.

Comparison to Previous Literature

Given that such a remuneration model for chronic disease care by pharmacists is novel to Alberta, there is no research to directly compare our outcomes with. Other CDM initiatives by pharmacists have demonstrated positive impact across chronic diseases such as hypertension, hyperlipidemia, and heart failure.[24-27] These studies, however, have largely been disease-specific and limited to controlled research settings. It is important to note that pharmacists and patients who agree to participate in clinical trials are likely fundamentally different (i.e., higher levels of motivation, less comorbidity) than those studied in large scale population-level programs such as the CACP initiative.

Research on similar remuneration models for primary care physicians has been undertaken. A study analyzing a care planning payment initiative for physicians in British Columbia found a slight reduction in total healthcare costs for patients with chronic heart failure, chronic obstructive pulmonary disease and hypertension, but not for those with diabetes.[12] It did find, however, an overall reduction in hospital admissions and durations of stay for all conditions.[12] Lavergne et al. further demonstrated insignificant changes in healthcare utilization outcomes using an interrupted time-series study design.[6] The outcomes of this research are in line with other studies demonstrating an overall limited impact of incentive programs for physicians.[5, 28, 29] ITS analyses in the UK demonstrated that quality of healthcare did not significantly increase for those with various chronic diseases compared to the rate it was improving prior to the implementation of their physician pay-for-performance (PFP) program.[30] Indeed, patients in the UK actually perceived a reduction in the continuity of their care after the implementation of this program.[7]

Interestingly, at the time of the program launch, the pharmacy CACP program was touted as a CDM program expected to reduce hospitalizations, ED visits and physician visits.[9] The data presented in our research demonstrated some reductions in total healthcare utilization in those patients who received a pharmacist-billed CACP; from a policy level, however, these results may be more important. CDM programs should encompass not just a single yearly assessment as is required for CACP reimbursement, but also require a program of close follow-up. Further structure may be of benefit to the program, such as the use of quality indicators (i.e., achieving target blood pressure in those with hypertension or the use of angiotensin converting enzyme medications in those with diabetes) to better monitor the effectiveness of CACPs. As such, one could interpret the CACP program as just a starting point of a comprehensive CDM program. Collectively, the evidence to date would suggest that the clinical gains at the populations level of incentive programs aimed at CDM across a wide range of patients and clinicians remains varied.

Strengths and Limitations

Our study captured all individuals who received a pharmacist-billed CACP in Alberta from 2012-2015, which increases the opportunity to determine clinically important signals in outcomes. Our robust matching process limited potential confounders such as the medical conditions qualifying a patient for a CACP and differing clinical practices within individual

pharmacies. Moreover, the robust CITS design used controlled for both within-group and between-group differences and secular trends that may otherwise bias the results of the study.[15] However, our study is not without limitations.

First is the relatively short duration of the follow-up period, given, in part, to the relatively short-term history of these programs. Further research in this area should study longer follow-up periods as data become available and evaluate processes of care, such as ordering of laboratory tests and use of guideline-recommended medications, which would be more likely to change in the shorter term. Second, since pharmacists were not required to enter ICD codes for the qualifying CACP conditions, we had to rely on a 5-year history in the administrative database to determine qualifying conditions for our analysis and matching process. The controls, however, were matched using the same rigorous process so the results are unlikely to be differentially biased. Lastly, given the large population size of our study, many of the outcomes were found to be statistically significant regardless of clinical significance or relevance.

It is important to note that the overall disease burden in the control group was slightly higher than the CACP population at the time of CACP implementation based on the Elixhauser Comorbidity Index (0.22 vs. 0.11, respectively). It could be hypothesized that those with poorer or more complex health condition might be less likely to be offered a CACP by pharmacists due to the additional time and effort it may take to complete the CACP; likewise, a pharmacy may be less accessible to those with poorer health thereby reducing the opportunity for a CACP. However, the comorbidity burden was relatively low overall in both groups and unlikely to contribute to significant differences in outcomes. While the CITS analysis adjusts for pre-intervention health utilization trends in both groups, the clinical judgement utilized by the pharmacist to determine who is offered a CACP and the reasons for patient acceptance or refusal of a CACP cannot be adjusted for in this analysis and may present a limitation in the interpretation of the data. It is also important to consider that pharmacist recommendations via a CACP may not be implemented by physicians, or the patients, which may further impact the extent to which healthcare utilization outcomes change. Another limitation is that the CACP is only a single point of care. We did not evaluate follow-ups arising out of the CACP (an important component of CDM). Indeed, it may be naïve to assume that a single yearly visit would have a major impact on patient outcomes. Lastly, our analysis did not assess the cost

effectiveness of the CACP initiative, the impact of CACPs at the patient level, nor the quality of the developed care plans by specific pharmacists or pharmacies; future research may benefit from such a focus.

Conclusion

The initial uptake of the pharmacist CACP initiative in Alberta has been substantial, but the impact on healthcare utilization by individuals and the impact on the health system from a policy perspective is uncertain. As other jurisdictions across Canada and the world aim to implement strategies to reduce the burden of chronic diseases on their healthcare system, our results are an important addition to the literature which mostly focuses on physician care plans and have shown limited impact overall. Pharmacists' role in managing chronic diseases is growing worldwide; further exploration on how to better design pharmacist CACPs, including required close follow-up and quality indicators, is needed if healthcare utilization gains are to be realized.

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Table 4-1. Baseline Demographics, Qualifying Conditions and Comorbidity Burden of Study Population.

Characteristic*	**Matched Controls (n=241, 658)**	**CACP Cohort (n=137, 178)**	**P-value**
Sex			
Female	124 124 (51%)	70 111 (51%)	0.31
Male	117 534 (49%)	67 067 (49%)	
Age, yr (mean, SD)	65 (15)	63 (15)	<0.001
Qualifying Conditions			
Asthma	83 913 (35%)	32 661 (24%)	<0.001
Chronic Obstructive Pulmonary Disease	74 377 (31%)	25 262 (18%)	<0.001
Chronic Heart Failure	66 382 (27%)	18 521 (14%)	<0.001
Diabetes Mellitus	142 374 (59%)	68 825 (50%)	<0.001
Hypertension	213 767 (88%)	113 871 (83%)	<0.001
Ischemic Heart Disease	120 392 (50%)	47 743 (35%)	<0.001
Mental Health Disorder	204 430 (85%)	98 609 (72%)	<0.001
Elixhauser Comorbidity Index (mean, SD)	0.22 (0.47)	0.11 (0.34)	<0.001

*All values reported as n (%) unless otherwise specified. Baseline characteristics were calculated at time of index CACP.

Table 4-2. Interrupted time series regression estimates and associated 95% confidence intervals for mean differences per 10,000 patients in healthcare utilization outcomes in patients who received a CACP compared to controls.

Variable	Physician visits [a]	Hospitalizations [a]		Emergency Department Visits [a]	
		Total	*ACSC*	*Total*	*ACSC*
Intercept 12 months before index CACP [b]	-561.8 (-765.9 to 41.9	-205.5 (-225.9 to -185.0)	-36.7 (-39.6 to -33.9)	-2125(-2241.3 to -2008.7)	-195.5 (-222.5 to -168.5)
Pre-incentive trend [c]	97.7 (63.3 to 132.0)	9.7 (7.8 to 11.5)	-0.03 (-0.5 to 0.4)	25.6 (6.1 to 45.1)	9.8 (6.2 to 13.4)
Level change after CACP implementation [d]	-407.7 (-804.4 to -10.9)	-99.5 (-118.9 to -80.1)	-3.8 (-6.3 to -1.2)	116.2 (-233.3 to 465.7)	-48.2 (-114.7 to 18.3)
Trend change after CACP implementation [e]	-66.5 (-109.4 to -23.6)	-6.7 (-9.0 to -4.5)	0.98 (0.5 to 1.4)	-6.3 (-54.6 to 41.9)	-8.0 (-18.5 to 2.5)
Overall CACP effect [f]	-1206 (-1859.2 to -552.8)	-180.5 (-205.1 to -155.8)	8.0 (0.3 to 15.7)	40.1 (-379.0 to 459.2)	-144.2 (-238.0 to -50.4)

[a] All reported values indicate the average difference in the mean number of events in those who received a CACP compared to those who did not (CACP vs. control)

[b] Model intercept 12 months before CACP introduction

[c] Rate of change in the outcome over time prior to CACP introduction

[d] Immediate change in outcome following CACP introduction

[e] Month-to-month change in rate or slope after CACP introduction, relative to the pre-incentive difference in trend

[f] The overall CACP effect is the difference in the total number of events over the 12 month post-CACP period, compared to the counterfactual difference in trends had the CACP not occurred (i.e., pre-incentive difference in trends projected forward).

Figure 4-1. Difference in mean monthly physician visits per 10,000 patients in CACP patients compared to controls.

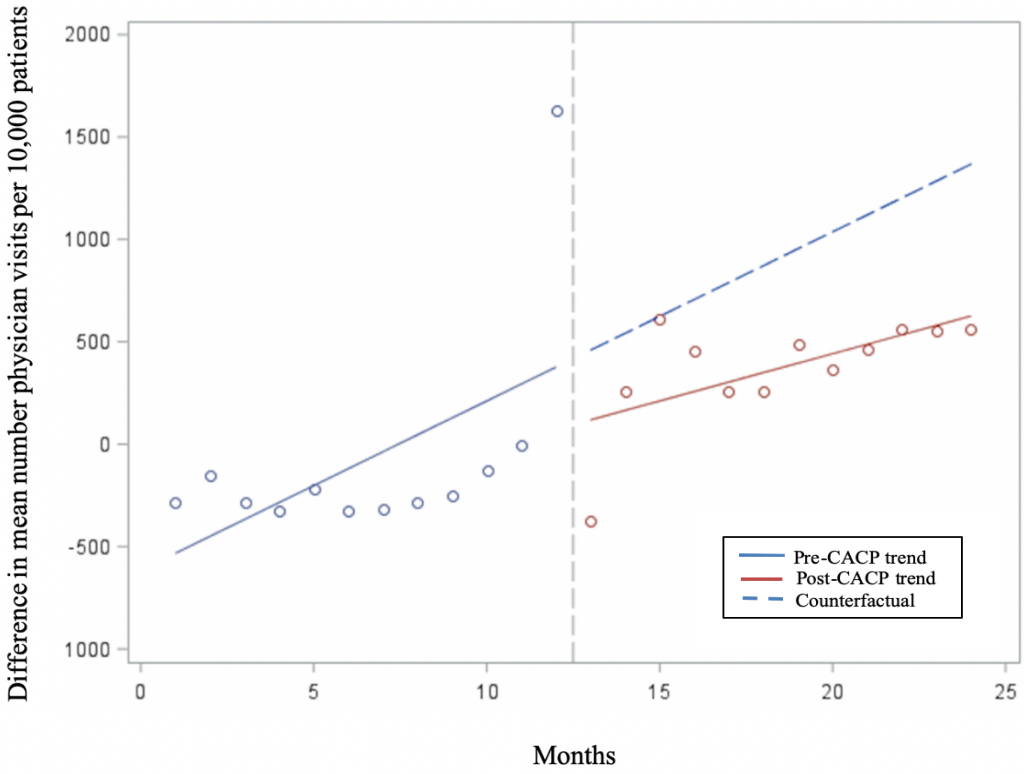


Figure 4-2. Difference in mean monthly all-cause (A) and ACSC (B) hospitalizations per 10,000 patients in CACP patients compared to controls.

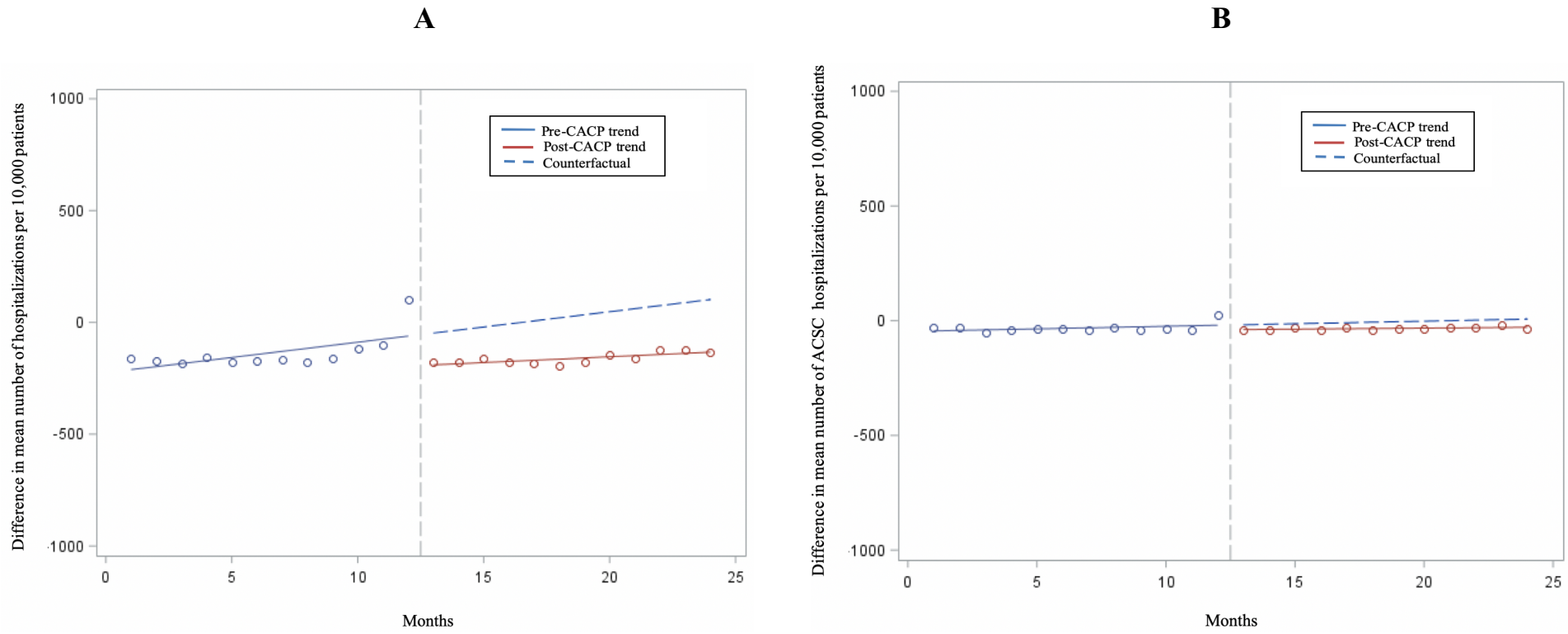


Figure 4-3. Difference in mean monthly all-cause (A) and ACSC (B) emergency department visits per 10,000 patients in CACP patients compared to controls.

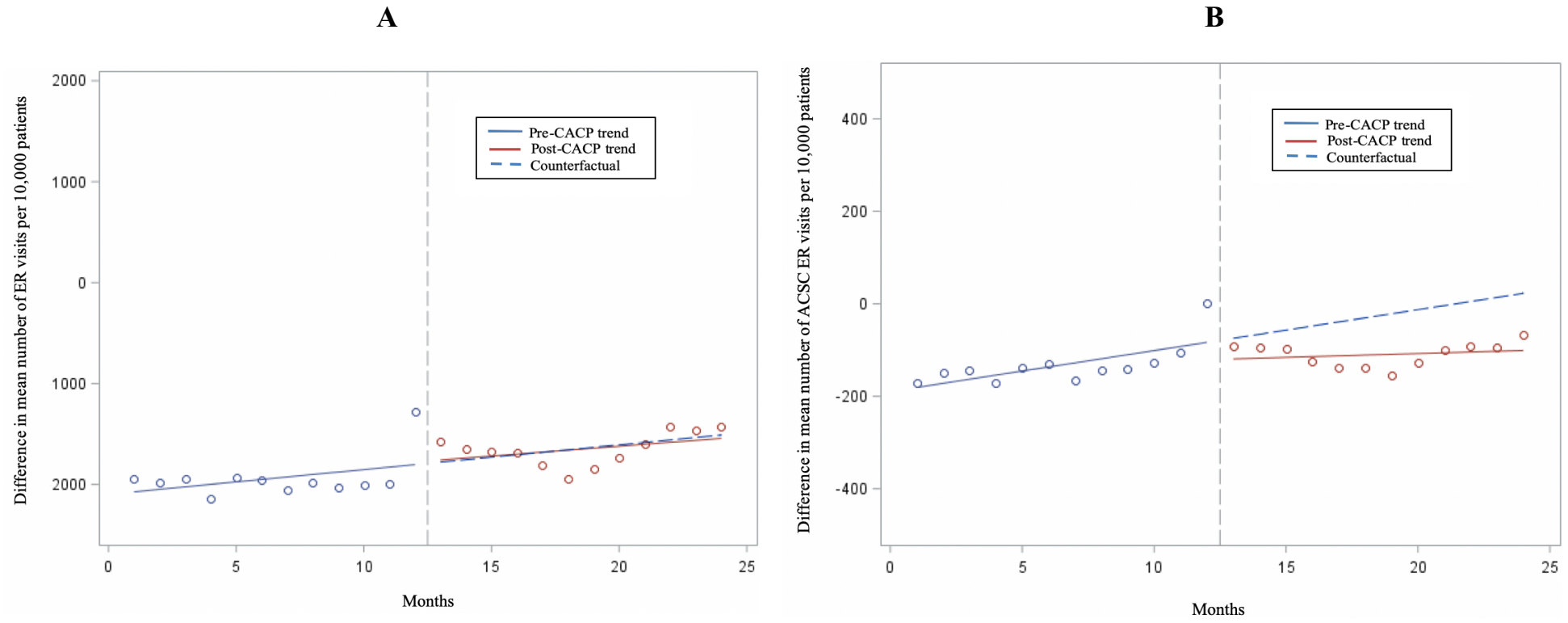
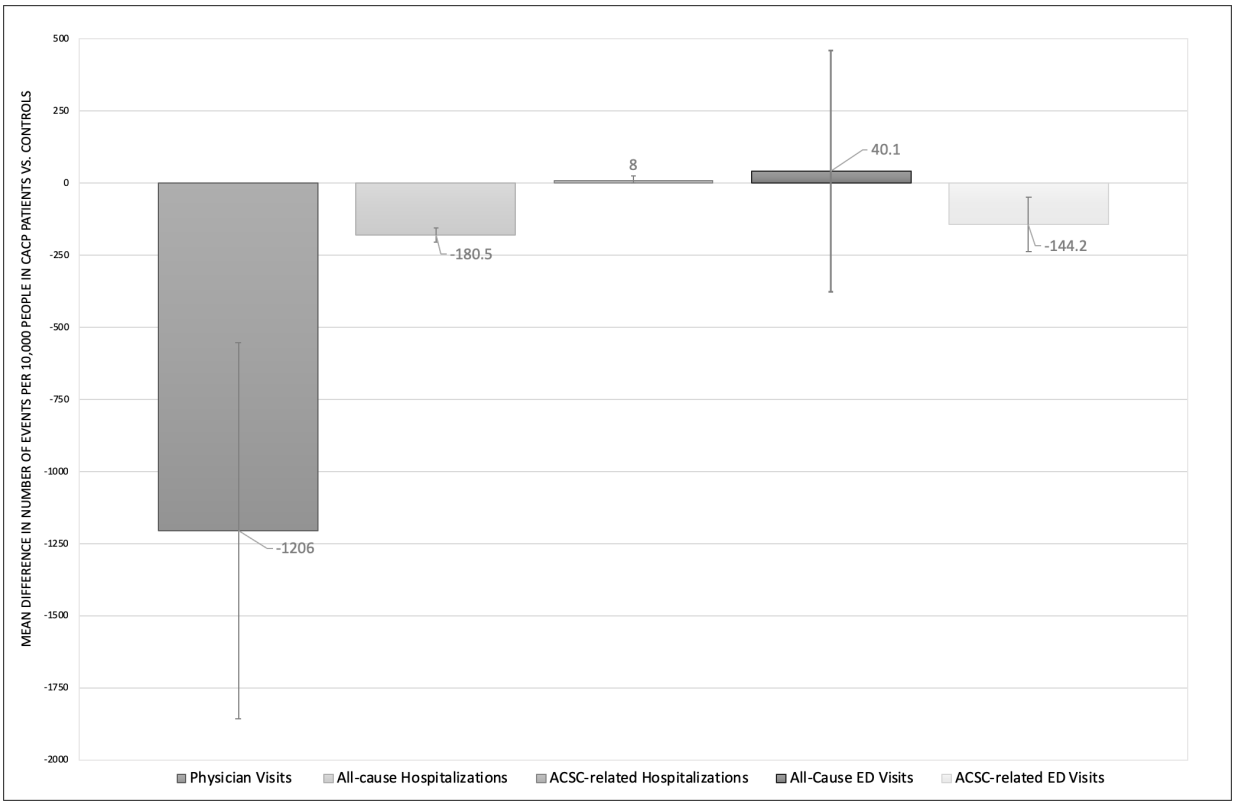


Figure 4-4. Absolute effect of CACP program on physician visits, all-cause and ACSC-related hospitalizations, and all-cause and ACSC-related emergency department visits per 10,000 people in patients who received a pharmacist-billed CACP compared to controls.



APPENDIX 4-1. Ambulatory Care Sensitive Condition Indicator Definition

Table 4-1-1. Ambulatory Care Sensitive Condition Indicator Definition[1-3]

ACSC Condition	ICD-10-CA Codes (most responsible diagnosis code of:)
Grand mal status and other epileptic convulsions	G40, G41
Chronic obstructive pulmonary diseases	J41, J42, J43, J44, J47 MRDx of Acute lower respiratory infection (J10.0, J11.0, J12-J16, J18, J20, J21, J22), only when a secondary diagnosis of J44
Asthma	J45
Diabetes	E10.0, E10.1, E10.63, E10.9, E11.0, E11.1, E11.63, E11.9, E13.0, E13.1, E13.63, E13.9, E14.0, E14.1, E14.63, E14.9
Heart failure and pulmonary edema	I50, J81 *Excluding cases with cardiac procedures
Hypertension	I10.0, I10.1, I11 *Excluding cases with cardiac procedures
Angina	I20, I23.82, I24.0, I24.8, I24.9 *Excluding cases with cardiac procedures

*cardiac procedure codes identified using CCI coding:
1HA58, 1HA80, 1HA87, 1HB53, 1HB54, 1HB55, 1HB87, 1HD53, 1HD54, 1HD55, 1HH59, 1HH71, 1HJ76, 1HJ82, 1HM57, 1HM78, 1HM80, 1HN71, 1HN80, 1HN87, 1HP76, 1HP78, 1HP80, 1HP82, 1HP83, 1HP87, 1HR71, 1HR80, 1HR84, 1HR87, 1HS80, 1HS90, 1HT80, 1HT89, 1HT90, 1HU80, 1HU90, 1HV80, 1HV90, 1HW78, 1HW79, 1HX71, 1HX78, 1HX79, 1HX80, 1HX83, 1HX86, 1HX87, 1HY85, 1HZ53 rubric (except 1HZ53LAKP), 1HZ54, 1HZ55 rubric (except 1HZ55LAKP), 1HZ56, 1HZ57, 1HZ59, 1HZ80, 1HZ85, 1HZ87, 1IF83, 1IJ50, 1IJ54GQAZ, 1IJ55, 1IJ57, 1IJ76, 1IJ80, 1IK57, 1IK80, 1IK87, 1IN84, 1LA84, 1LC84, 1LD84, 1YY54LANJ

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CHAPTER 5. Exploring the Impact of a Pharmacist Comprehensive Annual Care Plan on Perceived Chronic Illness Care by Patients.

5.1. INTRODUCTION

Chronic diseases are defined as medical conditions which are often long-term and do not have a cure (e.g., asthma).[1] The prevalence of chronic diseases is increasing worldwide, and it is projected that by 2030, the number up deaths due to chronic disease will be 52 million.[2] The consequences to an individual living with chronic disease are extensive, including impaired mobility, inability to work, increased physician and hospital visits, increased prescription medications, and even early death.[1] Given the prevalence, the cost to the healthcare system for the management of chronic diseases is significant; it is reported that individuals living with chronic diseases account for over two-thirds of hospital admissions, over one-third of all physician visits, and more than one-quarter of emergency department (ED) visits.[1] Over 735,000 people were identified in Alberta, Canada living with hypertension, diabetes, chronic obstructive pulmonary disease (COPD), and coronary artery disease in 2012-2013, costing the Alberta government over $4.5 billion in one year for the management of these four chronic diseases.[1] In 2014, the Auditor General of Alberta released a report strategizing the immediate need for improved chronic disease management (CDM).[1]

Patient engagement is identified as a key factor in effective CDM, since patients spend the majority of their time outside of physician offices and need to self-manage their own conditions.[1] Patient engagement in their CDM has also been linked to improved health outcomes.[3] The development of a care plan is a cornerstone in CDM since it links the services provided by the healthcare professional to the self-management expectations required by the patient.[1] Such a model is congruent with the Chronic Care Model (CCM) which has demonstrated improved health outcomes in patients who are informed and activated in their CDM which occurs alongside other interdependent factors such as availability to community resources.[4-6]

In 2012, Alberta Health, the provincial health ministry, introduced a CDM initiative in the form of Comprehensive Annual Care Plans (CACP) by pharmacists.[7] Given pharmacists' rapidly growing scope of practice in Alberta, including ordering laboratory tests and initial access prescribing, pharmacists are in an ideal position to help patients manage their chronic diseases.[8] CACPs are intended to be developed in collaboration with the patient and outline the patient's medical history, medications, and specific goals and timelines of further medical and laboratory tests and non-pharmacological therapy such as exercise; pharmacist CACPs should place a particular focus on drug therapy needed to manage a patient's chronic disease.[1] The CACP should reflect the patient's values and personal health goals as they relate to his or her complex health care needs.[1] Pharmacists in Alberta are remunerated by Alberta Health once annually for the preparation of a CACP for patients with two or more of the following conditions: asthma, diabetes, chronic obstructive pulmonary disease (COPD), heart disease, heart failure, hypertension, or mental health disorders.[7] Recognizing that some patients may receive similar care plans for which their pharmacist does not submit a billing claim to Alberta Health, we use the term "pharmacist-billed CACP" to indicate those that have been remunerated by Alberta Health.

To date, little evaluation has been undertaken on the effectiveness of pharmacist-billed CACPs in enhancing CDM. Given the important role of the patient in their own CDM, the patient experience with their disease management is an important criterion to evaluate when analyzing the overall effectiveness of CACPs. Other researchers qualitatively explored pharmacist CACPs in Alberta and their results suggest that some patients have positive perceptions regarding the knowledge and support for meeting their health goals gained through a CACP, as well as improved access to care.[8, 9] This study was limited, however, by the small number of patients, and lack of comparison of perceptions of patients who didn't receive a CACP. Therefore, the objective of this current study is to assess patients' perspective of the pharmacist CACP on their chronic illness care. We hypothesized that patient who receive a pharmacist-billed CACP in Alberta will have better perceived quality of chronic illness care compared to those patients who do not receive a CACP.

5.2. METHODS

A cross-sectional survey design was used to assess Alberta patients' perceived quality of chronic illness care associated with CACPs. Between February and December 2019, individuals over 18 years of age who received pharmacist-billed CACP in the previous 3 months were identified by Alberta Health, based on billing codes (00071114/00081114).[7] In addition, for each person who received a CACP, up to two matched controls with similar age (within 5 years), sex, qualifying CACP conditions, service provider (i.e., same pharmacy), and date of service (within 1 year) but who did not receive a pharmacist-billed CACP were also invited to participate to establish a control group for the study. Only the first eligible CACP (or the pseudo-index CACP date in the control group, based on the matched case's index date) was used to identify potential participants; once a participant was contacted, they were excluded from further survey distributions to prevent repeated data from the same participant.

Cover letters containing relevant study information and a unique URL to access the online survey for either the CACP group or the control group were mailed out to all selected participants in both groups. The selection and mail-out process occurred 3 times (February 2019, June 2019, December 2019) until our required sample size was obtained. Survey responses were collected in Qualtrics XM platform. All participant identification, matching, and mail distribution was completed by Alberta Health so as to maintain the confidentiality of personal health information of the participants.

The study received approval from the University of Alberta Human Research and Ethics Board (Pro00083926).

Survey Measures

The primary outcome measure for this evaluation was the 11-item version of the Patient Assessment of Care for Chronic Conditions (PACIC) questionnaire.[10] The PACIC was developed to assess the degree to which the care provided to patients is congruent with the CCM, from the perspective of the patient.[11] The questionnaire asks patients the extent to which they have received specific care and actions related to chronic disease care from their health professional (in this case, their pharmacist), with responses ranging from 0% to 100%.

Responses have been categorized as low (0-30%), medium (40-60%), and high (70-100%)[10]; since the tool built into our questionnaire allowed for selection by 1 unit, or percentage, by the respondent, we modified the categories to 0-39%=low, 40-69%=medium, 70-100%=high and opted to adapt the word "medium" to "moderate". The PACIC has been validated in patients with diabetes, in whom the PACIC total score is associated with increased physical activity, receiving appropriate laboratory assessments and self-management counseling.[12] The longer 20-item version of the PACIC has been widely used in research across majority of other chronic diseases as well.[13-16] Based on the expertise of our steering committee, we added 3 questions, with similar format, with a particular focus on the pharmacy practice setting and the collaborative intention of CACPs. The additional questions were: "*Told how visits with other types of health professionals would help your treatment", "Given enough time to talk about your medical conditions or medications", and "Told your pharmacists would work together with other health professionals to coordinate your care".*

Based on our team's previous experience using the PACIC-11[17, 18], we anticipated the SD of the total score to be approximately 25.0. As there is no pre-specified minimally important difference for PACIC scores, we estimated an effect size 0.3, or an absolute difference of 7.5 points to be clinically important. To observe such a difference/effect size with 80% power and a probability of type 1 error of 5%, we required 131 patients who received a CACP and 262 controls (393 total). We initially anticipated a 35% response rate for the survey (based on recent population surveys undertaken by Alberta Health), lending the need to contact 1123 selected patients (i.e., 374 exposed and 749 unexposed). Additional mailouts were sent out in order to meet our pre-specified sample size.

Immediately following the PACIC questions in the survey, respondents were asked to rate their overall satisfaction with care they receive by their pharmacy using a 6-point Likert scale with 1=very dissatisfied and 6=very satisfied. Secondary outcome measures in the survey included the 5-level EQ-5D, including the visual analogue scale (VAS) self-rating of health.[19, 20] The Patient Health Questionnaire (PHQ-2) and Generalized Anxiety Disorder Scale (GAD-2) were used to evaluate the mental health of the respondents; scores of 3 and greater on both scales are considered highly specific and sensitive for the positive screening of each disorder.[19-22] To

explore the potential impact of health literacy on our results, a Single Item Literacy Screener was included.[23]

Lastly, 2 questions were included at the beginning of the survey to explore whether respondents who received a pharmacist-billed CACP were aware that they had received one, and whether they were asked to sign the document, as this is a pre-established expectation of the CACP remuneration model; in the control group, these questions serve to explore whether they were aware they had not received this service. The 2 questions were: *"In the last 3 months, did you spend time with your pharmacist to review your medical conditions in order to create a detailed treatment plan?" and "In the last 3 months, do you recall signing a treatment plan or medication review at your pharmacy?";* the respondent was asked to respond yes or no to both questions. Questions related to sociodemographic characteristics (age, sex, marital status, education level, annual income, ethnicity) and qualifying chronic disease status were included at the end of the survey to fully summarize the cohort of respondents, for possible adjustment of unbalanced characteristics in our analysis if necessary. A copy of the survey is provided in Appendix 5-1.

Statistical Analysis

Proportions were calculated for all categorized variables describing the demographics of the study population. Proportions and 95% confidence intervals (CI) were calculated for the PHQ-2 and GAD-2, categorized into proportions of individuals reporting a score of 3 and greater and less than 3, as well as those reporting they received a care plan and signed a care plan. Means and standard deviations were calculated for age, VAS score, satisfaction of care from pharmacist, and Single Item Literacy Screener. The Canadian EQ-5D-5L value set was used to generate an index value and standard deviation for the EQ-5D-5L in each study group.[20]
Only 34% of the total study population responded to all 14 PACIC questions, our main outcome measure. Give the high non-response rate, a total PACIC-11 score or mean of all 14 PACIC-like questions on the survey was not computed since complete case analysis would substantially reduce the sample size of our study population (34% of the CACP patients and 36% of the controls). As such, one-way ANOVA tests were used to determine the association between responses to each of the PACIC items according to CACP group. All analyses were completed

using Stata 14 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.)

Sensitivity Analysis

A post-hoc subgroup analysis was undertaken to evaluate the PACIC outcomes in those patients who received a pharmacist-billed CACP and answered 'yes' to the question *"In the last 3 months, did you spend time with your pharmacist to review your medical conditions in order to create a detailed treatment plan?"* and the subset of the control group who did not receive a CACP and answered 'no' to the above question. The purpose of the sensitivity analysis was to further assess a subgroup of patients within our cohorts who were aware and likely engaged in the CACP development process with their pharmacist and to eliminate those who may have received a CACP but did not have it billed through Alberta Health, or were engaged in another type of medication review with the pharmacist that could be perceived as a CACP.

5.3. RESULTS

A total of 3,500 CACP patients and 7,000 controls were invited to participate in the study. After eliminating letters that were returned to sender, the final sample frame reduced to 3,442 CACP patients and 6,888 control patients. A total of 178 CACP patients and 341 control patients participated in the online survey, demonstrating a response rate of 5.2% and 5.0%, respectively. Respondents in both the CACP and control cohorts had a mean age of 64 years with approximately 46% female. (Table 5-1) Marital status, highest level of education, and annual income were similarly distributed across the two groups, with the majority reporting a marital status of married/common law (>60%), completed college or technical school (>30%) and an annual income of $50,000-99,999 (>30%). Ethnicity was similar across CACP patients and controls with the majority being Caucasian (>80%). The proportion of qualifying CACP conditions between the two groups were similar with hypertensive disease and diabetes mellitus being the most commonly reported. The health literacy abilities were similar between both groups (1.5 [SD 0.9] vs. 1.7 [SD 1.1] in CACP patients vs. controls; p=0.07).

The general health status of the respondents, as measured by the EQ-5D-5L Index score and VAS, did not differ significantly between the two groups. (Table 5-2) Regarding mental health status, the proportion of patients with a PHQ-2 score of 3 or greater was 16% and 18% (p=0.62) in the CACP group and control group, respectively, and the proportion of patients with a GAD-2 score of 3 or greater was 15% and 18% (p=0.39) in the CACP group and control group, respectively.

Response rates to all 14 PACIC-like questions ranged from a high of 80% to a low of 42%. (Table 5-3) Importantly, response rates for each question did not significantly differ between the CACP and control groups. In general, patients who receive a pharmacist-billed CACP reported similar average PACIC scores for each question compared to controls. (Table 3-4) Although some questions were rated moderately high in both groups (e.g., "*satisfied that your care was well organized*" (mean score 67 and 70, in those who received a CACP and controls, respectively; p=0.33) a number of questions were rated low. Indeed, of the 11 validated PACIC questions, both CACP patients and controls rated 9 (82%) out of 11 questions below a mean score of 40. Moreover, statistical differences were noted, however, in 4 questions "*given choices about treatment to think about*" (38 vs. 29; p=0.046), "*contacted after a visit to see how things were going*" (30 vs. 20; p=0.046), "given enough time to talk about your medical conditions or medications" (67 vs 59; p=0.04) and "*told how visits with other types of health professionals would help your treatment*" (27 vs. 15; p=0.01) whereby mean scores were higher in controls relative to CACP patients, respectively; although the clinical importance of these differences is uncertain. With respect to the 3 additional PACIC-like questions, only "*given enough time to talk about your medical conditions or medications*" was moderately high for either the CACP or control patients. Overall, females rated PACIC questions lower than males but the differences did not meet statistical significance except for item 14 where females rated it 15 points lower (p<0.01). Collectively, although some differences were noted, the CACP and control group were remarkably similar in their PACIC responses, suggesting low to moderate overall perceived care of their chronic illnesses regardless of CACP.

Despite their responses to the PACIC, overall satisfaction with care or how care was organized by the pharmacist was relatively high, irrespective of the CACP group. Indeed, those

individuals who did not receive a pharmacist-billed CACP reported a slightly higher level of satisfaction of care by their pharmacy compared to those who did receive a CACP (5.0 [1.3] vs. 4.7 [1.4], respectively; p=0.01). (Table 5-4) Moreover, within the PACIC tool, CACP patients and controls reported similarly high satisfaction that their care was well organized (67 vs. 70, respectively, p=0.33). However, only 44% of CACP patients reported receiving a care or treatment plan by their pharmacist; interestingly, 44% of control patients also reported receiving a care plan from their pharmacist despite never having a CACP billed through Alberta Health at the time of the survey distribution. When asked if they recalled signing a treatment plan from their pharmacist, this proportion drops to 32% of CACP patients and, again, 30% of control patients reported signing a care plan from their pharmacist.

Sensitivity Analysis

In total, 79 CACP patients and 192 control patients were included in the sensitivity analysis. Demographics and overall health status in this subgroup did not differ significantly from the overall study sample. (Appendix 5-2, Table 5-2-1, Table 5-2-2) When evaluating those patients who had a pharmacist-billed CACP who reported receiving a care plan and those control patients who reported not receiving a care plan, the PACIC mean scores differed markedly from those reported in the overall study sample. (Table 5-5) Specifically, patients who received a pharmacist-billed CACP reported significantly higher PACIC scores than the control group across all questions. The questions that differed most dramatically included "*given a copy of your treatment plan*" (mean score 56 vs. 22, respectively; p<0.001), "*asked questions, either directly or on a survey, about your health habits*" (mean score 59 vs. 24, respectively; p<0.001), "*helped to make a treatment plan that you could carryout in your daily life*" (mean score 46 vs. 10, respectively; p<0.001) and "*asked how your chronic condition affects your life*" (mean score 51 vs. 17, respectively; p<0.001). However, despite the higher scores, overall perceived chronic illness care across most of the questions remained low to moderately low, with few questions with moderate to high average scores.

5.4. DISCUSSION

Given the significant role that patients must play in managing their own chronic illnesses, such as diet, exercise, and managing medications and monitoring practices amongst other daily responsibilities, understanding the effect of the CACP initiative from the patient perspective is crucial. Overall, our results demonstrate that having a pharmacist-billed CACP does not lead to substantially improved chronic illness care from a patient perspective. Our sensitivity analysis suggests that a more engaged patient in the care plan development process does markedly improve the perception of chronic illness care by the patient. This is not surprising given that an informed, activated patient is an important aspect of the CCM that leads to improved patient outcomes.[4] It may also signal an overall lack of patients' understanding of the goals of the CACP program, with poor explanation of it from Alberta Health and by the pharmacists providing the service.

Comparison to other literature

Since Alberta is the only jurisdiction to introduce a population-wide fee-for-service model such as the CACP program for pharmacists, our study is the first to quantitatively evaluate the patient perspective on chronic illness care in such a setting. Majority of research exploring care plan development for patients with complex needs have focused on primary care physicians. Indeed, when evaluating remunerations models for primary care physicians, studies have shown a minimal impact on quality of healthcare delivered.[24-26] However, many indicators of quality in these studies rely on the delivery of specific services and do not seek to gain patient perspective of their care. Campbell et al. sought to evaluate the patient experience related to healthcare reform under the United Kingdom Quality and Outcomes Framework introduced in 2004 where primary care physicians are remunerated for the development of care plans for patients with chronic disease.[27, 28] Unfortunately, patients actually reported less continuity of care and lower satisfaction of care under this model.[27, 28] The overall study population in our study reported similar findings, where those who received a pharmacist-billed CACP did not perceive a substantially higher level of care than the controls as hypothesized.

Pharmacists have most often been, and continue to be, involved in clinical services related to medication management services such as medication reviews.[29] While an improvement

in outcomes specific to certain chronic diseases such as diabetes and hypertension tend to be demonstrated in a controlled research setting (i.e., randomized controlled trials), similar outcomes rarely translate to the real-world.[30] This is often due to a lack of expectations around regular pharmacist follow-up, unclear patient eligibility criteria, lack of program structure, and poor program evaluation.[30] This has been demonstrated in both British Columbia and Ontario Canada for their population-wide medication review service provided by pharmacists.[30] In fact, people were less likely to be offered a medication review through the Ontario MedsCheck program if they were taking a higher number of medications.[31] Our research highlights similarities to these studies, where a population-wide service model found minimal impact perceived at the patient level. Patient engagement in such initiatives may improve perceived care.

In a recent qualitative assessment of Alberta's pharmacist CACP program, Schindel et al. found that while not all patients walked away from a pharmacist-billed CACP with a clear understanding of their treatment goals, those who did were more motivated to play a role in the care of their chronic illness.[9] Further, Hughes et al. demonstrated patient perceptions of gained knowledge about medical conditions and medications and encouragement and support to reach health goals after receiving a CACP from a pharmacist.[8] However, the reasons why a pharmacist would select a particular patient to receive a CACP in this research setting and why patients would accept or reject the service are unknown and may impact the extent of the perceived benefits found. Nevertheless, in our sensitivity analysis, we showed that when the patient recalls receiving a CACP (perhaps a marker of better engagement by the pharmacist), that patient satisfaction is greater, compared to those who did not receive a CACP. It is also possible that the CACP program design was too vague in terms of its goals and expectations for what a pharmacist should do. In the minds of some pharmacists, a CACP might just be a thorough medication review (which is important, but unlikely to change outcomes).

Strengths and Limitations

A strength of this study is the use of a random sample of all patients who received a pharmacist-billed CACP in Alberta in the previous 3 months, thereby reducing the potential biases such as pharmacist level of care and patient selection and involvement that may be present

in a more controlled research setting. To further strengthen our data, the use of 2 control patients for every CACP patient were included and closely matched on important criteria that may otherwise confound the data such as age, sex, pharmacy provider, and qualifying conditions for a CACP. The use of a control group helps tease out a possible CACP effect from that of usual care patients already receive from pharmacists in Alberta. Lastly, our sensitivity analysis allowed us to explore a group of patients who were likely more aware and engaged in the CACP process.

It is important to also note the limitations of this study. First, a cross-sectional study design cannot infer causality; our study results are only a snapshot in time of the perceived chronic illness care of patients and matched controls after a CACP, or lack thereof, was delivered. The response rate to our survey was also quite low (~5%), therefore limiting generalizability to the entire Alberta population. The online URL provided in a letter may have added an extra barrier to accessing the survey but was necessary to maintain patient confidentiality. Additionally, different biases are inherent to survey research. First, patients who responded to the survey may differ fundamentally from those who did not. Since participants had to access the survey online, this may have limited responses from those who did not have access to the Internet. The letters were also written in English, potentially reducing the participation of those who were unable to read English. Recall bias may further confound our results since we are relying on patients recalling specific information about their interaction with a pharmacist up to 3 months prior. However, the PACIC-11 is a validated self-report tool for evaluating chronic illness care occurring up to 6 months prior.[10] Unfortunately, missing responses for items within the PACIC-11 limited the available data for analysis and suggests the instrument may not resonate with patients in this context. Some other caveats include: we were not able to evaluate the quality of developed CACPs and how this relates to perceived patient impact; it may be that the CACP program design is not specific enough or the expectations are too vague as to encourage guidelines-based care; and it is also possible that patients do not realize what their pharmacist is doing for them (perhaps pharmacists are underselling themselves). Previous research suggests that patients are not aware of care planning services by pharmacists and terms often used by pharmacists to describe a care plan, such as “medication review” can blur patient awareness of the service they are receiving.[8, 9, 32] We also could not account for patient follow-up specifically in our analyses– as such, it is a review of a single event (a CACP), when chronic

disease care is a longitudinal phenomenon. However, the PACIC-11 asks patients to recall all visits with their pharmacist in the previous 3 months; therefore, follow-up visits may be reflected in their responses but cannot be quantitatively confirmed in our analyses. Perceived chronic illness care and health behaviors may also differ based on sex and this association was not explored in our analysis; while study participants self-reported their sex, it was also a variable used to match exposed participants to controls and therefore could not be further stratified without introducing bias.

Conclusion

Overall, the chronic illness care provided by pharmacists in Alberta is perceived by patients to be moderate to low irrespective of whether a patient received a pharmacist-billed CACP or not. Sensitivity analyses suggest benefit of a pharmacist-billed CACP relative to controls who do not receive care plans. Patients' perception of their chronic illness care suggest that the CACP program needs to be improved, perhaps with patients involved in the redesign.

5.5. REFERENCES

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Table 5-1. Demographics of Study Population

Characteristic *(number of respondents in CACP group; number of respondents in control group)*	**CACP Group (n=178)**	**Control Group (n=341)**	**p-value**
Age (n=147; 273) mean, SD	64 (12)	64 (12)	0.73
Sex (n=162; 306)			0.96
Female	46%	46%	
Male	54%	54%	
Marital Status (n=162; 306)			0.83
Single/never married	10%	12%	
Married/common law	69%	63%	
Separated/Divorced	9%	12%	
Widowed	11%	11%	
Prefer not to respond	2%	2%	
Education Level (n=162; 306)			0.59
Less than high school	7%	6%	
High school	27%	26%	
College/technical school	35%	36%	
Post-secondary	16%	18%	
Post-graduate	13%	11%	
Prefer not to respond	1%	2%	
Annual Income (n=162; 303)			0.30
<$20,000	7%	10%	
$20,000-$49,999	20%	24%	
$50,000-$99,999	33%	30%	
>$100,000	24%	19%	
Prefer not to respond	17%	18%	
Ethnicity (n=162; 304)			0.18
Caucasian	83%	88%	
Aboriginal/Indigenous	1%	1%	
African	0.6%	0.7%	
Hispanic/Latino	0.6%	0.3%	
Caribbean	0.6%	0.3%	
East Asian	1%	2%	
South Asian	4%	3%	
Middle Eastern	0%	0.3%	
Prefer not to respond	4%	1%	

Qualifying Conditions (n=128; 248)			
Asthma	20%	23%	0.50
Chronic obstructive pulmonary disease	13%	12%	0.74
Ischemic heart disease	9%	4%	0.09
Hypertensive disease	54%	44%	0.07
Heart failure	10%	8%	0.62
Diabetes mellitus	39%	40%	0.93
Mental health disorder	22%	21%	0.77

Table 5-2. Health and literacy status of study population

Survey Question *(number of respondents in CACP group; number of respondents in control group)*	**CACP Group (n=178)**	**Control Group (n=341)**	**p-value**
EQ-5D-5L Index* (n=160; 302)	0.79 (0.17)	0.76 (0.18)	0.23
EQ-5D-5L Visual Analogue Scale* (n=161; 308)	68 (19)	69 (19)	0.87
Single Item Literacy Screener* (n=162; 306)	1.5 (0.89)	1.7 (1.1)	0.07
PHQ-2 Score** (n=158; 300)			
Equal to or greater than 3	16% (11% to 22%)	18% (14% to 22%)	0.62
GAD-2 Score** (n=158; 299)			
Equal to or greater than 3	15% (10% to 21%)	18% (14% to 23%)	0.39

*Values reported as mean (SD)

**Values reported as proportions (95% CI)

Table 5-3. PACIC scores in total study population

PACIC-11 Survey Questions *(number of respondents in CACP group; respondents in control group)*	**CACP Group (n=178)**	**Control Group (n=341)**	**p-value**
Given choices about treatment to think about (n=119/224)	29 (35)	38 (38)	0.046
Satisfied that your care was well organized (n=142; 285)	67 (36)	70 (35)	0.33
Helped to set specific goals to improve your eating or exercise (n=91; 198)	28 (36)	34 (39)	0.21
Given a copy of your treatment plan (n=91; 185)	38 (42)	36 (43)	0.68
Encouraged to go to a specific group or class to help you cope with your chronic condition (n=79; 155)	17 (32)	17 (31)	0.99
Asked questions, either directly or on a survey, about your health habits (n=102; 193)	37 (39)	40 (40)	0.53
Helped to make a treatment plan that you could carryout in your daily life (n=80; 173)	27 (37	32 (39)	0.34
Helped to plan ahead so you could take care of your condition even in hard (n=78; 173)	23 (34)	32 (40)	0.06
Asked how your chronic condition affects your life (n=84; 182)	32 (39)	39 (41)	0.16
Contacted after a visit to see how things were going (n=75; 162)	20 (35)	30 (39)	0.046
Told how visits with other types of doctors, like an eye doctor or surgeon, would help your treatment (n=75; 156)	18 (33)	23 (34)	0.28
Additional Pharmacy-Specific Survey Questions *(number of respondents in CACP group; respondents in control group)*			
Told how visits with other types of health professionals would help your treatment (n=75; 158)	15 (30)	27 (36)	0.01
Given enough time to talk about your medical conditions or medications (n=121; 232)	59 (40)	67 (38)	0.04
Told your pharmacist would work together with other health professionals to coordinate your care (n=90; 178)	34 (40)	45 (44)	0.05

*Values reported as mean (SD)

Table 5-4. Satisfaction of pharmacy care and care plan awareness of study population

Survey Question *(number of respondents in CACP group; respondents in control group)*	**CACP Group (n=178)**	**Control Group (n=341)**	**p-value**
Satisfaction with care from pharmacist* (n=159; 308)	4.7 (1.4)	5.0 (1.3)	0.01
Participants reporting they received a care plan** (n=178; 340)	44% (37% to 52%)	44% (39% to 49%)	0.90
Participants reporting they signed a care plan** (n=174; 336)	32% (26% to 40%)	30% (25% to 35%)	0.62

*Values reported as mean (SD)

**Values reported as proportions (95% CI)

Table 5-5. PACIC scores in sensitivity analysis subgroup

PACIC-11 Survey Questions[**] *(number of respondents in CACP group; respondents in control group)*	**CACP Group (n=79)**	**Control Group (n=192)**	**p-value**
Given choices about treatment to think about (n=63;116)	40 (37)	23 (32)	<0.001
Satisfied that your care was well organized (n=70;152)	76 (30)	61 (37)	<0.001
Helped to set specific goals to improve your eating or exercise (n=48; 98)	42 (40)	19 (32)	<0.001
Given a copy of your treatment plan (n=45; 94)	56 (40)	22 (37)	<0.001
Encouraged to go to a specific group or class to help you cope with your chronic condition (n=35; 85)	29 (39)	8 (21)	<0.001
Asked questions, either directly or on a survey, about your health habits (n=56; 96)	59 (38)	24 (33)	<0.001
Helped to make a treatment plan that you could carryout in your daily life (n=41; 84)	46 (41)	10 (21)	<0.001
Helped to plan ahead so you could take care of your condition even in hard (n=37; 85)	37 (39)	16 (30)	<0.01
Asked how your chronic condition affects your life (n=42; 87)	51 (42)	17 (31)	<0.001
Contacted after a visit to see how things were going (n=35; 84)	38 (44)	13 (28)	<0.001
Told how visits with other types of doctors, like an eye doctor or surgeon, would help your treatment (n=38; 82)	31 (40)	10 (23)	<0.001
Additional Pharmacy-Specific Survey Questions *(number of respondents in CACP group; respondents in control group)*			
Told how visits with other types of health professionals would help your treatment (n=35; 82)	26 (37)	12 (26)	0.03
Given enough time to talk about your medical conditions or medications (n=63; 116)	72 (35)	53 (41)	<0.01
Told your pharmacist would work together with other health professionals to coordinate your care (n=44; 86)	53 (42)	24 (37)	<0.001

[*]Sensitivity Cohort: CACP cohort includes individuals who were billed for a CACP by a pharmacist and answered 'yes' to the question "In the last 3 months, did you spend time with your pharmacist to review your medical conditions in order to create a detailed treatment plan?" Control cohort includes individuals who were not billed for a CACP and answered 'no' to the question "In the last 3 months, did you spend time with your pharmacist to review your medical conditions in order to create a detailed treatment plan?"

[**]Values reported as mean (SD)

APPENDIX 5-1. Patient Questionnaire

You have been invited to participate in a research study on chronic disease care being conducted by investigators from the School of Public Health at the University of Alberta.

Study Title: *Exploring the Impact of Pharmacist Comprehensive Annual Care Plans on Perceived Quality of Care by Patients in Alberta*

For this project, you are asked to complete a survey, providing information about yourself, including how you rate your physical and mental health and your recent experiences with health services in Alberta. This brief survey should take about 10-15 minutes to complete.

Thank you.

Q1 In the last 3 months, did you spend time with your pharmacist to review your medical conditions in order to create a detailed treatment plan?

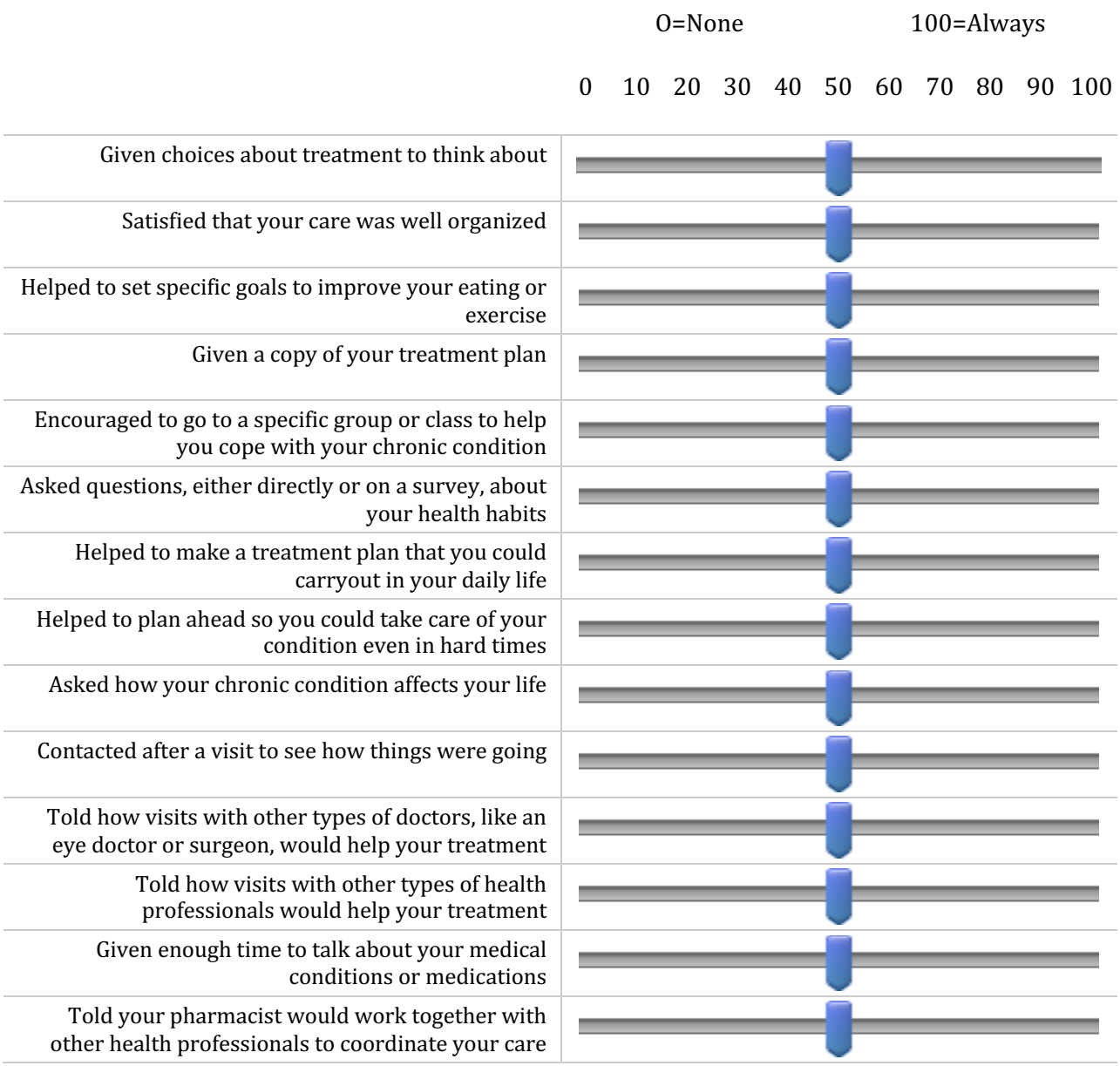
- ○ Yes
- ○ No

Q2 In the last 3 months, do you recall signing a treatment plan at your pharmacy?

- ○ Yes
- ○ No

Q3 **Patient Assessment of Chronic Illness Care (PACIC-11)**

Considering your recent visits to your community pharmacy in the last 3 months to receive care and services for your chronic medical conditions, what percentage of the time were you:



Q4 Please answer the following statement.

	Extremely satisfied	Moderately satisfied	Somewhat satisfied	Somewhat dissatisfied	Moderately dissatisfied	Extremely dissatisfied
Overall, how satisfied are you with the care you receive by your pharmacist?	○	○	○	○	○	○

The following SIX questions explore your health-related quality of life using a validated tool called the: EQ-5D-5L

Q5 Please click the ONE box that best describes your health TODAY.

MOBILITY

- ○ I have no problems in walking about
- ○ I have slight problems in walking about
- ○ I have moderate problems in walking about
- ○ I have severe problems in walking about
- ○ I am unable to walk about

Q6 Please click the ONE box that best describes your health TODAY.

SELF-CARE

- ○ I have no problems washing or dressing myself
- ○ I have slight problems washing or dressing myself
- ○ I have moderate problems washing or dressing myself
- ○ I have severe problems washing or dressing myself
- ○ I am unable to wash or dress myself

Q7 Please click the ONE box that best describes your health TODAY.

USUAL ACTIVITIES *(e.g. work, study, housework, family or leisure activities*)

- ○ I have no problems doing my usual activities
- ○ I have slight problems doing my usual activities
- ○ I have moderate problems doing my usual activities
- ○ I have severe problems doing my usual activities
- ○ I am unable to do my usual activities

Q8 Please click the ONE box that best describes your health TODAY.

PAIN / DISCOMFORT

- ○ I have no pain or discomfort
- ○ I have slight pain or discomfort
- ○ I have moderate pain or discomfort
- ○ I have severe pain or discomfort
- ○ I have extreme pain or discomfort

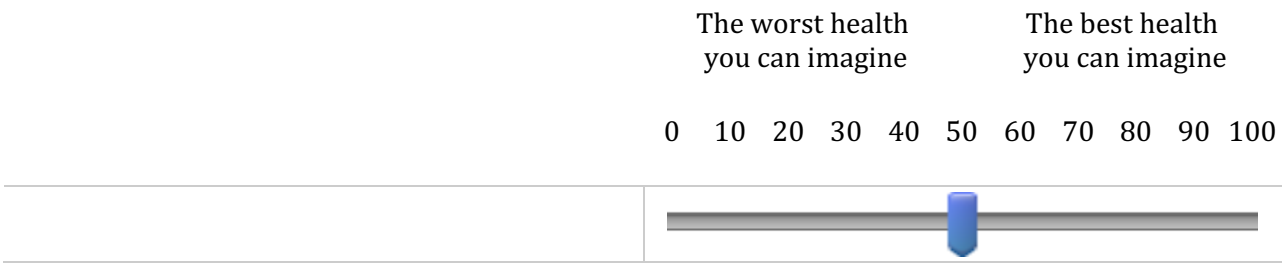
Q9 Please click the ONE box that best describes your health TODAY.

ANXIETY / DEPRESSION

- ○ I am not anxious or depressed
- ○ I am slightly anxious or depressed
- ○ I am moderately anxious or depressed
- ○ I am severely anxious or depressed
- ○ I am extremely anxious or depressed

Q10
We would like to know how good or bad your health is TODAY. The following scale is numbered from 0-100.

100 means the best health you can imagine.
0 means the worst health you can imagine.
Please click on the scale to indicate how your health is TODAY.



Q11 (PHQ-2) Over the past 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
Little interest or pleasure in doing things	○	○	○	○
Feeling down, depressed or hopeless	○	○	○	○

Q12 (GAD-2) Over the last 2 weeks, how often have you been bothered by any of the following problems:

	Not at all	Several days	More than half of the days	Nearly every day
Feeling nervous, anxious, or on edge	○	○	○	○
Not being able to stop or control worrying	○	○	○	○

Q13 (Single Item Literacy Screener) How often do you have someone like a family member, friend, hospital or clinic worker or caregiver help you read health plan materials (such as written information about your health or care you are offered)?

- ○ All of the time
- ○ Most of the time
- ○ Some of the time
- ○ Little of the time
- ○ None of the time

Q14 Please select your sex

- ○ Male
- ○ Female

Q15 Please select your YEAR of birth.

Q16 What is your current marital status?

- ○ Single – never married
- ○ Married/common law
- ○ Separated/Divorce
- ○ Widowed
- ○ Prefer not to respond

Q17 What is the highest level of education you have completed?

- ○ Less than high school
- ○ Completed high school (or equivalent)
- ○ Completed college or technical school (diploma)
- ○ Completed post-secondary training (bachelor's degree)
- ○ Post-graduate degree (Master's, PhD, MD)
- ○ Prefer not to respond

Q18 What is your current employment status?

- ○ Employed
- ○ Unemployed
- ○ Retired
- ○ Prefer not to respond

Q19 Which of the following categories best describes your total annual household income?

- ○ Less than $20,000
- ○ $20,000 to $49,999
- ○ $50,000 to $99,999
- ○ More than $100,000
- ○ Prefer not to respond

Q20 Which of the following best describes your ethnicity?

- ○ Caucasian
- ○ Aboriginal/Indigenous
- ○ African
- ○ Hispanic/Latino
- ○ Caribbean
- ○ East Asian
- ○ South Asian
- ○ Middle Eastern
- ○ Prefer not to respond

Q21 Do you have any of the following medical conditions that have been diagnosed by a health professional? (Check all that apply)

- [ ] Asthma
- [ ] Chronic Obstructive Pulmonary Disorder
- [ ] Ischemic Heart Disease
- [ ] Hypertensive Disease
- [ ] Heart Failure
- [ ] Diabetes Mellitus
- [ ] Mental Health Disorder

Thank you for taking the time to complete this survey.

APPENDIX 5-2. Sensitivity Analysis

Table 5-2-1. Demographics of sensitivity analysis subgroup

Characteristic *(number of respondents in CACP group; number of respondents in control group)*	**CACP Group (n=79)**	**Control Group (n=192)**	**p-value**
Age (n=68; 153) mean, SD	65 (12)	65 (12)	0.63
Sex (n=74; 171)			0.67
Female	43%	46%	
Male	57%	54%	
Marital Status (n=74; 171)			0.14
Single/never married	10%	11%	
Married/common law	62%	68%	
Separated/Divorced	10%	11%	
Widowed	16%	9%	
Prefer not to respond	3%	2%	
Education Level (n=74; 171)			0.22
Less than high school	5%	6%	
High school	32%	25%	
College/technical school	38%	37%	
Post-secondary	16%	17%	
Post-graduate	15%	13%	
Prefer not to respond	1%	1%	
Annual Income (n=74; 169)			0.44
<$20,000	8%	9%	
$20,000-$49,999	24%	21%	
$50,000-$99,999	31%	31%	
>$100,000	24%	18%	
Prefer not to respond	12%	21%	
Ethnicity (n=74; 169)			0.89
Caucasian	86%	88%	
Aboriginal/Indigenous	1%	0.6%	
African	0%	0%	
Hispanic/Latino	1%	0.6%	
Caribbean	0%	0.6%	
East Asian	1%	1%	
South Asian	3%	3%	
Middle Eastern	0%	0%	
Prefer not to respond	4%	1%	

Qualifying Conditions (n=59;134)			
Asthma	12%	22%	0.09
Chronic obstructive pulmonary disease	20%	13%	0.17
Ischemic heart disease	10%	3%	0.04
Hypertensive disease	51%	40%	0.18
Heart failure	8%	10%	0.67
Diabetes mellitus	31%	36%	0.48
Mental health disorder	22%	15%	0.23

Table 5-2-2. Health and literacy status of sensitivity analysis subgroup

Survey Question *(number of respondents in CACP group; number of respondents in control group)*	**CACP Group (n=79)**	**Control Group (n=192)**	**p-value**
EQ-5D-5L Index Value* (n=73; 170)	0.77 (0.18)	0.80 (0.15)	0.15
EQ-5D-5L Visual Analogue Scale Score* (n=161; 172)	67 (21)	70 (18)	0.30
Single Item Literacy Screener* (n=74; 171)	1.6 (1.1)	1.5 (1.0)	0.57
PHQ-2 Score** (n=71; 166) Equal to or greater than 3	20% (12% to 31%)	13% (9% to 19%)	0.21
GAD-2 Score** (n=71; 167) Equal to or greater than 3	20% (11% to 31%)	15% (10% to 21%)	0.37

*Values reported as mean (SD)

**Values reported as proportions (95% CI)

Table 5-2-3. Satisfaction of pharmacy care and care plan awareness of sensitivity analysis subgroup

Survey Question *(number of respondents in CACP group; respondents in control group)*	**CACP Group (n=178)**	**Control Group (n=341)**	**p value**
Satisfaction with care from pharmacist* (n=73; 174)	4.9 (1.4)	4.9 (1.3)	0.84
Participants reporting they received a care plan**(n=79; 191)	100%	0	
Participants reporting they signed a care plan** (n=77; 190)	62% (51% to 73%)	9% (6% to 15%)	<0.001

*Values reported as mean (SD)

**Values reported as proportions (95% CI)

CHAPTER 6. Conclusion

6.1. SUMMARY

Chronic diseases account for a significant proportion of morbidity and mortality worldwide; the need for effective CDM strategies to tackle this growing burden is urgent and necessary in order to sustain healthcare systems globally.[1-3] The research in this dissertation focused on Alberta, Canada, whose AG emphasized this urgency by stating that "*there is an overarching need for purposeful, province-wide action to manage the growing burden of chronic disease. New actions must be dramatic. Small, incremental improvements could be overwhelmed by rising chronic disease numbers*".[4] In Alberta, the provincial government introduced two similar, but separate, remuneration models for physicians and pharmacists (in 2009 and 2012, respectively) to improve care for individuals living with chronic diseases.[4] Under these models, clinicians (or in the case of pharmacists, the pharmacies) are paid by the provincial health funder (Alberta Health) to collaborate with their patients to create and implement a care plan, or a CACP.[4] While the uptake of this clinical service has been substantial by both physicians and pharmacists, little evaluation had occurred to evaluate the impact of CACPs on patient health outcomes.[4]

The overall goal of this dissertation was to evaluate both the physician and pharmacist CACP remuneration models from an overall healthcare utilization perspective, including physician visits, hospital admissions, ED visits (Chapters 2 [pharmacist CACP program] and 3 [physician CACP program]) and from the perspective of the patient and their perception of chronic illness care (Chapters 4 [pharmacist CACP program] and 5 [physician CACP program]). The results of this research are a significant contribution to evaluating these chronic disease initiatives in Alberta, closing this prior gap in knowledge that will be critical to informing future negotiations between pharmacy and physician professional bodies and the Alberta Government. As well, these data will help to direct other jurisdictions in Canada and worldwide looking to implement similar chronic disease initiatives. Indeed, these data can be used to inform pharmacists and physicians on their practices and to redesign the CACP program to provide the best care for individuals with complex needs.

6.2. MAIN FINDINGS

Based on the need to evaluate the impact of physician-billed and pharmacist-billed CACPs in Alberta since the programs were introduced, as described above, I aimed to explore the hypotheses that individuals who received a physician-billed or pharmacist-billed CACP would have reduced hospital admissions, ED visits and physician visits than those who did not; these outcomes are well-recognized as large drivers of healthcare costs in those living with chronic disease.[4] It is less clear whether CACPs should lead to an increase or decrease in physician visits; the delivery of a CACP by either a physician or pharmacist may appropriately increase physician visits due to increased follow-ups based on parameters set out in the plan, or, you may expect that as care improves and the patient stabilizes as a result, less frequent physician visits would be needed. While interpretation is unclear, physician visits are a large driver of healthcare costs in a publicly funded healthcare system and initial exploration of CACP impact on this outcome is still worthwhile. Next, I sought to assess the hypotheses that individuals who received a physician-billed or pharmacist-billed CACP would perceive their chronic illness care to be better than those who did not.

Physician CACP Program: In Chapter 2, CITS analyses were used to evaluate changes in physician visits, ED visits (ACSC-related and all-cause) and hospital admissions (ACSC-related and all-cause) 12 months before and after physician-billed CACP. While the mean difference in physician visits decreased by 1060.5 ($p>0.05$) visits per 10,000 people in CACP patients compared to controls, increases were found across the other outcomes explored. Specifically, an increase by 429.6, 26.3, 1548.3, and 95.4 (all $p<0.05$) visits per 10,000 people in all-cause hospitalizations, ACSC-related hospitalizations, all-cause ED visits, and ACSC-related ED visits was found in those who received a CACP compared to controls. Despite statistical significance, the differences in healthcare utilization found by the physician CACP program from a population health perspective require further interpretation and may be more meaningful. In fact, the magnitude of increase in all-cause ED visits is surprising, since it was hypothesized that ED visits would decrease, and may be considered important given that the average cost of an ED visit in Canada is $148.[5]

Pharmacist CACP Program: The impact of pharmacist-billed CACPs on major healthcare utilization was explored in Chapter 4. More specifically, using CITS analyses, I assessed whether those patients who received a pharmacist-billed had fewer physician visits, ED visits (all-cause and ACSC-related) and hospitalizations (all-cause and ACSC-related) in the year after a CACP compared to those who did not. CACP implementation was associated with a reduction in all-cause hospitalizations, ACSC-related ED visits and physician visits in CACP patients compared to controls by 180.5, 144.2, and 1,206.0 (all $p<0.05$) visits per 10,000 people in the year post-CACP compared to what it would have been without CACP delivery. An increase in ACSC-related hospitalizations by 8.0 ($p<0.05$) admissions was also noted; all-cause ED visits also increased by 40.1 visits but was not statistically significant ($p>0.05$). Overall, from a population health perspective, the impact of pharmacist-billed CACPs may be more meaningful and requires further interpretation.

Patient perspectives, Physician CACP: In Chapter 3, patient perspectives on chronic illness care related to physician-billed CACP delivery were explored. Using the same primary outcome measure as in Chapter 4 above, patients generally reported a moderate (defined as 40-69%) level of care regardless of receiving a physician-billed CACP or not. After adjusting for PHQ-2 scores, a screening tool for depression[6], scores decreased across majority of PACIC questions in both groups suggesting that an increased likelihood of depression may further reduce perceived care. Similar to the pharmacist CACP, further sensitivity analyses demonstrated that those patients who were likely more engaged in the CACP process (i.e., physician-billed CACP patients who recalled receiving a CACP vs. controls who recalled not receiving a CACP) perceived their chronic illness care to be significantly higher compared to controls.

Patient perspectives, Pharmacist CACP: Patient perspectives on chronic illness care related to pharmacist CACP delivery were explored in Chapter 5. The main outcome measure was the 11-item PACIC which measures constructs of care that align with the CCM, including patient activation/involvement, system design/decision support, goal setting/tailoring, problem solving/contextual, and follow-up/coordination.[7] The tool was adapted to include 3 additional questions not otherwise captured and targeted at collaboration with other health professionals

since this is an essential component of chronic disease care. Responses to the PACIC-11 and adapted questions, which ranged from 0 to 100%, were similar across both groups regardless of receiving a CACP or not; it is also important to note that the average score across 9 of the 14 questions were rated as low (defined as <39%) by patients in both cohorts. Control patients had significantly higher scores across 4 questions compared to those who received a pharmacist-billed CACP; these questions included: "*given choices about treatment to think about*" (38% vs. 29%; p=0.046), "*contacted after a visit to see how things were going*" (30% vs. 20%; p=0.046), "given enough time to talk about your medical conditions or medications*"* (67% vs 59%; p=0.04) and "*told how visits with other types of health professionals would help your treatment*" (27% vs. 15%; p=0.01). The importance of these differences is uncertain as minimally clinically important differences on the PACIC-11 or the three additional questions are uncertain. Interestingly, a sensitivity analysis exploring responses in those patients who were likely more engaged in the CACP process (i.e., pharmacist-billed CACP patients who recalled receiving a CACP vs. controls who recalled not receiving a CACP) found markedly higher PACIC scores across all questions in the CACP cohort compared to controls.

6.3. IMPLICATIONS FOR HEALTH POLICY AND CLINICAL PRACTICE

There is little high-quality evidence to date suggesting that FFS (payment for providing a clinical service) or PFP (payment based on quality of care indicators for a patient, such as achieving a clinical target) remuneration models for health professionals improves patient care or outcomes.[8,9] In fact, the most recent systematic reviews of such models concluded that they remain experimental and are not considered evidence based.[8, 9] Indeed, population-level evaluations of various FFS and PFP initiatives around the world have occurred post-hoc without clear objectives set out to measure effectiveness.[10] This becomes difficult, then, to fully measure the effects of the intervention since we are unable to untangle their true purpose from the outcomes we may expect to see.[10] Moreover, less than ideal data sources are often then relied on to try and answer this effectiveness question post-hoc. Although the data is a limitation, FFS and PFP models around the world focused on chronic disease care have not found consistent benefits to the patients receiving them or the healthcare system as a whole.[8, 9, 11-13] When rigorous study

methodologies and analyses available to evaluate post-hoc population interventions are conducted, such as the ITS design, results generally demonstrate that post-intervention outcomes do not stray far from trends occurring in the outcome prior to intervention; examples of this include evaluations of the British Columbia Complex Care Initiative, which is primarily FFS based, by Lavergne et al.[13] and the UK Quality and Outcomes Framework, which is primarily PFP, by Campbell et al.[11] Both of these population-wide interventions for chronic disease care, similar to that implemented in Alberta and evaluated in this body of research, did not set out clear parameters by which they should be assessed.[10] Therefore, it is perhaps not surprising that impact demonstrated by any of these remuneration models has been uncertain when evaluated at the population level. It is likely that individual patients may be benefiting greatly by these programs, but the research is not aimed at the individual per se; moreover, health policies are often directed at a population to improve health as a whole as opposed to small pockets of individuals. The results of this research, collectively with other literature from around the world, therefore, reinforces the need for evidence-based health policy in order to gain outcomes that are meaningful to patients at a population-level and to healthcare systems.

It is possible that chronic disease initiatives like the CACP program in Alberta are more intended to generate income for clinicians by taking on the care of patients with chronic diseases.[10] However, what remains unknown is the proportion of clinicians that end up getting paid more money to perform the same caliber of patient care that they already were providing, given the lack of auditing and direction associated with program implementation. This was highlighted in the Alberta AG Report in 2014, where some family physicians billed for care plans at a much higher rate than the majority of physicians, suggesting inappropriate billing and delivery of care plans to generate income.[4] Johnson and McLeod reported that in the first 2 years of the physician CACP program, approximately 2% of physicians accounted for 20% of total CACP billings.[14] Perhaps these initiatives improve clinician documentation of patient care, while not actually changing the level of care being provided. Indeed, the patient survey results in Chapters 4 and 5 demonstrate that minimal differences in perceived chronic illness care were found between those who received a CACP and those who didn't; moreover, controls reported receiving a care plan and even signing one while administrative data indicated that no CACP was billed for their care. As a result, those controls seem to be a group with significant attention by

their healthcare providers and, therefore, making differences between formal CACPs and other chronic care plans difficult to separate. In fact, PCN physicians have reported one of the reasons they do not bill for CACPs is because "they feel care plans are a regular part of the responsibility to their patients".[4] It is perhaps not surprising then that minimal impact was found between groups.

While paying both pharmacists and physicians for providing an enhanced level of care for individuals with chronic disease is essential to recognize their expertise and time, the design of a remuneration model should take more careful planning and design to ensure that healthcare funding is balanced appropriately with realistic outcomes. For example, certain subgroups of patients may be more likely to benefit from such a model (i.e., disease specific, disease severity). In 2010 to 2011, Hollander and Kadlec found that under the BC Complex Care Initiative, net annual health care costs decreased for those with hypertension, COPD and congestive heart failure, but not for those with diabetes.[15] This may highlight that certain disease states may benefit more from a specific comprehensive care strategy more than others (i.e., the high-risk approach). A broad FFS model spanning a wide range of chronic diseases that can differ significantly by patient level needs, in Alberta and other jurisdictions, has not clearly demonstrated benefit at a population level.

The degree to which comprehensive care programs align with the CCM is also an important consideration. The CCM outlines a model in which "informed, activated patients interact with prepared, proactive practice teams".[16] Programs that have demonstrated benefit are limited to robustly intercollaborative primary care settings[10]; family physicians and community pharmacists may be less able to achieve such results given the practice setting they work in. While many family physicians in Alberta are part of a primary care network[17], increasing opportunity for collaboration with other health professionals, developing a CACP may not influence collaboration further than what was already occurring. Indeed, patients who received a physician CACP in Alberta reported being told their physicians would work together with other types of health professionals to coordinate their care only 60% of the time and were educated on how such visits would help their treatment only 50% of the time. The practice setting of a community pharmacist can be very isolating and difficult to engage in meaningful

interprofessional collaboration.[18] This increases the challenge of pharmacists to meet this construct of the CCM; not surprising, we saw even less collaboration reported by patients in our research, where patients who received a pharmacist-billed CACP were told their pharmacist would work together with other types of health professionals to coordinate their care only 34% of the time and were educated on how such visits would help their treatment only 15% of the time. Importantly, the CCM strongly recommends the use of electronic health records (EHR)[16]; while clinicians likely pull data from Alberta's EHR to populate a CACP and create short term and long term goals with their patients, there were no requirements set out in the programs to upload a completed CACP to the EHR for transparency, auditing, and sharing between healthcare professionals for the purposes of improved continuity of care. This is an important short falling of the Alberta CACP program.

Another major limitation of the model in Alberta is the lack of follow-up requirements set out once a CACP is delivered. Without regular follow-up, a CACP is a single, written document that outlines important health information and goals for a patient that can easily be overlooked and forgotten with time, by both the patient and the clinician (which was quite evident in the patient surveys). Follow-up visits promote both parties to receive and interpret the required laboratory monitoring necessary to manage the condition, or to re-assess the effectiveness and safety of current medications. Perhaps clinical trials, such as those showcasing pharmacist led CDM[19-22], demonstrate benefit in the short-term due to the high level of follow-up requirements set out in the protocols. Limitations that still prevent generalization of clinical trial data to the real-world linger, however, such as fundamental differences between those patients and clinicians who choose to participate in a trial compared to those who don't. As previously mentioned, the physician CACP program did not outline any requirements for follow-ups and left this up to the discretion of the physician. The pharmacist CACP model did include payments in smaller increments for follow-up consultations to a CACP[23], but how these follow ups were utilized and how frequently was also at the pharmacist's discretion and were not a requirement of the program. Indeed, given concerns with potential abuse of the follow-up model, significant changes have been made to the follow-up aspects of the pharmacy CACP program in Alberta where a maximum of 12 follow-ups can be billed to Alberta Health.[24] In summary, care planning is an important aspect of CDM and the CCM; however, perhaps the Alberta CACP model did not

include enough aspects of the CCM to realize its full potential.

Lastly, it is pertinent to review the inherent challenges that may exist for pharmacists and physicians who implement a CACP. The introduction of a FFS remuneration model does not necessarily remove the time constraints and workload already present in a clinical practice. The intensity of workload in both community pharmacies and family physician practices are well documented[25, 26]; to increase care for those with chronic diseases and to develop a CACP collaboratively with a patient may also require elimination or reduction of other services to other patients. This is likely a difficult balance faced by physicians and pharmacists when provided with this remuneration model, without necessarily a clear answer. Both physicians and pharmacists are also limited by the engagement of the patient and the steps that patient takes to continue implementing the care plan out of the office or pharmacy. Indeed, patients play a critical role in the self-management of their chronic diseases[4] and lack of participation would likely lead to poorer outcomes despite clinician effort. In Chapters 4 and 5 of this thesis, clear benefits were seen in perceived chronic illness care when patients were more likely to be engaged in the CACP process. Of course, better recall of a CACP may also represent unique differences in the patients themselves that may influence outcomes (i.e., health literacy, motivation), but more likely than not, increased collaboration with the patient while developing a CACP would lead to better recall of the service provided. Therefore, increased engagement of the patient in developing a CACP may improve their participation in self-managing their condition on their own. Clinicians should consider how to best involve their patients in the development of a CACP, as currently in Alberta, this is likely not the case for all patients and may be a factor in the overall lack of impact demonstrated by the program.

Pharmacists may also face additional barriers to CACP implementation. First, pharmacists without additional prescribing authorization may rely on physician uptake of recommendations made within the care plan; without this, it is unlikely that benefits can be easily realized. Even those with prescribing rights may favor physician collaboration in decision-making for the patient and might still face this additional limitation. Secondly, patients often do not perceive the role of their pharmacist to include CDM; instead, many simply expect pharmacists to dispense medications, assess for drug interactions, and educate on new

prescriptions.[27] In fact, Hughes et al. found that most pharmacists and patients referred to a CACP as a medication review which may be confusing to patients in terms of the clinical service they are actually receiving.[28] This may shed light on the lower overall perceived chronic illness care reported by patients of pharmacists in Chapter 3 compared to the scores of physicians in Chapter 4, who they would more likely expect to receive it from. Pharmacists are important primary care providers who are well-equipped to manage chronic diseases within the community[29]; the need for pharmacists to better educate the public on the services they can provide, and more specifically, the purpose of a CACP, is urgently needed. Lastly, majority of pharmacists do not personally receive the reimbursement payments for a CACP. Instead, these payments go to the corporations, chains, or pharmacy managers who employ the pharmacist. As a result of this, pharmacists may be expected to deliver a certain number of CACPs per shift without a reduction in other workload to provide the service in a high quality, meaningful way. This may also limit pharmacist engagement with the CACP process itself.

Taken together, the results of this research highlight important considerations regarding the design and implementation of the CACP program in Alberta. Ultimately, it is important to recognize that many of these issues are not the fault of the clinicians but rather, of short-sighted design of a population-level intervention. Fortunately, many of these issues could be better addressed moving forward, such as including, at a minimum, the following aspects:

- **Regular follow-up requirements:** a care plan can only be effective if both the clinician and the patient are engaged with the plan on an ongoing basis. Once a CACP is in place, clinicians should be required to follow-up with patients throughout the year to revisit the care plan, review disease targets, and adjust the plan as necessary. The frequency of follow-up visits needed would be disease and patient specific, but likely a minimum requirement of 2-4 follow-up visits over the year would increase continuity and impact. Additional receipt and signing of the treatment plan, including any changes, should occur at these stages as well.

- **Quality improvement indicators:** since the delivery of a CACP annually falls under a FFS model, adding PFP aspects to this program would be of benefit to further promote improvement in chronic disease care. The development of a CACP could remain as a once

per year FFS, but quality improvement indicators for each eligible chronic disease could result in further payments to the clinicians once targets are achieved for a particular patient. Examples of this may include use of medications that have demonstrated significant impact on clinical outcomes for a specific disease (i.e., angiotensin converting enzyme inhibitors for heart failure and diabetes) as well as objective disease outcomes (i.e., target blood pressure achievement for hypertensive disease, target hemoglobin A1c achievement for diabetes).

- **CACPs linked to electronic health record:** to improve access of CACPs between health professionals to improve continuity of care and collaboration in care planning for mutual patients, as well as patient access, signed CACPs developed by physicians and pharmacists should be required to be uploaded to the patient's EHR in Alberta. In addition to improved access and continuity of care, this requirement would also increase transparency of the care plan itself and promote a means of quality assurance by regulatory bodies to ensure clinicians are meeting standards of care.

- **Auditing procedures:** currently, few to no audits are occurring to ensure that patients receiving a CACP are indeed eligible; as well, quality of care plans and the nature of follow-up visits are not monitored. Increased auditing, facilitated by details within billing codes to Alberta Health and access to CACPs on the EHR, would improve accountability to produce high quality care plans that meet professional expectations. This would also allow for changes to professional education and the program itself to occur if audits determine further progress is needed.

- **Patient engagement:** ensuring patient engagement in the CACP process and post-CACP is likely more difficult. However, professional education and program guidance demonstrating the importance of patient engagement on outcomes could be better marketed. The above strategies of EHR access and regular auditing would also help to promote this issue, as a lack of patient signature on CACPs could signal a lack of engagement. As well, a lack of regular follow-ups and adapted CACP documents may also signal this.

- **Program evaluation parameters:** the original design of the CACP program was limited by

a lack of parameters set out to measure effectiveness, as previously discussed in this chapter. Clear parameters to measure effectiveness of the program are needed and likely need to include more than only high-level healthcare utilization as analyzed in these studies. While administrative data lends itself well to analyses of healthcare utilization, other important parameters to capture processes of care may better evaluate the efficacy of a CDM program. Examples include delivery of an asthma action plan, achieving blood pressure targets and the use of evidence-based therapies for specific diseases. These evaluation parameters tie in with the quality improvement indicators discussed above and may require better use of EHR to record delivery and achievement of such care. Clear parameters to also evaluate the patient and clinician perspectives should also be mapped out moving forward.

With the addition of these program requirements, the goal is that the CACP program (or at least at this time, the pharmacy CACP program) can continue to evolve into an effective comprehensive care program where measurable outcomes can be evaluated on a regular basis.

6.4. FUTURE RESEARCH

Important limitations and considerations have been identified in the evaluation of the Alberta CACP program that warrants further research. First, research with a longer follow-up duration is needed as this program continues. The CITS analyses used in Chapters 2 and 3 of this thesis assessed major outcomes of interest 12 months before and after a CACP; it could be argued that more time is needed to reflect real changes in healthcare utilization. Given the relatively new introduction of these models in Alberta at the time I embarked on this research and received data from Alberta Health, follow-up periods were limited. Of particular note, the physician CACP billing code has been recently removed due to budget constraints in the current Alberta government.[30] Therefore, future research would be limited to 2009 to 2020 that this program was available for physicians and potentially any realistic time period after where patients may still be benefiting from such a service. Given the later start date of the pharmacist CACP program (2012), longer term research is urgently needed to continue its evaluation. With that being said, these analyses will be extremely challenging as patients are eligible to achieve a CACP on a yearly basis. Patients who receive 1 or 2 consecutive CACPs will be fundamentally different than those who receive 5 years of CACPs. The perception of the program, patient-

clinician relationship, and overall health status over time would be extremely large confounders in any analysis of this magnitude. Moreover, discussions with several internationally recognized biostatisticians has indicated that these analyses would be so fundamentally complex to model in order to obtain a valid answer that the exercise may prove futile as methods for these types of analyses are simply not well-defined in the literature; as a result, development and validation of a new statistics method may be required to undertake this.

Next, outcomes that reflect quality of care and adherence to clinical practice guidelines (i.e., laboratory monitoring, medication use) would also be of use to explore practice change associated with CACPs. Such changes in processes of care could also be captured in a shorter follow-up period than outcomes like hospitalizations but would allow extrapolation forwards to predict the outcomes that would likely occur with guideline recommended care. For example, in those with diabetes, close monitoring of hemoglobin A1c and kidney function, in addition to use of medications including hypoglycemic drugs, statins, and drugs that act on the renin-angiotensin system lead to better outcomes.[31] Preliminary analyses around such outcomes have been undertaken and few changes were noted as a result of a CACP.[32]

The frequency and utilization of follow-up visits post-CACP would be useful to explore moving forward to determine whether these impact health outcomes. Reliance on administrative data alone, however, may limit the interpretation of results since the exact nature of the visit and whether it relates to the CACP is unknown. This is even more difficult for exploring pharmacist follow-ups, as there is no requirement to enter ICD codes or specific reasons for a follow up into their billing details for Alberta Health. Administrative exploration may be a starting point to research this aspect of CACPs, but again, those patients who receive follow-ups may be fundamentally different than those who do not, and limitations in how to manage these types of analyses remain a limitation as discussed above. Prospectively based studies with access to clinician charts and documentation may be more beneficial to approach this research question in order to better control for confounding.

This body of research has explored the impact of physician and pharmacist CACPs from a healthcare utilization and patient perspective, but not a clinician perspective. Preliminary work

has been completed to gain insight on perspectives of physicians and pharmacists in Alberta. Schindel et al. found that pharmacists reported improved patient-centered care, collaboration with physicians and other healthcare professionals, and expanded roles as primary health care providers as a result of delivering CACPs in their practice.[33] Evaluating physician perspectives to date is minimal, with consultation by the AG of Alberta's finding physicians to be "generally very positive about the potential of care plans to improve care of patients with chronic disease".[4] Moving forward, ongoing research is needed to fully evaluate how clinicians are building it into their practice, the value added, practice changes that have occurred as a result of it, and challenges. Since the physician CACP billing code has been removed, it would also be interesting to explore how chronic illness care by family physicians is impacted as a result of this. The distinct on and off periods of the physician CACP program would lend well to additional ITS analyses similar to what was completed in this research. Utilizing survey and focus group methods to explore the pharmacist CACP implementation process would add value to this area of research.

Other important areas for future research around the physician and pharmacist CACP program in Alberta would include exploring the quality of care plans provided; intuitively, one can assume that a higher quality, more comprehensive care plan would lead to improved outcomes as it would represent a well thought out CDM strategy. However, patient and clinician follow through on the plan would still remain an important limitation. Next, it would be worthwhile to explore how care plans are used to collaborate amongst health professionals and especially how physician and pharmacist CACPs are used to inform the other; indeed, exploring patient outcomes in those who received both a physician and a pharmacist CACP compared to only 1 or none would be beneficial. Lastly, prospective studies assessing patient engagement and participation in managing their condition post-CACP would add value to evaluating the CACP process completely. This may also include utilizing similar survey outcome measures used in this body of research but expanding to explore perceptions before and after a CACP in order to better understand the causality of the CACP itself; focus groups that can dig deeper into patient perspectives would also be beneficial. Cohort studies that include reviews of medical records would help us to better explore gaps that may exist between clinician recommendations and steps patients take themselves to follow the care plan (i.e., laboratory monitoring, medication

adherence); understanding how these gaps may affect outcomes is an important consideration when fully evaluating such a program.

6.5. CONCLUSION

The four interrelated studies within this body of research are an important addition to the current gap of knowledge that exists around the impact of the Alberta CACP program for physicians and pharmacists. The program was quantitatively evaluated to determine whether delivery of care plans to patients with chronic diseases impacted the frequency of future physician visits, hospitalizations and ED visits, as well as patient perceptions of chronic illness care. While glimpses of benefit were noticed, including a reduction in all-cause hospitalizations, ACSC-related ED visits and physician visits after a pharmacist-billed CACP, and better perceived chronic illness care amongst patients who received a physician-billed CACP compared to those who didn't, it is difficult to predict the importance of these benefits from a population-level clinical and policy perspective. Further research to continue exploring this program is needed. More importantly, a more stringent design and evaluation parameters are needed to better realize the full potential of this population-level intervention.

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