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A mixed-methods exploration on whether and how community health navigators impact the mental health of adults with chronic health conditions in ENCOMPASS

by

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A THESIS
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Abstract

Background: Living with chronic health conditions (CHCs) can be distressing due to impacts on quality of life. People with CHCs are more susceptible to mental illness such as anxiety or depression. The Community Health Navigator (CHN) program being tested in the Enhancing Community Health Through Patient Navigation, Social Advocacy, and Social Support (ENCOMPASS) study helps patients living with CHCs address health burdens. CHNs are Community Health Workers who provide patient navigation, and address barriers to care. They support patients by facilitating communication with care providers, connecting them to resources, encouraging care plan adherence, providing advice, education, and emotional support, and helping carry out health-related goals. CHN support may address anxiety and depression, and this study is an opportunity to understand this impact.

Purpose: To explore, using a convergent mixed-methods design, whether and how the CHN intervention impacts anxiety and depression of adult patients with CHCs enrolled in the ENCOMPASS study at a Primary Care Network in Calgary, Alberta.

Methods: The quantitative portion of this study used anxiety and depression scores from the Generalized Anxiety Disorder Scale (GAD-7) and Patient Health Questionnaire (PHQ-9), respectively, administered at baseline, 6- and 12-months. The scores of CHN intervention and control patients were compared at 6- and 12-months using Analysis of Covariance (ANCOVA). The qualitative portion used a qualitative descriptive approach where inductive content analysis was used to analyze transcripts from semi-structured interviews with CHNs and patients, and CHN case notes. The analysis sought to explain the quantitative results and explore how CHNs addressed patients' mental health concerns.

Results: Out of 183 patients enrolled in the ENCOMPASS study, between 140 and 149 patients were included in the quantitative analyses, depending on data completeness for each outcome. After data transformation to address assumptions violations, there were no significant differences in anxiety and depression scores between intervention and usual care (control) patients at either 6 or 12 months after enrolment ($p > 0.05$). The qualitative analysis provided insight into these results, revealing that CHNs faced challenges that hindered their ability to address patients' mental health, such as a lack of training and patient discomfort towards mental health work. There were also challenges that patients faced in addressing their mental health, such as a lack of relevant mental health resources, and pressures from the COVID-19 pandemic. Despite not detecting a quantifiable effect on outcomes, patients reported that working with a CHN benefited their mental health, and improved well-being and feelings of being cared for.

Conclusion: The degree of consistency between the qualitative and quantitative results was mixed. The combination of challenges faced by CHNs and patients might explain why CHN support did not have a significant impact on anxiety and depression symptoms scores. However, patient reports of benefit to mental wellbeing and psychosocial health indicate that the CHN program may improve mental health in ways that were not objectively measured. This study evaluated the impact that CHNs had on anxiety and depression, and contributes to the growing knowledge on the impact of patient navigation, and the mental health of patients with CHCs in Canada.

Preface:

This thesis is original, unpublished, and independent work by the author, Alvin Pham.

Ethics approval was provided by the University of Calgary Conjoint Health Ethics Board for the project “ENCOMPASS: ENhancing COMmunity health through Patient navigation, Advocacy and Social Support – Program Expansion Trial B (CWC)”, Ethics Certificate number REB20-0009, issued October 14, 2020.

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List of Abbreviations

ANCOVA	Analysis of Covariance
BC	British Columbia
CHC	Chronic Health Condition
CHN	Community Health Navigator
CHW	Community Health Worker
CI	Confidence Interval
CKD	Chronic Kidney Disease
COPD	Chronic Obstructive Pulmonary Disease
COVID-19	Coronavirus Disease
CVD	Cardiovascular Disease
CWC	Calgary West Central
EMR	Electronic Medical Record
ENCOMPASS	ENhancing COMmunity health through Patient navigation, Advocacy, and Social Support
GAD-7	Generalized Anxiety Disorder Scale
HPA	Hypothalamic-Pituitary-Adrenal
ICA	Inductive Content Analysis
MCID	Minimal Clinically Important Difference
PCN	Primary Care Network
PHQ-9	Patient Health Questionnaire
PN	Patient Navigator
RCT	Randomized Control Trial
REDCap	Research Electronic Data Capture
SD	Standard Deviation
UK	United Kingdom
US	United States

Chapter 1 – Introduction:

1.1 - Chronic Health Conditions:

Approximately 44% of Canadian adults have at least one chronic health condition (CHC) – which are non-infectious, of slow progression and long duration, and include diabetes, hypertension, asthma, chronic obstructive pulmonary disease, heart disease, chronic kidney disease, and more (1). The number of Canadians with multiple diagnoses (multimorbidity) is also increasing, with prevalence of multimorbidity among adults rising from 19.4% in 1978 to 33% in 2016 (2,3). Those with certain chronic illnesses are susceptible to developing further health conditions, or even mortality due to health complications (4).

1.2 - Comorbidity of Mental and Physical Illness:

Living with CHCs can be highly distressing; treatments can be costly and time-consuming (5), the modifications to lifestyle can be restrictive, and the physical complications may cause pain, discomfort, and reduced quality of life (6,7). This stress can be magnified if people living with CHCs experience financial, social, or cultural barriers to care (8). The physical and emotional burden that is often associated with having CHCs increases the risk of developing mental illnesses such as anxiety (9) or depression (10). Anxiety is characterized by frequent excessive fear and worry (11). Depression is associated with poor mood, loss of interest in typical activities, changes in body weight and appetite, sleep disturbance, changes in psychomotor function, a sense of worthlessness or guilt, impaired cognition and decision-making, and/or recurrent thoughts of death or suicide ideation (11). The global prevalence of anxiety and depression amongst people with diabetes is 14% and 18%, respectively (12). For people with cardiovascular diseases (CVD), the prevalence is 15% (13) and 20% (14). In chronic kidney disease (CKD), the prevalence is 19% (15) and 24% (16) and in chronic obstructive pulmonary disease (COPD), studies report a prevalence of 15% for anxiety (17) and as high as 40% for depression (18). In turn, comorbid mental illness can exacerbate the symptoms and risks associated with CHCs. There are instances of this relationship reflected in literature.

Anxiety has been shown to aggravate symptoms of certain CHCs. For example, anxiety may be associated with impaired glycemic control in people with diabetes (19), possibly due to treatment avoidance (e.g., needles and medication) and symptom suppression, and potentially leading to hyperglycemia and diabetic ketoacidosis, increased risk of hospitalization (20,21), and increased mortality risk in the long-term (21). Through the hypothalamic-pituitary-adrenal (HPA) axis, anxiety also triggers the release of inflammatory hormones. Prolonged exposure to which can lead to decreased insulin sensitivity, persistent body fat, and dyslipidemia; all of which may hinder diabetes management or exacerbate CVDs (22,23). The accumulation of physiological stress due to anxiety, such as increased resting heartrate, inflammation, and prolonged exposure to stress-response biochemicals, may cause strain on the heart (22). Furthermore, poor health behaviours that are commonly associated with anxiety, such as smoking and alcohol consumption (22), might further exacerbate CVDs as well as COPD and asthma (17,22).

Depression is also associated with negative diabetes, CVD, and CKD outcomes due to the inflammatory processes associated with excessive activation of the HPA axis (23–25). The decreased mood, negative thoughts, sedentarism, social isolation, increased smoking and alcohol consumption, and overeating that is associated with depression have been shown to hinder the ability of patients with diabetes and CVD to adhere to their care plan, seek help for their condition, and maintain healthy habits (13,21,26–28). And because CHCs like diabetes are inextricably tied to CKD, improper self-care due to depression increases the risk of CKD and its complications (24). In people with CKD, depression is further associated with lower medication adherence, and forgoing dialysis treatment (29).

These examples show that mental and physical health are intertwined, where individuals with CHCs are more likely to have mental health concerns which in turn exacerbates physical health complications.

1.3 – Patient Navigators and Community Health Workers:

Patient Navigators (PNs) and Community Health Workers (CHWs) are job titles that are often used synonymously in literature to describe lay health worker roles (30,31). While there is no universal definition for these roles, they have been broadly described as trained workers that provide tailored, person-centered support to help individuals achieve health goals and overcome barriers to care (8,30,32,33).

While CHW and PN may be used to describe very similar roles, there are also examples of divergence in their definitions. The primary function of PNs is to guide patients through the healthcare system (31). They may be professionals (e.g., nurses, social workers, etc.) or non-professionals (34). PN has its roots in cancer care, and the earliest PN role was developed to address disparities in cancer survival rates of ethnic minorities, and groups of low socioeconomic status (33,35). PNs have since been expanded to address other dimensions of health, such as transitional care (36–38), dementia care (39), mental health and addictions (40), and CHC management (8). Existing PN interventions in Canada focus on cancer care, transitional care (41), paediatrics (42), and dementia care (39). PN integration within the health care system means that they are equipped to help patients navigate care, access treatments and resources, and coordinate care between providers (41).

Alternatively, CHWs are non-health professionals with strong ties to the community they are serving, and often act as a liaison between community members and health and social services (34,43–45). The CHW role emerged and gained popularity in the early to mid 1900s across China, Indonesia, India, Tanzania, Honduras, and Guatemala as a way to address the health needs of populations that were rural, poor, and lacking trained physicians. Members from these communities were trained as CHWs to perform a variety of tasks, such as providing education on vaccinations and cleanliness, administering first-aid, and providing basic medical care. Later, the World Health Organization (WHO) would formally outline the role of CHWs in primary health care, one that is based on principles of health promotion, disease prevention, intersectoral collaboration, social justice, and community integration (46). Since then, CHWs have been deployed in clinical and community settings globally, providing a wide range of services such as navigating the health care system, connection to resources, educating and coaching, and providing social support (34,43,47). The nature of the role also enables CHWs to act as cultural brokers that support patients or community members to access appropriate services, improve patient-provider communication, and help overcome language barriers (45,48). Their deep community integration enhances their ability to address health inequities of immigrants and populations that are marginalized (45,48). In high-income countries, CHW programs targeting CHC management have shown effectiveness for increasing screening and use of primary care (49), reducing emergency department visits and hospitalizations (50,51), and improving health outcomes (51–53). Existing CHW programs in Canada support immigrants, refugees, indigenous communities, other communities experiencing marginalization, people with disabilities, and cancer (45,48,54).

1.4 – The CHN Program:

The term Community Health Navigator (CHN) was created for the navigator intervention tested in the ENCOMPASS (ENhancing COMmunity health through Patient navigation, Advocacy, and Social Support) studies in Alberta, where CHNs are defined as CHWs that provide PN. The intervention was purposefully designed to incorporate key elements of both CHWs and PNs, namely the health care system integration and key navigation function of PNs, and the strong community ties of CHWs (34,43–45). Job postings for the CHN role were open to the public, but preference was given to those who were non-health professionals. This was done to preserve the equal power dynamic between patients and CHNs, where CHNs are supportive community members rather than experts. Applicants were also required to demonstrate community involvement, multicultural or multilingual competency, and shared experience with the population they would be supporting. CHNs received training on various skills and topics, such as goal setting, motivational interviewing, medical terminology, and more. They were embedded in interdisciplinary primary care teams where they could be deployed to support patients within the primary health care system.

The CHN program was evaluated in a series of randomized control trials (RCTs) in the ENCOMPASS studies (55). The aim of the intervention was to support primary care patients with CHCs in managing their health through system navigation and addressing barriers to care. They help patients by facilitating communication with care providers, accessing resources, encouraging adherence to care plans, providing advice, education, and emotional support, and setting and carrying-out health-related goals. CHNs have supported patients with a variety of goals, including: exercising more, eating healthier, being connected to appropriate healthcare providers and services, improving medication and treatment adherence, finding low-cost food, transportation, and medication resources, and more. CHNs can also support patients in managing stress, reducing social isolation, and being an empathetic member of patients' care teams.

The CHN intervention is based on a systematic review that identified and described how existing patient navigator roles address certain barriers (56). This study informed the development of a CHN program theory that proposed a link between CHN activities and health outcomes. This preliminary theory was later refined using feedback from patients and providers, and data from a feasibility study, resulting in an updated program theory that is being used today (Figure 1). The activities that CHNs perform fall into three categories: educational and knowledge related, patient supporting activities, and coordination and logistical support.

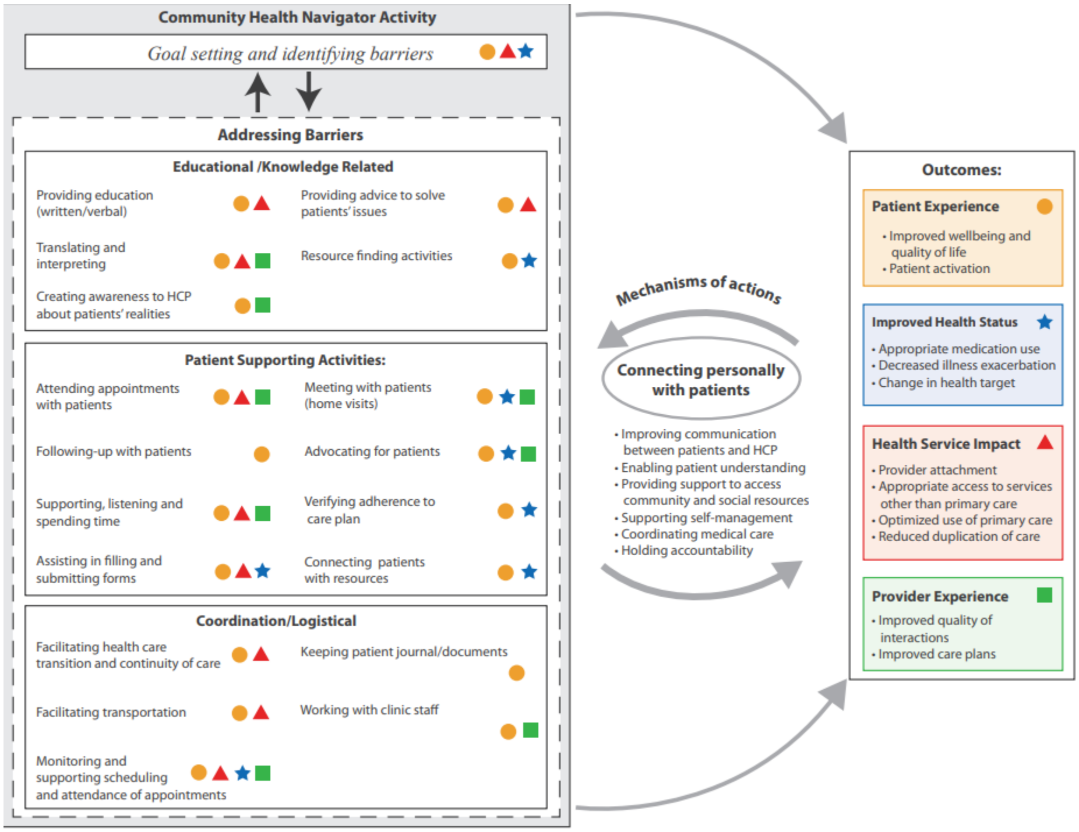

Figure 1. Updated ENCOMPASS Program Theory (unpublished).

1.5 – Navigators and Mental Health

While the CHN intervention was designed to support patients with CHCs, the mechanisms of support have the potential to address the anxiety and depression that can co-occur with, and exacerbate CHCs. For example, the ability of CHNs to help patients adhere to care plans, monitor and attend appointments, and facilitate care and communication with providers, may address the physical health complications that exacerbate their mental health(13,17,19–29). These activities may also be performed to directly support patients with their mental health goals. There are some examples from literature of how certain aspects of the CHN role can impact mental health, namely the ability to connect personally with patients, address adherence to care plans, ensure continuity of care, develop personalized care plans, and manage patients' barriers (57–64).

There is a reasonable body of literature exploring the impact of navigation interventions on mental health, however, the findings are mixed. One scoping review concluded that individuals with mental health and/or addictions saw improved outcomes from PN support (65). Another systematic review examining CHW interventions in the US found that these interventions led to a reduction of mental health symptomology (51). In contrast, a third systematic review found mixed results for mental health when evaluating the effectiveness of navigation programs in the United States (US) and United Kingdom (UK) (66). A study on a PN intervention for CHCs in Philadelphia, Pennsylvania reported improved mental health as a secondary outcome in its participants (67). This relationship is less studied within a Canadian context. One navigator program in a rural British Columbia (BC) community for individuals with mental health and addictions concerns was effective at increasing access to community resource referrals, however the impact on mental health outcomes was not discussed (68). An environmental scan of PN programs in Alberta identified a gap in PN programs relating to mental health (69). Finally, when the focus turns to anxiety and depression outcomes associated with navigation interventions for Canadians with CHCs, the body of research is relatively non-existent. Taken together, this reflects a lack of understanding of the impact of PNs on mental health, specifically the anxiety and depression of patients with CHCs.

1.6 – Study Importance:

Many activities that CHNs perform can directly address some of the complications that patients with CHCs face in relation to their anxiety and depression. This notion, coupled with the dearth of knowledge on this topic, provides strong rationale for formally evaluating the impact of the CHN intervention on anxiety and depression outcomes of patients with CHCs. Patient anxiety and depression measures were captured in surveys administered during the ENCOMPASS study, presenting an opportunity to objectively assess this phenomenon. Using ENCOMPASS qualitative data, there is also an opportunity to understand the experiences of CHNs and patients related to mental health – how mental health was addressed within the intervention, how the presence of mental illness affected intervention procedures, and how the intervention may have impacted mental health outcomes.

1.7 - Purpose and Objectives:

The purpose of this study was to explore, using a convergent mixed-methods design, whether and how the CHN intervention impacts anxiety and depression of adult patients with CHCs enrolled in the ENCOMPASS study in Alberta. There are two objectives that accompanied the overarching purpose of this research:

1) To assess the impact of the CHN intervention on anxiety and depression outcomes of patients with CHCs. It was hypothesized that patients who received CHN support would

have better anxiety and depression outcomes compared with those that did not receive CHN support.

2) To describe the experiences of CHNs and patients within the program in situations pertaining to mental health, how mental health concerns impacted the program and vice versa, and to explain the quantitative results.

Chapter 2: Methods

2.1 – Setting:

ENCOMPASS is series of clinical trials that tested the CHN intervention at four Primary Care Networks (PCNs) in Alberta between 2017 and 2023: Mosaic, Edmonton O-day'min, West View, and Calgary West Central (CWC). This study used data from the trial completed at CWC PCN between 2021 and 2022 (70). The CWC PCN is a network of 135 primary care clinics located in Southwest Calgary. With the support of PCN staff, the research team identified eight clinics with the largest number of eligible patients in the PCN, and invited them to participate in this two-armed, pragmatic, randomized controlled trial. Six clinics agreed to participate.

2.2 – Description of Participants:

Eligible patients were 18 years of age or older, and had two or more of the following CHCs: hypertension, diabetes, chronic kidney disease, ischemic heart disease, congestive heart failure, and chronic obstructive pulmonary disease or asthma. PCN staff identified patients fitting these criteria in electronic medical record (EMR) data, and provided a list of eligible patients to the CHN assigned to the clinic to clean and review. Participating physicians were given the opportunity to verify the eligibility of their patients, and exclude patients they deemed ineligible, with reasons. Patients were excluded if they resided in a long-term care facility, had moderate to severe dementia, or were unable to provide informed consent.

2.3 – Study Design:

This study employed patient-level block randomization, stratified by study site, where patients were individually randomized to receive CHN support for approximately six months, or usual care. A total of 957 patients from CWC PCN were invited to participate by the PCN team, and 276 patients agreed to be referred to the research team. Of these, 183 patients consented to participate in the study, where 90 patients were randomized to the intervention group and 93 patients were randomized to the usual care group. Randomization was concealed and computer generated, and researchers were blinded to block size. This study employed a convergent mixed-methods design to achieve the overarching research purpose, and to address the two-pronged research objectives of exploring a) whether and b) how the CHN intervention impacts the anxiety and depression of adult patients with CHCs. Leveraging both quantitative and qualitative data sources allows for a more holistic exploration of the topic at hand that neither approach could accomplish alone (71). Data collection and analysis of quantitative and qualitative data were conducted separately, and merged when both phases were complete. Convergent designs are useful for determining consistencies and inconsistencies between data sources, and when the results of one component can be used to explain the other (71,72).

The first research objective was addressed by assessing the effect of the CHN intervention on quantitative anxiety and depression symptoms scores. The qualitative portion used interview transcripts and CHN case notes to explore how CHNs interacted with patients around mental health concerns, what challenges they faced, and the experience of patients with respect to mental health concerns. Qualitative methodologies can be used to provide an in-depth description into an individual's experience to better understand a phenomenon (72). In this case, describing the experiences of individual patients and CHNs added to the understanding of how CHNs addressed situations pertaining to mental health, addressing the second research objective.

2.4 – Quantitative Component:

2.4.1 – Data Source:

The quantitative portion of this study used data collected from health surveys during the ENCOMPASS trial at CWC PCN. These surveys were administered to all patients at baseline (0-months), 6-months, and 12-months, where participants self-reported sociodemographic (gender, age, ethnicity, education, etc.) and health (CHC diagnoses, self-reported mental health, health literacy, etc.) information. Health survey data were exported from Research Electronic Data Capture (REDCap) to Microsoft Excel to be formatted for analysis.

2.4.2 – Outcomes:

The outcomes were self-reported anxiety and depression symptom severity scores, assessed using the Generalized Anxiety Disorder scale [GAD-7] (73), and the Patient Health Questionnaire [PHQ-9] (74), both of which are validated instruments. These outcomes were captured in surveys administered at baseline, 6-month and 12-month time points. Scores for the GAD-7 range from 0 – 21, while scores for the PHQ-9 range from 0 – 27. A higher score corresponds to a higher symptom severity for both measures (Table 1).

Table 1. Categories of symptom severity for depression and anxiety with corresponding GAD-7 and PHQ-9 scores.

Symptom severity diagnostic categories	GAD-7 Score	PHQ-9 Score
Minimal	1 – 4	1 – 4
Mild	5 – 9	5 – 9
Moderate	10 – 14	10 – 14
Moderately Severe	--	15 – 19
Severe	15 – 21	20 – 27

2.4.3 – Descriptive Statistics:

Sociodemographic characteristics of patients enrolled in the ENCOMPASS study at CWC PCN were summarized using descriptive statistics. The number of patients within each category of age, gender, marital status, highest level of education, employment status, annual household income, racial, ethnic, and cultural background, and number of chronic conditions were summarized. Mean GAD-7 and PHQ-9 scores with standard deviations were calculated for each sub-category of sociodemographic characteristics.

Changes in GAD-7 and PHQ-9 scores from baseline to 6-months, and baseline to 12-months were calculated for each patient and compared to the minimal clinically important differences (MCID) for each of the two scales. MCID scores are the minimal amount of change in disease symptomology that patients perceive to be important (75). Scores of MCID are helpful for determining if an individual patient has had a meaningful response to a treatment or therapy, which is valuable for assessing the size of treatment effects in clinical trials (76). For this study, MCID scores were used as a descriptive tool to compare the number of patients that reported no clinical change, a clinically meaningful decrease, or a clinically meaningful increase in anxiety and depression symptom severity for both intervention and control groups at 6- and 12-months. This provided context prior to commencing statistical analyses. Changes in scores of at least 4 and 5 were considered clinically important for GAD-7 (77) and PHQ-9 (76), respectively. Descriptive statistics were calculated using R (version 4.2.2 GUI 1.79 High Sierra Build), R Studio (version 2023.09.01+494), and Microsoft Excel.

2.4.4 – Primary Analysis:

Analysis of covariance (ANCOVA) was used to test for statistically significant differences in mean GAD-7 and PHQ-9 scores between intervention and control groups at the time points of interest. The test statistic was obtained from the F-distribution (alpha = 0.05). Four separate one-way ANCOVA tests were performed: 6-month GAD-7, 12-month GAD-7, 6-month PHQ-9, and 12-month PHQ-9. PHQ-9 and GAD-7 scores were treated as continuous variables, and the dependent variables were GAD-7 and PHQ-9 scores, and the covariates were baseline GAD-7 and PHQ-9 scores. The categorical independent variable was the study arm (CHN intervention vs. usual care).

ANCOVA allows for comparisons of a continuous dependent variable between different levels of a categorical independent variable, while also allowing for adjustment of any potential effects due to a covariate at baseline (78). When examining RCT data with baseline and follow up time points, ANCOVA is recommended to adjust for baseline data imbalance that might bias follow-up outcomes, and therefore has greater statistical power than other methods (79). Power calculations using Shieh's method for ANCOVA designs (80) were performed to assess statistical power of each test, where a minimum of 80% was considered adequately powered. Statistical (e.g., Shapiro-Wilk (81) and Breusch-Pagan (82) tests) and graphical assessments (i.e., scatterplots and histograms of residuals) were used to determine if data satisfied the assumptions for ANCOVA analysis: normality and homoscedasticity of residuals, linearity, and independence of covariate and dependent variable (83). Square root and cube root transformations were applied to address assumption violations where necessary since data distributions appeared to be right-skewed (84). Patients were excluded from analyses if they had incomplete data (incomplete baseline or follow-up surveys, missing responses to the GAD-7 or PHQ-9 questionnaires, or if they withdrew from the study) for the time points being explored.

2.4.5 – Sub-group Analyses:

Additional sub-group analyses were completed for exploratory purposes. Firstly, a subset of patients with scores ≥10 for GAD-7 or PHQ-9 (i.e., consistent with moderate to severe generalized anxiety disorder or major depressive disorder, respectively) were analyzed. Studies have shown that using a threshold of ≥10 produces high sensitivity for detecting clinically significant changes (73,74,77,85). Therefore, these exploratory analyses were performed to assess the impact of the CHN intervention for individuals with probable clinical anxiety and depression, who presumably would need further support managing their health. Further sub-group analyses were considered based on results of descriptive statistics. Any sub-category of age, gender, marital status, highest level of education, employment status, annual household income, racial, ethnic, and cultural background, and number of chronic conditions with relatively higher or lower PHQ-9 or GAD-7 scores was examined if it contained at least 30 patients at baseline. As with the primary analyses, ANCOVA was used to test for statistically significant differences in GAD-7 and PHQ-9 scores between intervention and control groups, only at six months, for all sub-group comparisons. Statistical analyses, power calculations, and assessment of analysis assumptions were performed using R (version 4.2.2 GUI 1.79 High Sierra Build) and R Studio (version 2023.09.01+494).

2.5 – Qualitative Component:

2.5.1 – Qualitative Approach and Paradigm:

The second objective of this study was to describe the experiences of CHNs and patients in situations pertaining to mental health. The rationale for undertaking this objective was to make clear how the topic of mental health might have arisen between a CHN and a patient, and how CHNs might have handled a broad range of mental health situations. A qualitative descriptive methodology was chosen to describe accurate accounts of the patients' experience after participating in the CHN program, and CHNs' experiences supporting patients. This was based on a close reading of the CHN case notes and interview transcripts with minimal interpretation, which is characteristic of qualitative description (86).

2.5.2 – Data Sources:

Two qualitative data sources were used: CHN case notes and interview transcripts with CHNs and patients. Both were already collected for the ENCOMPASS trial at CWC PCN and available for use.

Case notes for 88 patients were available for analysis, collected between 2021 and 2022 at CWC PCN, and all were included in the qualitive analysis phase. CHNs kept case notes for all intervention patients, which contained all documentation pertaining to patient work, including: needs assessments, action planning forms containing patients self-identified priorities, updates for clinics, and patient encounter forms with comments and lists of activities completed during each encounter. Needs assessments and action planning forms were completed at the beginning of the CHN intervention, while patient encounter forms and clinic updates were completed throughout the intervention period up until the last patient encounter. CHNs recorded case notes as a standard operating procedure of the role. Notes were written and stored electronically on REDCap. These notes contained CHNs' experiences when working with their patients, and instances where CHNs wrote direct quotes from patients during encounters. Some CHNs had supported patients with their mental health goals. Other situations pertaining to anxiety, depression, and general mental health concerns arose during encounters between CHNs and some patients, and these were captured in the notes.

For the interview data, transcripts of five interviews with CHNs and nine interviews with patients completed between 2022 and 2023 were analyzed. Interviews were semi-structured, approximately 60-minutes in length, and were conducted by one of four ENCOMPASS researcher staff members in person, over the phone, or over Zoom. Separate interview guides were used for patient and CHN interviews. Both guides elicited impressions of the program and CHN role, how and if CHNs helped, successes and challenges, lessons learned, and recommendations (Appendices A and B). The interviews did not specifically inquire about mental health; however, they broadly captured overall impressions and experiences of CHNs' work with patients, and patients' experiences of being supported by CHNs, which provided an opportunity to discuss mental health if it was relevant to patient or CHN experience.

2.5.3 – Researcher characteristics and reflexivity

It is important that I declare my former and current roles with ENCOMPASS, and how these roles might have influenced this research undertaking. I had certain pre-conceptions about how mental health was handled by CHNs based on my experience as a CHN at Mosaic PCN (2019 and 2020), a CHN supervisor at CWC PCN (2020 and 2022), and a current research assistant with ENCOMPASS. These experiences led me to believe that situations of mental health do arise when CHNs work with patients, and CHNs are able to perform activities to address these situations that eventually lead to an outcome. Witnessing and navigating situations of mental health when they arose in my, and my CHN colleagues' patients spurred my interest in formally evaluating the CHN intervention's impact on mental health.

My affiliations with ENCOMPASS and the CHN program led me to constantly engage in reflexivity, which is defined as ongoing appraisal of how one's subjective experience might be influencing their research (87). Both data sources being analyzed contained information detailing my work as a CHN, meaning my own experiences as a CHN were reflected in the data used for this study. This presented a risk of biasing my interpretation towards a positive or beneficial outcome during analysis, or conversely being overly critical of my work in an attempt to overcorrect this bias. Having been involved in the implementation and delivery of this program might have also biased my perception about its effectiveness. These risks are likely limited to the data analysis and interpretation phases of this study since I was not involved with data collection at CWC PCN.

Other aspects of my identity have shaped my motivations for undertaking this research, and how I approached the data to varying degrees. As a 29-year-old, English-speaking male with a middle-class upbringing, I have been granted many social and financial privileges that people dealing with complex mental and physical health conditions may not have. Therefore, I cannot truly understand the experiences of individuals who need to navigate the complexities of their health, along with their social determinants of health, in order to improve their well-being. However, my past experiences make me strive to empathize with these individuals. As a second-generation Canadian of Vietnamese origin, I have seen how intersecting cultural, financial, and educational barriers to care have impacted my family and community members who sometimes lacked the resources, time, or literacy required to optimize their care. In the past I have advocated and interpreted for family members during healthcare appointments, and also connected them to health and social resources. Having witnessed their challenges motivated me to seek out professional and extracurricular opportunities where I could better support people dealing with these challenges. This is what drew me to become a CHN, which led to my desire to learn more about social determinants of health, and the different factors that contribute to an individual's well-being, including mental health.

My purpose for undertaking a reflexive practice is to enhance the status of my research, in keeping with the ideas proposed by Gough and Madill (88). While it is impossible to separate one's subjectivity from qualitative research (87), it is my goal to be transparent about how my subjective experience drives my research motivations, the associated risks, and potential strengths. Despite the associated risks with subjectivity, I do believe that my prior experiences were valuable for informing my analysis by providing me with deeper insight into the nuances of the experiences being explored, which is in line with Gough and Madill's perspective on subjectivity as a strength (88). Nonetheless, I was determined to remain as objective as possible, avoided making assumptions during analysis, and employed other safeguards to enhance trustworthiness. By disclosing my reflexive process, I hope to demonstrate to the reader my commitment to enhancing the trustworthiness of this study's findings.

2.5.4 – Data Analysis:

Patients and CHNs were assigned unique identifiers based on the order they appeared on ENCOMPASS data lists. An 'I' at the beginning of the identifier indicates data from interview transcripts (e.g., I-CHN-1, I-Patient-1, etc.) while 'CN' indicates excerpts from case note data (e.g., CN-Patient-1). These identifiers were used to preserve patient and CHN confidentiality during the presentation of results.

A combination of deductive and inductive strategies was utilized throughout data analysis for both data management and interpretation (89). A deductive coding strategy was applied during the initial reading of the data for the purpose of identifying and sorting data into categories most relevant for the qualitative research question, and for early codebook development, as outlined by Bingham (89). Preliminary codes were created in order to broadly capture *Mental Health Situations,* CHN *activities,* and *outcomes* in line with Bingham's approach using deductive codes at this stage.

Inductive codes along with their definitions were developed as sub-categories of preliminary codes during a second round of coding. A primarily inductive content analysis (ICA) approach was used during the open coding phase of the study for line-by-line coding of data excerpts identified in the initial reading of case notes and interview transcripts, an approach useful for understanding and describing a phenomenon (90). This is fitting for this study's qualitative descriptive methodology, and for addressing the objective of describing the experiences of CHNs and patients to better understand how CHNs handled broad situations of mental health. An inductively driven analysis was also useful for creating codes that were more representative of the data since the data sources were not collected to study mental health. The ideas captured in these codes were more specific to identify meaning in relation to the research question. Some deductive coding of CHN *activities* and *outcomes* was also completed during this phase, which identified specific *activities* and *outcomes* in the CHN program theory (Figure 1) within the preliminary codes.

A third and final round of coding was completed to refine sub-categories of codes and finalize the codebook. Inductive and deductive codes that best reflected the patterns in the data were synthesized and interpreted to form the final set of themes. Coding was completed while adhering to a manifest style of ICA, which Vears describes as analyzing what is apparent while avoiding inferring meaning beyond what is written (90). Coding of case notes and interview transcripts was done separately, although the same codebook was used for both. Any inductive codes created, or other changes made to the codebook for case note analysis were applied to the interview analysis codebook, and vice versa. Journalling was completed throughout each phase of data analysis, and ENCOMPASS team members were consulted for support with theme development. Data were imported into NVivo 14 (QSR International) for line-by-line coding.

Coding frequency and summaries in NVivo aided with identifying patterns in the data, data analysis, and compiling quotes for theme development.

2.5.5 – Techniques for Trustworthiness:

I maintained a journal as an audit trail for coding, analysis, and interpretation decisions. Three other researchers on the ENCOMPASS team (DGJ, GB, and MA) participated in the open coding stage of analysis. DGJ is a research associate with expertise in qualitative methods. GB and MA are both trained in qualitative analysis. All researchers work closely with the case note data, and DGJ has also worked closely with interview data. I also met with DGJ on a biweekly basis. During these meetings, we engaged in conversations regarding the data. DGJ acted as a second coder where appropriate, and KCM supported with refining final set of themes. The support with coding, reviewing, and frequent meetings provided an opportunity to appreciate alternative lenses for the data, triangulate findings, and mitigate bias. I was able to share my coding and themes with other members of the ENCOMPASS team when necessary. This multidisciplinary team consists of faculty members, healthcare professionals (physicians), and patient partners, all diverse in gender, ethnicity, and educational background. I also had the opportunity to my share findings with two committee members, DC and BO, who are PhD level clinician-scientists, and have backgrounds in endocrinology and family medicine, respectively. DC is a co-principal investigator of ENCOMPASS while BO has no prior affiliation.

2.6 – Mixed-methods integration:

As part of the convergent mixed-methods design, the quantitative and qualitative results were integrated and compared when the analyses for both components were complete. An integrated results joint display, complete with meta-inferences using combined findings, was applied at the point of integration in order to add clarity to the comparisons (71,91). The meta-inferences were used for interpretation and conclusions.

2.7 – Ethics:

Approval from the Conjoint Health Research Ethics Board of the University of Calgary was obtained for ENCOMPASS: ENhancing COMmunity health through Patient navigation, Advocacy and Social Support – Program Expansion Trial B (CWC)(REB20-0009). The analysis of GAD-7 and PHQ-9 outcomes was included in the approved protocol, and therefore no modifications were necessary for the quantitative portion of this study. Similarly, analyzing qualitative data sources for the purpose of exploring patient and CHN experience was also included, and no modifications were necessary for the qualitative portion of this study.

Chapter 3 – Results:

3.1 – Quantitative:

3.1.1 – Descriptive Statistics:

Table 2 summarizes baseline sociodemographic characteristics for 183 patients enrolled in the ENCOMPASS study at CWC PCN. The average age of study participants was 68.5 (SD 12.8; range 30 – 97), and most patients in the study were over the age of 65 (n = 123, 67.2%). There were slightly more males (n = 97, 53.0%) than females (n = 86, 47.0%) and a majority of patients were married or in common law relationships (n = 108, 59.0%). More than half of the patients either had a university degree, college diploma, or advanced degree (n = 115, 62.8%). A majority were retired (n = 116, 63.4%), the most commonly reported category of household income was $30,000 – $59,999 per year (n = 44, 24.0%), while another fifth reported household income under $30,000 (n = 36, 19.7%). A large majority of patients identified as being white for their ethnic, racial, cultural background (n = 150, 82.0%). Finally, about half of the participants reported having 5 or more chronic conditions (n = 94, 51.4%).

Table 2. Summary of sociodemographic characteristics.

Characteristic	Overall (n = 183)	Intervention (n = 90)	Control (n = 93)
Age			
Under 65 years old	60 (32.8%)	24 (26.7%)	36 (38.7%)
65 years old and over	123 (67.2%)	66 (73.3%)	57 (61.3%)
Gender			
Female	86 (47.0%)	42 (46.7%)	44 (47.3%)
Male	97 (53.0%)	48 (53.3%)	49 (52.7%)
Marital Status			
Married	108 (59.0%)	52 (57.8%)	56 (60.2%)
Not Married	75 (41.0%)	38 (42.2%)	37 (39.8%)
Highest level education			
Less than high school (or equivalent)	16 (8.7%)	9 (10.0%)	7 (7.5%)
High school diploma (or equivalent)	37 (20.6%)	19 (21.1%)	18 (19.4%)
Registered trade/apprenticeship diploma or certificate	14 (7.7%)	11 (12.2%)	3 (3.2%)

College, CEGEP, or non-university diploma	46 (25.1%)	17 (18.9%)	29 (31.1%)
University degree	47 (25.7%)	25 (27.8%)	22 (23.7%)
Advanced degree (MD, Masters, Doctorate, or Professional)	22 (12.0%)	9 (10.0%)	13 (14.0%)
Prefer not to answer	1 (0.55%)	NA	1 (1.08%)
Current employment status			
Unemployed-seeking employment	9 (4.9%)	3 (3.3%)	6 (6.5%)
Retired	116 (63.4%)	62 (68.9%)	54 (58.1%)
Full-time employee	31 (16.9%)	15 (16.7%)	16 (17.2%)
Part-time employee	8 (4.4%)	3 (3.3%)	5 (5.4%)
Other	19 (10.4%)	7 (7.8%)	12 (12.9%)
Prefer not to answer	NA	NA	NA
Annual Household Income			
\$0 to \$29,999	36 (19.7%)	17 (18.9%)	19 (20.4%)
\$30,000 to \$59,999	44 (24.0%)	22 (24.4%)	22 (23.7%)
\$60,000 to \$89,999	24 (13.1%)	14 (15.6%)	10 (10.8%)
\$90,000 to \$119,999	18 (9.8%)	10 (11.1%)	8 (8.6%)
\$120,000 up to \$149,999	16 (8.7%)	5 (5.6%)	11 (11.8%)
\$150,000 or more	17 (9.3%)	9 (10.0%)	8 (8.6%)
Prefer not to answer	26 (14.2%)	13 (14.4%)	13 (14.0%)
Not available	2 (1.1%)	NA	2 (2.2%)
Racial, ethnic, cultural background			
White	150 (82.0%)	76 (84.4%)	74 (79.6%)
Latin American	NA	NA	NA
Black or African Canadian	4 (2.2%)	NA	4 (4.3%)
East Asian	8 (4.4%)	3 (3.3%)	5 (5.4%)
Aboriginal or Indigenous	4 (2.2%)	2 (2.2%)	2 (2.2%)
Middle Eastern	2 (1.1%)	NA	2 (2.2%)
South Asian	8 (4.4%)	5 (5.6%)	3 (3.2%)
Southeast Asian	2 (1.1%)	2 (2.2%)	NA
Prefer not to answer	2 (1.1%)	1 (1.1%)	1 (1.1%)
Do not know	1 (0.5%)	NA	1 (1.1%)
Not Available	2 (1.1%)	1 (1.1%)	1 (1.1%)
Number of chronic conditions			
0-2	40 (21.9%)	20 (22.2%)	20 (21.5%)
3-4	49 (26.8%)	24 (26.7%)	25 (26.9%)
5-6	49 (26.8%)	25 (27.8%)	24 (25.8%)
≥7	45 (24.6%)	21 (23.3%)	24 (25.8%)

Table 3 shows baseline mean GAD-7 and PHQ-9 scores across sociodemographic categories by study arm. Overall mean baseline GAD-7 and PHQ-9 scores were 3.7 (SD 4.2) and 5.2 (SD 5.7), respectively. Control group patients had slightly higher GAD-7 and PHQ-9 scores than intervention patients. Patients that were under 65 years of age, with an annual household income \$0 - \$29,999, or with greater than or equal to seven chronic conditions had relatively higher (indicating more severe symptoms) GAD-7 and PHQ-9 scores at baseline than the remaining sub-groups in their respective categories. Additionally, patients with a high school education, or five to six chronic conditions had relatively higher PHQ-9 scores only. These sub-groups also had sample sizes greater than n = 30 and were therefore selected for further exploratory analysis.

Table 3. Baseline mean GAD-7 and PHQ-9 scores across sociodemographic categories by study arm. The first line of each row contains the mean GAD-7 score (SD), and the second line contains mean PHQ-9 score (SD).

Characteristic	Overall	Intervention	Control
Baseline GAD-7 score	3.2 (4.73)	2.9 (4.4)	3.5 (5.1)
Baseline PHQ-9	5.2 (5.73)	4.7 (5.7)	6.0 (5.8)
Age			
Under 65 years old	5.4 (5.8)* 7.8 (6.8)*	5.5 (6.0) 8.1 (7.4)	5.4 (5.9) 7.5 (6.5)
65 years old and over	2.2 (3.7) 3.9 (4.7)	2.0 (3.1) 3.5 (4.5)	2.4 (4.2) 4.5 (4.9)
Gender			
Female	3.5 (4.7) 5.7 (5.5)	3.3 (4.5) 5.1 (5.1)	3.7 (4.9) 6.3 (5.9)
Male	3.0 (4.8) 4.7 (5.9)	2.6 (4.2) 4.4 (6.3)	3.4 (5.3) 5.1 (5.5)
Marital Status			
Married	2.8 (4.07) 4.6 (5.18)	2.1 (3.13) 3.3 (4.47)	3.4 (4.72) 5.8 (5.52)
Not Married	3.9 (5.52) 6.1 (6.38)	4.1 (5.40) 6.7 (6.74)	3.7 (5.70) 5.4 (6.02)
Highest level education			
Less than high school (or equivalent)	1.7 (3.4) 4.6 (6.0)	1.1 (2.6) 4.8 (6.5)	2.4 (4.4) 4.4 (5.9)
High school diploma (or equivalent)	4.0 (5.5) 6.2 (6.4)*	4.16 (5.3) 6.26 (6.4)	3.9 (5.9) 6.2 (6.6)
Registered trade/apprenticeship diploma or certificate	4.3 (7.0) 6.4 (8.4)	3.6 (5.5) 5.4 (7.3)	7 (12.1) 10 (13.1)
College, CEGEP, or non-university diploma	3.3 (4.1) 4.9 (4.4)	2.9 (3.6) 3.5 (3.3)	3.5 (4.4) 5.7 (4.7)
University degree	3.1 (4.4) 4.9 (5.1)	2.2 (3.2) 3.7 (4.2)	4.1 (5.4) 6.3 (5.8)
Advanced degree (MD, Masters, Doctorate, or Professional)	2.6 (4.6) 4.5 (6.4)	3.3 (5.7) 5.7 (8.9)	2.0 (3.7) 3.6 (4.1)
Prefer not to answer	2.0 (NA) 1.0 (NA)	NA	2.0 (NA) 1.0 (NA)
Current employment status			
Unemployed-seeking employment	6.9 (7.2)	13.7 (7.6)	3.5 (4.4)

	9.6 (9.3)	19.7 (9.3)	4.5 (3.5)
Retired	2.3 (3.7) 4.1 (4.6)	2.1 (3.1) 3.6 (4.3)	2.5 (4.3) 4.7 (5.0)
Full-time employee	4.4 (4.5) 5.5 (4.2)	3.2 (4.0) 4.3 (3.5)	5.5 (4.8) 6.6 (4.6)
Part-time employee	0.9 (1.1) 2.3 (2.1)	1.3 (1.5) 4.0 (1.7)	0.6 (0.9) 1.2 (1.6)
Other	6.6 (7.2) 10.3 (8.8)	6.1(6.8) 9.0 (10.1)	6.9 (7.7) 11 (8.4)
Prefer not to answer	NA	NA	NA
Annual Household Income			
$0 to $29,999	5.1 (6.5)* 8.4 (7.8)*	5.1 (6.2) 9.1 (8.0)	5.2 (6.9) 7.8 (7.7)
$30,000 to $59,999	2.2 (3.6) 4.1 (3.7)	2.0 (2.7) 3.8 (3.6)	2.5 (4.4) 4.3 (3.9)
$60,000 to $89,999	3.6 (3.6) 5.9 (6.1)	3.1 (3.7) 5.2 (6.1)	4.2 (3.4) 6.8 (6.2)
$90,000 to $119,999	1.4 (3.4) 2.7 (3.4)	1.0 (2.3) 1.7 (2.4)	1.9 (4.65) 4.0 (4.1)
$120,000 up to $149,999	1.4 (2.0) 3.1 (3.1)	1.8 (2.5) 2.2 (2.9)	1.2 (1.9) 3.6 (3.2)
$150,000 or more	3.5 (3.9) 4.4 (4.1)	3.1 (3.2) 3.8 (3.1)	4.0 (4.8) 4.0 (4.1)
Prefer not to answer	3.77 (5.31) 5.15 (6.44)	3.23 (5.88) 3.77 (6.58)	4.31 (4.85) 6.54 (6.23)
Not available	9.0 (12.7) 9.0 (11.3)	NA	9.0 (12.7) 9.0 (11.3)
Racial, ethnic, cultural background			
White	3.3 (4.8) 5.1 (5.7)	2.7 (4.0) 4.4 (5.5)	3.9 (5.5) 5.9 (6.0)
Latin American	NA	NA	NA
Black or African Canadian	3.8 (5.7) 5.8 (8.0)	NA	3.8 (5.7) 5.8 (8.0)
East Asian	0.6 (1.06) 2.8 (2.55)	0.0 (0) 2.3 (3.21)	1.0 (1.2) 3.0 (2.5)
Aboriginal or Indigenous	5.8 (8.9) 7.5 (10.3)	9.5 (13.4) 13.0 (14.1)	2.0 (1.41) 2.0 (0)
Middle Eastern	1.5 (2.1) 9.0 (7.1)	NA	1.5 (2.1) 9.0 (7.1)
South Asian	3.3 (3.4) 6.6 (6.7)	3.2 (3.4) 7.2 (8.3)	3.3 (4.2) 5.7 (4.0)
Southeast Asian	7.5 (7.8) 6.0 (2.8)	7.5 (7.8) 6 (2.8)	NA
Prefer not to answer	1.5 (2.1) 3.0 (4.2)	0.0 (NA) 0.0 (NA)	3.0 (NA) 6.0 (NA)
Do not know	0.0 (NA) 6.0 (NA)	NA	0.0 (NA) 6.0 (NA)
Not Available	2.5 (3.5) 4.5 (2.1)	5.0 (NA) 6.0 (NA)	0.0 (NA) 3.0 (NA)
Number of chronic conditions			

0-2	2.0 (3.3)	1.8 (2.9)	2.2 (3.6)
	2.9 (3.6)	2.4 (3.9)	3.4 (3.2)
3-4	2.6 (4.3)	2.0 (3.9)	3.3 (4.7)
	3.9 (4.5)	3.0 (3.2)	4.7 (5.5)
5-6	3.2 (4.7)	3.1 (4.3)	3.3 (5.1)
	5.0 (6.1)*	5.5 (6.7)	4.6 (5.5)
≥7	5.1 (5.9)*	4.9 (5.4)	5.2 (6.4)
	8.8 (6.5)*	7.9 (6.9)	9.6 (6.1)

*Groups selected for sub-group analysis

Figure 2 shows the number of participants in the ENCOMPASS study at the CWC PCN, those with GAD-7 and PHQ-9 data available for this study, and those excluded along with their reasons for exclusion.

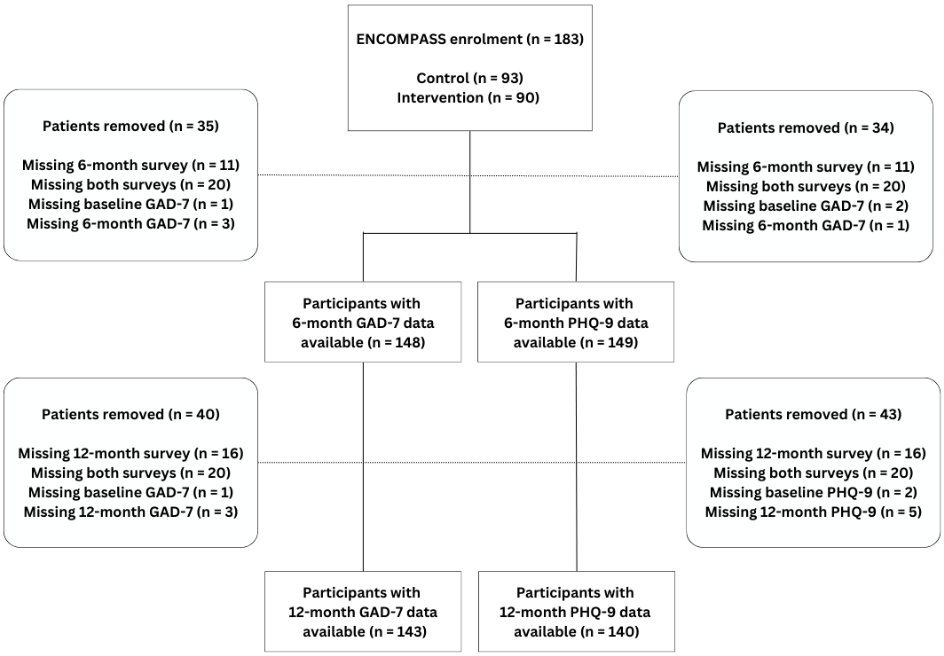

Figure 2. Flow diagram of the number of patients enrolled in the ENCOMPASS study at CWC PCN between 2021 – 2022, included in this study for analyses, and excluded with reasons.

The only noteworthy differences for MCIDs were seen for GAD-7 at 6-months, in that a greater proportion of control patients (n = 12, 16.4%) reported minimal clinically important increases compared with intervention patients (n = 4, 5.3%). However, the number of participants with MCIDs was small. Besides this, the number of intervention and control patients that reported no minimal clinically important differences, minimal clinically important decreases, and minimal clinically important increases for GAD-7 and PHQ-9 scores were mostly similar at 6- and 12-months. Descriptive statistics for MCID are summarized in Table 4.

Table 4. Summary of MCID descriptive statistics.

GAD-7	Study Arm	No change	MCID - decreased	MCID - increased
6 – months (n = 148)	Control (n = 73)	51 (69.9%)	10 (13.7%)	12 (16.4%)
	Intervention (n = 75)	61 (81.3%)	10 (13.3%)	4 (5.3%)
12 – months (n = 143)	Control (n = 69)	53 (76.8%)	10 (14.5%)	6 (8.7%)
	Intervention (n = 74)	61 (82.4%)	8 (10.8%)	5 (6.8%)
PHQ-9				
6 – months (n = 149)	Control (n = 74)	59 (79.7%)	6 (8.1%)	8 (10.8%)
	Intervention (n = 75)	65 (86.7%)	5 (6.7%)	6 (8.0%)
12 – months (n = 140)	Control (n = 68)	52 (76.5%)	10 (14.7%)	6 (8.8%)
	Intervention (n = 72)	60 (83.3%)	8 (11.1%)	4 (5.6%)

3.1.2 –Primary Analyses:

Results of statistical analyses, including all unadjusted and adjusted mean GAD-7 and PHQ-9 scores are summarized in Table 5. With the exception of the 6-month GAD-7 analysis, all analyses were underpowered. Either square root or cube transformations were performed for all four datasets due to the continuous data violating assumptions of normality and homoscedasticity. While these transformations did not fully rectify the assumptions, they were significantly improved (Table 6).

3.1.3 – GAD-7 analyses:

A total of 148 patients were included in the GAD-7 comparison at 6-months. The power for this analysis was 90.4%. The one-way ANCOVA test demonstrated a significant difference in mean GAD-7 scores between intervention and control groups at 6-months [$F(1,145) = 5.1$, $p = 0.025$]. Post-hoc analysis showed that adjusted mean GAD-7 scores for intervention and control groups were 2.26 (95% CI, 1.46 – 3.06) and 3.57 (95% CI, 2.76 – 4.38), respectively. However, 6-month GAD-7 data appeared to violate assumptions of normality and homoscedasticity, and a cube root transformation was applied. Following transformation, there was no significant difference in mean GAD-7 scores between intervention and control groups at 6-months [F(1,145) = 2.62, p = 0.11].

The 12-month GAD-7 analysis included 143 patients, and had a power = 12.1%. The one-way ANCOVA test did not find a significant difference in mean GAD-7 scores between intervention and control groups at 12-months [F(1,140) = 0.054, p = 0.82]. The difference remained non-significant following a cube root transformation to address violations of normality and homoscedasticity [F(1,140) = 0.00040, p = 0.98].

3.1.4 – PHQ-9 analyses:

For the one-way ANCOVA comparing mean PHQ-9 scores at 6-months, 149 patients were included and the power of the analysis was 52.3%. There was no significant difference in mean PHQ-9 score between intervention and control groups at 6-months [F(1,146) = 0.12, p = 0.73], and this was also true for the analysis with square root transformed data [F(1,146) = 0.19, p = 0.66].

As for the one-way ANCOVA comparing mean PHQ-9 scores at 12-months, 140 patients were included and the power of the analysis was 33.3%. Similarly, there was no significant difference in mean PHQ-9 score between intervention and control groups at 12-months [F(1,137) = 0.010, p = 0.92]. This lack of significant difference was also seen following a square root transformation on the data [F(1,137) = 0.048, p = 0.83].

Table 5. Results of primary ANCOVA analyses with adjusted and unadjusted mean GAD-7 and PHQ-9 scores.

Analysis	n	Mean (SD) Follow-Up Score	Mean (95% CI) Follow-Up Score (adjusted)	ANCOVA F-stat, p-value	ANCOVA F-stat, p-value (transformed)
6-month GAD-7	148			[F(1,145) = 5.1, p = 0.025	F(1,145) = 2.62, p = 0.11
Intervention	73	1.97 (3.07)	2.26 (1.46 – 3.06)		
Control	75	3.86 (5.27)	3.57 (2.76 – 4.38)		
12-month GAD-7	143			F(1,140) = 0.054, p = 0.82	F(1,140) = 0.00040, p = 0.98
Intervention	69	2.51 (4.13)	2.74 (2.11 – 3.36)		
Control	74	2.87 (4.15)	2.63 (1.98 – 3.28)		
6-month PHQ-9	149			F(1,146) = 0.12, p = 0.73	F(1,146) = 0.19, p = 0.66
Intervention	75	4.27 (5.20)	4.84 (3.90 – 5.78)		
Control	74	5.65 (5.88)	5.07 (4.12 – 6.01)		
12-month PHQ-9	140			F(1,137) = 0.010, p = 0.92	F(1,137) = 0.048, p = 0.83
Intervention	72	3.96 (4.47)	4.40 (3.64 – 5.16)		
Control	68	4.81 (4.84)	4.34 (3.56 – 5.13)		

Table 6. Summary of assumptions assessment for primary ANCOVA analyses, strategies applied to address violations, and results.

	Assessment	Met or Violated	Transformation	Result
6-month GAD-7				
Normality	Shapiro-Wilk Test, $p = 1.38 \times 10^{-11}$ Skewness = 1.55	Violated	Cube root	Shapiro-Wilk Test, p = 0.0049 Skewness = 0.20
Homoscedasticity	Breusch-Pagan Test, $p = 2.40 \times 10^{-9}$	Violated	Cube root	Breusch-Pagan Test, p = 0.20
Linearity	Scatterplot	Met	--	--
Independence of DV and covariate	Scatterplot	Met	--	--
12-month GAD-7				
Normality	Shapiro-Wilk Test, $p = 9.47 \times 10^{-6}$ Skewness = 0.41	Violated	Cube root	Shapiro-Wilk Test, p = 0.00014 Skewness = -0.19
Homoscedasticity	Breusch-Pagan Test, $p = 6.21 \times 10^{-23}$	Violated	Cube root	Breusch-Pagan Test, p = 0.26
Linearity	Scatterplot	Met	--	--
Independence of DV and covariate	Scatterplot	Violated	--	--
6-month PHQ-9				
Normality	Shapiro-Wilk Test, $p = 4.11 \times 10^{-12}$	Violated	Square root	Shapiro-Wilk Test, p = 0.00031

	Skewness = 1.57			Skewness = 0.59
Homoscedasticity	Breusch-Pagan Test, p = 3.02×10^{-7}	Violated	Square root	Breusch-Pagan Test, p = 0.31
Linearity	Scatterplot	Met	--	--
Independence of DV and covariate	Scatterplot	Violated	--	--
12-month PHQ-9				
Normality	Shapiro-Wilk Test, p = 6.26×10^{-9} Skewness = 1.27	Violated	Square root	Shapiro-Wilk Test, p = 0.045 Skewness = 0.13
Homoscedasticity	Breusch-Pagan Test, p = 5.11×10^{-6}	Violated	Square root	Breusch-Pagan Test, p = 0.59
Linearity	Scatterplot	Met	--	--
Independence of DV and covariate	Scatterplot	Violated	--	--

Alpha value for Shapiro-Wilk Test and Breusch-Pagan is p = 0.05

3.1.5 – Sub-group Analyses:

Results for exploratory sub-group ANCOVA analyses are summarized in Table 7. Out of all of the sub-group analyses of GAD-7 scores at 6-months, the only sub-group in which a statistically significant difference was detected was patients with an annual household income \$0 – \$29,999. For patients in this sub-group, there was a significant difference in GAD-7 scores at 6-months between intervention and control groups [F(1,26) = 6.25, p = 0.019). Post-hoc analysis revealed that adjusted mean GAD-7 scores for intervention and control groups were 2.43 (95% CI, 0.013 – 4.85) and 6.60 (95% CI, 4.26 – 8.93), respectively. For all other sub-groups, there was no significant difference in GAD-7 scores at 6-months between intervention and control groups: clinical anxiety [F(1,11) = 0.30, p = 0.60], under 65 years of age [F(1,43) = 1.41, p = 0.24], and greater than or equal to 7 CHCs [F(1,30) = 1.02, p = 0.32].

For the PHQ-9 exploratory analysis, there was no significant difference in scores at 6-months between intervention and control groups for any sub-groups: clinical depression [F(1,22) = 0.00050, p = 0.98], under 65 years of age [F(1,44) = 0.081, p = 0.78], an annual household income between \$0 – \$29,999 [F(1,26) = 1.06, p = 0.31], with a high school education [F(1,23) =

3.61, p = 0.070], with 5-6 CHCs [F(1,40) = 0.033, p = 0.86], and with greater than or equal to 7 CHCs [F(1,31) = 0.43, p = 0.52].

Table 7. Summary of sub-group analyses results using ANCOVA for mean GAD-7 and PHQ-9 scores at 6-months.

	n	Mean (95% CI) Follow-Up Scores (Adjusted)	ANCOVA F-stat, p-value
GAD-7			
Scores ≥10	14		F(1,11) = 0.30, p = 0.60
Intervention	5	8.12 (2.31 – 13.90)	
Control	9	9.93 (5.62 – 14.20)	
Under 65 years old	46		F(1,43) = 1.41, p = 0.24
Intervention	16	1.59 (0.00 – 3.40)	
Control	30	2.92 (1.61 – 4.23)	
Annual Income $0 – $29,999	29		F(1,26) = 6.25, p = 0.019
Intervention	14	2.43 (0.013 – 4.85)	
Control	15	6.60 (4.26 – 8.93)	
≥7 CHCs	33		F(1,30) = 1.02, p = 0.32
Intervention	13	8.23 (5.81 – 10.65)	
Control	20	7.06 (4.48 – 9.63)	
PHQ-9			
Scores ≥10	25		F(1,22) = 0.00050, p = 0.98
Intervention	8	11.90 (7.55 – 16.20)	
Control	17	11.90 (8.97 – 14.90)	
Under 65 years old	47		F(1,44) = 0.081, p = 0.78
Intervention	20	6.80 (4.51 – 9.09)	
Control	27	7.22 (5.26 – 9.19)	
Annual Income $0 – $29,999	29		F(1,26) = 1.06, p = 0.31
Intervention	11	8.50 (5.31 – 11.70)	
Control	18	6.47 (3.97 – 8.97)	
High school education	26		F(1,23) = 3.61, p = 0.070
Intervention	14	4.82 (2.48 – 7.16)	
Control	12	8.04 (5.50 – 10.58)	
5-6 CHCs	43		F(1,40) = 0.033, p = 0.86
Intervention	23	3.66 (2.68 – 4.63)	
Control	20	3.78 (2.86 – 4.69)	
≥7 CHCs	34		F(1,31) = 0.43, p = 0.52
Intervention	18	8.23 (5.81 – 10.65)	
Control	16	7.06 (4.48 – 9.63)	

3.2 – Qualitative Results:

Following the initial reading and data sorting phase, qualitative analysis was limited to text and transcript sections that included mentions of, or reference to, mental health. Mental health was mentioned in case notes of 36 of 88 patients for whom case notes were available. This included formally outlined mental health needs and goals related to patients' work with a CHN, CHN notes documenting comments made by patients relating to their mental health, and general mental health-related events that occurred in patients' lives (e.g., when patients experienced negative emotions, moments of stress caused by family, work, or other events, social isolation, general anxiety or panic attacks, depressive episodes, and crisis related events). Mental health was mentioned in four out of five CHN interviews to varying degrees, which included their experiences navigating patients' mental health, and general impressions about how mental health was addressed during the program. Mental health was mentioned in seven out of nine patient interviews, and mostly pertained to their own mental health, or the experience of receiving mental health support from their CHN. Analysis of these data sources produced three overarching themes: *Theme 1: Challenges CHNs faced*, *Theme 2: Challenges patients faced*, and *Theme 3: Benefits of CHN support*. These themes and their associated subthemes are expanded upon below, along with representative quotes.

3.2.1 – Theme 1: Challenges CHNs faced:

CHNs frequently addressed mental health throughout their work with patients. However, they faced challenges that hindered their ability to effectively address mental health with their patients, namely due to a lack of training and program guidelines regarding mental health, and some patients' discomfort towards mental health work.

Insufficient training and guidelines

CHNs discussed needing more training to address the wide variety of mental health situations that they encountered. CHNs also expressed a need for more clearly defined guidelines when it came to mental health to prevent them from working beyond their scope of practice.

> I would say mental health was a big thing when it comes to anxiety, depression, trying to find motivation from a person who is depressed, as well as some other disabilities like autism spectrum disorder, and things specific in that nature. I think I would have benefited from a little more mental health training. (I-CHN-4)

CHN-3 cautions: "just making sure that going forward, that there's boundaries for the CHN, or they may get in over their head, especially when you're dealing with people that may have severe mental illness" (I-CHN-3). This highlights CHNs' need for clear guidelines when addressing mental health so that they do not stray too far from their role expectations.

Patients' discomfort

Another challenge that CHNs encountered when trying to address patients' health needs was their level of comfort to address mental health. Some patients appeared to lack comfort with their CHN, or in general to address sensitive topics, which ultimately hindered their willingness to access mental health resources, hear suggestions to address their mental health, or even discuss mental health.

> Interviewer: […] do you think you trusted her enough if something happened in your life, in your personal life and something was on your mind and you really needed to share it […]?
>
> Respondent: I don't have that relationship with most people. […] If I was looking for resources and stuff, I trusted her to do that. If I was having like a mental issue, I wouldn't talk to most people, nothing to do with her though. (I-Patient-22)

There were other patients who exhibited signs of discomfort when their CHN broached the topic of mental health with them. CHN-1 reports an instance where they perceived Patient-58's discomfort when asked about mental health:

> I asked him how his mental health has been and he told me that he had crashed a bit but is doing much better now. When I asked him if he would like to explore supports to help with this he

> hesitated and I could tell he got uncomfortable. He told me that he is not interested at this time. (CN-Patient-58)

CHN-1 reported another patient felt uncomfortable accessing mental health resources due to their concerns surrounding mental health stigma: “She told me that she often worries about judgement surrounding accessing mental health supports” (CN-Patient-71). These excerpts highlight how patients’ apparent discomfort became a challenge for CHNs to adequately address mental health.

3.2.2 – Theme 2: Challenges patients faced:

There were also some challenges that patients faced when addressing their mental health with their CHN, which appeared to be due to external factors.

Lack of resources to address mental health

Many patients and CHNs reported a lack of resources as a factor affecting patients’ mental health. This included treatment-oriented resources to specifically address mental health symptoms, leaving CHNs without programs or services to refer patients to. One CHN recalls how a lack of internal PCN mental health resources was an issue for some patients:

> […] they got rid of our behavioural health consultants a couple months ago. And so for me, I had a couple patients who were seeing them and were really enjoying that, but then they got rid of them and the new program wasn’t available right away. So that was challenging just from an internal PCN standpoint. (I-CHN-1)

One of the patients this CHN was referring to who was impacted by the removal of internal resources was “hesitant to get community support for the same thing she was working with a behavioural health consultant for” (CN-Patient-75), demonstrating that even the setting in which resources are available may be a factor in some cases. CHN-4 also writes about supporting Patient-75: “She says that she doesn't know what I can support her with. She expressed that she is frustrated with a lot of things going on in her life, such as lack of availability of some healthcare providers […]" (CN-Patient-75). Again, the patient partly attributes the lack of internal mental health providers as a source of their frustration. There was also a lack of patient-specific resources - physical health, social, and financial. It was evident that physical health, social determinants, and mental health are all intertwined. For example, the case notes of a patient with stress and anxiety related to their unemployment shows how a lack of resources affected their mental and physical health: "The stress and lack of resources has been affecting his health and sleep as well, and the food he has been getting from the food bank has been quite unhealthy (lots of candy)" (CN-Patient-4). Overall, a lack of resources was a barrier for patients to address their mental health, either directly or by creating complications with their social determinants of health.

Pandemic pressures

A number of patients reported how the pressures associated with the COVID-19 pandemic created challenging situations and exacerbated their stress, either through economic hardship, or as a result of quarantine measures impacting their quality of life.

CHNs provided support to patients experiencing significant economic stress during the pandemic. CHN-4 writes how Patient-4 struggled to find employment during this time: "He mentioned to be getting a little demoralized from the rejection so I was able to reassure him that he has done a great job so far considering his situation, and the challenges because of COVID." CHN-4 also writes, "He re-iterated to me that getting a job will be the most significant 'treatment' for his current mental struggles" (CN-Patient-4). Another patient also attributed their mental health concerns to their employment situation, which was impacted by the COVID-19 pandemic. CHN-3 wrote this about the patient: "CHN is supporting [the patient] emotionally.

patient is struggling with her lack of income due to the pandemic" (CN-Patient-89). These quotes highlight how financial hardship can make it challenging, or even exacerbate someone's mental health.

Case notes of other patients show just how quarantine, or "lockdown", measures during the pandemic negatively impacted their mental health. In reference to these quarantine measures, CHN-1 reports this about their patient's mental health:

> Has apparently gotten way worse with Covid. Previously, even though she was struggling with anxiety and depression, she was pushed to go outside the house in order to live her life. Covid changed that and has escalated her mental health concerns. (CN-Patient-75)

The inability to engage in activities that previously brought them relief with their anxiety and depression appeared to exacerbate their mental health symptoms. The challenges posed by the COVID-19 pandemic appeared to be difficult to overcome, and brought stress to patients already experiencing mental health concerns, thus making it a barrier to effectively address their mental health.

3.2.3 – Theme 3: Benefits of CHN Support:

Despite the above limitations, there were many reports of how CHNs performed activities that were beneficial to patients' mental health. The data showed that the four activities that were most performed by CHNs to address mental health were: *(1) providing emotional and general support, (2) sharing or connecting patients to resources, (3) providing advice or suggestions,* and *(4) supporting patients to engage in physical activity*. *Providing support* was by far the most common activity, and CHNs performed this with nearly all patients when mental health situations arose. When patients experienced emotional hardship, CHNs *provided emotional support* by spending time with patients, showing sympathy, encouraging patients, offering help, and actively listening to patients' narratives. CHN*s supported patients to engage in physical* *activity* by accompanying them to exercise classes, gyms, or on walks, connecting them to resources for physical activity, or actively reminding and encouraging them to exercise; all of which often indirectly addressed their mental health. They also often *provided suggestions* to help solve problems, and *connected patients to resources* that either directly addressed their mental health, or addressed the barriers they were facing. CHN-4 reported *providing emotional support* with a patient while also helping them find employment. Their anxiety and stress were related to their employment situation:

> Today I provided him with more job postings […] and provided him with some emotional support during this difficult time. He expressed feeling helpless due to things beyond his control, and I tried to assure him we will continue to try our best. (CN-Patient-4)

Another patient recalls when CHN-1 *provided emotional support* by actively listening to them, and also provided *suggestions to solve their issue* of feeling socially isolated:

> She listened to me about what I thought my problems were. And one of the main things I was getting very isolated in the house. And she really helped me get a little bit over that, made suggestions. (I-Patient-53)

A patient mentions how CHN-1 *connected them to a resource* in the midst of a mental health crisis: “There was one particular period when I was getting pretty desperate and she gave me the distress line phone number and I called them and had a chat. That was OK. That was a good thing” (I-Patient-59).

Improved well-being

Some patients did report feeling better due to the activities that their CHN performed with them, which either reduced stress, alleviated anxiety, or contributed to better overall mental well-being. By helping patients stay accountable, they encouraged patients to engage in positive behaviours that made them feel better. As mentioned above, many patients also reported how

CHNs *connected them to resources* that made them feel better by addressing their mental health, or things that were exacerbating their stress. CHN-2 records how they *shared a resource* with a patient to help improve their sleep, which improved their well-being: "He had worked on his sleep schedule which greatly improved his mental health and anxiety, with using a sleep tracker" (CN-Patient-15). Here, the CHN aided the patient in adhering to a healthy behaviour that ultimately benefited their mental health conditions. Another example of a patient finding relief by engaging in healthy behaviours is Patient-53, who mentioned they became "very isolated" and depressed prior to joining the program, but said how the CHN, "[…] helped me kind of fight my isolation a bit like getting outside joining something, going for walks just for health" (I-Patient-53). The CHN addressed their mental health by encouraging them to be more socially active, and *supporting them to engage in physical activity.* Another patient specified how the *support with engaging in physical activity* and *connection to resources* (caregiver and financial), made them feel better:

> I think that having [CHN-1] assist me with the two major goals, have been better for my life and helped reduce stress, which I definitely don't need in my life. And then when my mom came to live with me that extra – going over and beyond – she helped me so much with that. I just think that my life is better financially and with my exercise and emotionally. (I-Patient-52)

The combination of addressing key barriers, and engaging in physical activity appeared to relieve these patients' stress, emphasizing just how closely mental and physical health can be connected. Finally, some patients felt better when CHNs provided *emotional support* by listening and spending time with patients. Patient-52 expressed how simply spending time with their CHN made them feel better:

> Interviewer: […] Can you describe your experience working with [CHN 1, name removed]? What was that like?

> Respondent: Oh it was wonderful. I mean, she's so nice. And I think that sometimes I would get a little – have a little anxiety – but I didn't feel that anxious when I was talking with [CHN-1]. She had a calming effect, sort to speak. And because of the help that she would provide, then I always felt better. (I-Patient-52)

Patient-53 shared how the holistic nature of the CHN program enabled them to address various dimensions of their mental and physical well-being, and ultimately made them feel better. In response to an interviewer inquiring about the physical health supports they received, this patient said this about the CHN program:

> It's deeper than that. It's like, not feeling so isolated, not being so depressed and enjoying things more. You know, I mean, they're all just physical things you listed off but like […] but it's mental and social that a lot of that darkness was lifted. (I-Patient-53)

Feeling cared for

Many of the patients that received mental health support from their CHN reported *feeling care for* and *positive experiences of care*, due to the interpersonal aspects of the working relationship between the CHN and the patient. It seemed that CHNs performed their activities while also being empathetic and understanding of patients' needs and feelings, which ultimately led to these patients *feeling like they were being cared for*. CHN-4 reported how patient-4, the same one who was experience stress related to their financial situation, *felt cared for* because the CHN *provided emotional support* and *connected them to resources*:

> I asked the patient if there was anything else that he could think of that I could support him with and he said no. He expressed that he was appreciative of all that I have done, providing an understanding and empathetic ear, and connection to resources. (CN-Patient-4)

When patients felt like they were being cared for, they themselves took a more active role in their own care and in working towards their goals. CHN-1 writes this about Patient-53 who they were supporting emotionally:

> She shared with me that she has seen many improvements in herself from participating in the CHN program and that it was exactly what she needed at the time […] she feels she has all of the knowledge she needs and she has also been proactive in seeking the things that she needs (CN-Patient-53)

In the process of understanding patients' needs and feelings, the holistic nature of the CHN approach addressed different dimensions of patient health. One patient reports: "I think it gave my morale a lift. And a big plus was these people are starting […] to treat people like a whole human being and not a piece of the pie. That was a real big benefit" (I-Patient-5).

3.3 – Mixed-Methods Integration– Joint Display:

In keeping with convergent mixed-methods design, the qualitative results of this study were merged with the quantitative results, using the three themes identified above (72). These themes provide insight into the anxiety and depression outcomes observed in the quantitative component of this study, as represented in a joint display (Table 8). Note that the quantitative results are based on analyses that used transformed data.

Table 8. Joint Display of quantitative and qualitative results.

Quantitative results (F-score, p-value)		Qualitative results (Themes and Illustrative Quotes)	Meta-inferences
6-month GAD-7 ANCOVA	No significant difference [F(1,145) = 2.62, p = 0.11]	***1) Theme 1: Challenges CHNs faced*** *a) Insufficient training and guidelines:* […] when it comes to anxiety, depression, trying to find motivation from a person who is depressed […] I think I would have benefited from a little more mental health training (I-CHN-4) *b) Patients' discomfort* I don't have that relationship with most people. […] If I was having like a mental issue, I wouldn't talk to most people, nothing to do with her though. (I-Patient-22) ***2) Theme 2: Challenges patients faced*** *a) Lack of resources to address mental health:* She expressed that she is frustrated with a lot of things going on in her life, such as lack of availability of some healthcare providers and her appointments getting postponed. (CN-Patient-75) *b) Pandemic pressures:* Has apparently gotten way worse with Covid. Previously, even though she was struggling with anxiety and depression, she was pushed to go outside the house in order to live her life. Covid changed that and has escalated her mental health concerns. (CN-Patient-75) ***3) Theme 3: Benefits of CHN support*** *a) Improved well-being:* […] sometimes I would get a little – have a little anxiety – but I didn't feel that anxious when I was talking with [CHN-1] […] And because of the help that she would provide, then I always felt better. (I-Patient-52) *b) Feeling cared for:* I think it gave my morale a lift. And a big plus was these people are starting […] to treat people like a whole human being and not a piece of the pie. That was a real big benefit. (I-Patient-5)	**Theme 1 – Consistent with quantitative results:** CHNs faced challenges, such as lack of training and patient discomfort to address mental health. Lead to lack of significant difference in outcomes. **Theme 2 – Consistent with quantitative results:** Lack of resources and pandemic pressures exacerbated mental health. Therefore, support did not translate to significant difference in outcomes. **Theme 3 – Inconsistent with quantitative results:** Some patients reported mental health benefits from CHN support, but this did not translate to significant difference in outcomes overall.
12-month GAD-7 ANCOVA	No significant difference [F(1,140) = 0.00040, p = 0.98]		
6-month PHQ-9 ANCOVA	No significant difference [F(1,146) = 0.19, p = 0.66]		
12-month PHQ-9 ANCOVA	No significant difference [F(1,137) = 0.048, p = 0.83]		

Chapter 4 –Discussion:

The quantitative portion of this study measured the impact of the CHN intervention on symptoms of anxiety and depression in patients with CHCs enrolled in the ENCOMPASS study at CWC PCN. There were no statistically significant differences in the mean anxiety and depression scores at -6 and -12 months between patients that received CHN support and patients that underwent usual care, with the exception of GAD-7 scores at 6-months. The degree of consistency between quantitative and qualitative results was mixed. The qualitative analysis revealed that CHNs and patients faced challenges that impeded their respective abilities to engage in mental health work, which might explain the lack of significant differences. Despite this, some patients reported benefits of CHN support for certain aspects of their mental health. This theme may be inconsistent with the quantitative findings, but it might also provide insight into the potential effect of CHN support on anxiety or indicate that the benefits are not reflected in the metrics that were used.

4.1 – Potential effect of CHN program on anxiety symptoms:

Prior to a cube-root transformation, there was a significant difference in mean 6-month GAD-7 scores between intervention and control patients. Control patients had a higher mean GAD-7 score than intervention patients. While this indicates lower symptom severity among intervention patients, average scores for both groups still fell within the minimal symptom severity category. While it is more reliable to base interpretations on transformed data (84) given the violation of assumptions for non-transformed data, this potential difference is still worth exploring. As captured in *Theme 3*: *Benefits of CHN support*, CHNs sometimes addressed patients' anxiety by connecting them to relevant resources, and some patients reported feeling better as a result. A similar lay-person intervention in Northern England, using the term 'social prescribing' instead of PN, saw more significant reductions in anxiety than this study. Woodall et al. attributed this finding to the prescribers/navigators helping with connection to community resources and social activities, leading to improved optimism in patients' lives, and translating to improved anxiety outcomes (92). The benefit of being connected to resources that directly or indirectly address patients' anxiety may explain why patients supported by CHNs had lower anxiety scores at 6-months than patients that underwent usual care. One important difference to note between this study and the study by Woodall et al. was that 40% of the patients in the latter study were 'severely' anxious at baseline. In contrast, a large majority of patients in the ENCOMPASS study were 'minimally' anxious. As previously mentioned, scores ≥10 for the GAD-7 have demonstrated high sensitivity for detecting clinically significant changes (73,74). Since a majority of patients had GAD-7 scores below 10 at baseline, this study might have had lower sensitivity to detect clinically significant improvements than the Woodall et al. study, where a larger proportion of patients were severely anxious. Although we did a sub-group analysis in patients with GAD-7 scores ≥ 10, the number included was small (n=14) and therefore underpowered.

4.2 – Integration of findings:

Theme 1: Challenges CHNs faced, was consistent with the quantitative results. Mental health was not an explicit priority of the program, and the CHN program was not designed to address mental health. The type of training that CHNs received, which lacked comprehensive mental health training, appeared to limit their ability to address mental health as far as impacting outcomes. Some CHNs claimed that the skills and knowledge they had were not sufficient, and they wanted training on general concepts related to mental health conditions, how to manage behaviours associated with certain conditions, and how to establish appropriate boundaries. The fact that they lacked mental health training seemed to contribute to CHNs feeling underprepared to support patients with these needs. The literature in this area is sparse, however studies have identified that directed mental health training for community health workers and other non-specialists improved knowledge, attitude, skill, confidence, and even patient outcomes (93,94). Another study that surveyed CHWs in the US during the COVID-19 pandemic found that a lack of training around communication, symptom identification, trauma, self-care, and stress reduction was a barrier to supporting patients' mental health (95), which is congruent with the findings in this study.

Another challenge that CHNs faced had to do with patients' individual levels of comfort to address mental health with their CHN. Some patients either were not trusting enough to discuss topics such as their mental health, or felt discomfort when their CHN brought up mental health. It is understandable that a patient's lack of comfort surrounding mental health would be a barrier for their CHN to work on it with them. Comfort is a key aspect of a therapeutic alliance, which is the patient and provider's agreement to help overcome a patient's challenges (96,97). There is extensive research on the association between a therapeutic alliance and outcomes for mental health interventions (96–99), with some in the context of navigator interventions (100). It is unclear from the data the reasons why these patients exhibited a *lack of comfort,* but this characteristic might have hindered the therapeutic alliance between the CHN and the patient, and therefore led to the lack of impact to anxiety and depression outcomes.

Theme 2: Challenges patients faced, was also consistent with the quantitative results. Patients and CHNs spoke of various factors that limited their ability to effectively address patients' mental health.

One challenge that many patients faced was a general lack of resources within the PCN and in the community, such as resources to treat or alleviate mental health conditions, primary care health services, or resources centered on social determinants of mental health (food, financial, social support, etc.). Patients reported how being unable to access or locate appropriate resources negatively affected their mental health, either by causing complications with their physical health conditions, their social determinants of health (e.g., finances and employment), or by creating feelings of helplessness and frustration. It is unsurprising how this could be a barrier to address one's mental health. This would also be a barrier for CHNs to provide support since connection to resources is a key component of the program that would be made futile if resources were not available. A lack of internal and external resources is a common barrier to patient mental health care in North America (63,95,101,102). Studies by Otis et al. (101) and Craske et al. (102) showed that an inability to access appropriate resources resulted in unmet needs for anxiety treatment. Garcini et al. also found that limited community services were a barrier for CHWs when supporting community members with their mental health needs (95). Lastly, a study in Glasgow saw no difference in anxiety or depression outcomes between groups receiving navigation support to address health inequalities and comparison groups (103). The authors attributed this to a lack of available resources due to reduced funding in the social services sector. The availability of resources likely contributed to the lack of CHNs' impact on patients' anxiety and depression outcomes.

There were some reports of how the pressures associated with the COVID-19 pandemic negatively affected patients' mental health. The ENCOMPASS trial at CWC PCN (2021 and 2022) coincided with the global pandemic that contributed to economic hardship and significant lifestyle changes worldwide, including in Canada (104–108). This particular period was marked by high rates of unemployment, inflation, and debt in Canada (109), which is consistent with reports of financial hardship seen in the qualitive data. It is well-documented that periods of economic hardship lead to poor mental well-being, increased incidence of mental illness and suicide, as a result of unemployment, income reduction, and debt (110). This relationship was also seen in studies evaluating the association between economic hardship as a result of COVID-19 and mental health (111,112). Furthermore, the data seem to agree with literature showing that the mental health of Canadians was negatively impacted during periods of quarantine and emergency "lockdown" measures throughout the pandemic. Studies attribute this to the inability to engage in health promoting behaviours (e.g., diet and exercise), increased risky behaviours (e.g., smoking, alcohol consumption, binging, etc.), and social isolation (104–108,113–115). Provincial restrictions did relax at some points during the trial at CWC PCN (116), however it is possible that many patients were unable to immediately reclaim their pre-pandemic quality of life. The challenges posed by COVID-19 ultimately were a barrier for patients to address their mental health, either by exacerbating their mental health, or by preventing them from engaging in mental health-promoting activities; another potential reason for the lack of impact on anxiety and depression outcomes.

At first glance, the experiences represented in *Theme 3: Benefits of CHN support,* were seemingly inconsistent with most of the quantitative results since they showed how CHN activities actually benefited patients' mental health. However, these findings may not be entirely surprising considering the improvement of GAD-7 scores at 6-months observed initially. While the benefits of CHN support may not have been profound enough to be captured in final anxiety and depression symptom scores, the findings from *Theme 3* provide reasons to believe that the improvement in GAD-7 at 6 months, prior to data transformation, was a real finding. They do this by providing a more nuanced understanding of how the program might support mental well-being. The activities that were performed the most to address mental health, and seemed to be the most beneficial were: *(1) providing emotional and general support, (2) sharing or connecting patients to resources, (3) providing advice or suggestions,* and *(4) supporting patients to engage in physical activity*. The mental health benefits that were reported were in the form of *improved well-being* and patients *feeling cared for*.

When patients reported *improved well-being*, it was typically from reduced stress, and alleviated anxiety. Very few patients reported alleviation of depression symptoms, again reinforcing the notion that the CHN role may be impactful for anxiety and not depression. As previously discussed, Woodall et al. postulated that the improved anxiety outcome in their study may be attributable to increased optimism in patients' lives (92), which is something a few patients in this study also reported. One study saw no significant difference between CHW intervention and control groups in psychosocial health measures (including anxiety), but improved patient self-rated psychosocial health in the intervention group (117). Another study found that a navigator intervention had a significant impact on mental well-being (118). This can be compared to this study, where despite no objective evidence of an impact on anxiety and depression symptom scales, the qualitative data supported the notion that the CHN program had beneficial effects on well-being, and helped patients to feel supported both physically and emotionally. Although it cannot be said that the CHN program improved outcomes related to specific mental health diagnoses, patients endorsed "feeling better" overall which, while somewhat vague, indicates potential benefits to mental health in a general sense. It may be that other objective measures would have been more appropriate to assess the effect of the program on well-being or psychosocial health more generally.

It was typical for patients working with CHNs to *feel cared for*. The empathetic and personalized nature of CHN support made patients feel cared for, and even prompted some patients to be more proactive in their own care. These results seem to be congruent with a qualitative study that interviewed clients being supported by CHWs in a HIV/AIDS program (119). In the study by Dovoust et al., clients reported that their CHWs were caring and supportive, and made them feel more empowered to access resources themselves. They were also able to cultivate strong personal connections with their CHWs, and claimed that their CHWs addressed their care holistically. The parallels between the Dovoust et al. study and this study of patients/clients feeling cared for, increasing their self-efficacy, and appreciating holistic support is an interesting one, and speaks to the power and universality of navigators delivering person-centred support across various health domains.

Another CHW intervention for low-income patients with CHCs in Philadelphia, Pennsylvania also saw no difference in mental health outcomes between intervention and control groups (120). The authors proposed that perhaps the intervention did not specifically address the outcomes explored, or that once intervention patients started engaging in behaviours to address their health, they encountered barriers that they did not previously anticipate. The first proposition might explain why this study on CHNs found no statistically significant results for the outcomes explored. Considering the lack of training to address anxiety and depression, and the fact that these conditions are not a part of the ENCOMPASS study referral criteria, it is clear that the CHN program was not explicitly designed to address patients' anxiety and depression symptoms. This would be the most straight-forward reason for the similarities between the quantitative and qualitative results. Despite this, some patients still reported feeling better, which shows the program's potential to address mental health.

4.3 – Potential interaction with low income:

Out of all sub-group analyses performed, the only one that yielded a statistically significant result was analysis of GAD-7 for the sub-group of patients that reported an annual household income of $0 – $29,999. In this sub-group, patients that worked with a CHN had lower GAD-7 scores than patients that underwent usual care at 6-months. While it is possible that this is a spurious finding, if real, it may suggest that CHN support is particularly beneficial for the anxiety of patients with lower income. Considering how finances are a prominent social determinant of anxiety, and are closely tied to other factors such as food security, transportation, housing, and more (121–123), it might be expected that these patients would stand to benefit more from CHN support. The fact that many patients in this study reported economic hardship as a source of their mental health issues is further indicative of the relationship between social determinants and mental health. Navigator programs were historically created to support groups that were underserved and facing the most barriers, including financial (33,35,124–127). In fact, these results may also explain the lack of significant outcomes in the rest of the sample, since most of the patients in this population had higher annual household income on average. Therefore, it is possible that they may not have needed as much CHN support for their mental health.

4.4 – Strengths:

One strength of this study is how the convergent mixed-method design leveraged ENCOMPASS data. One of the challenges of mixed-methods studies posited by Creswell and Clarke, is the time needed for two phases of data collection and analysis (71). The data for this study were already collected and available for use, which increased the efficiency of the study.

Another strength of this study was that the RCT design of the quantitative component. The random assignment of groups within an RCT helps control for confounding by increasing the chance of equal distribution of unmeasured confounders in each study group (128). This randomization, coupled with the temporal nature of an RCT allowed for a greater weighing of causality of the CHN intervention on the mental health outcomes being explored (128). Furthermore, using validated survey instruments in the GAD-7 and PHQ-9 promotes objectivity, as well as comparability to other studies that measured the same outcomes. These aspects further reinforced this study's internal validity, and ability to make inferences about clinically significant effects of the CHN intervention.

ENCOMPASS data sources are strengths in themselves, as they were collected with participant accessibility and inclusivity in mind. Patients were given options to complete health surveys in-person, by phone or by email to mitigate barriers to participation. Phone and video conferencing options were provided for completion of qualitative interviews. Additionally, third party translation services, cultural brokers, and research assistants with cultural safety training provided support throughout the data collection phases of the study to help ensure that language was not a barrier to participation. These methods helped increase the diversity of participants, which enhances the generalizability of findings across these demographics.

Finally, while the primary researcher's connection with the CHN program was a potential source of bias, it was also a potential strength in that there was greater understanding of the context of ENCOMPASS and the CHN program. This familiarity facilitated deeper insight into the ENCOMPASS data sources and handling procedures, the context of the CHN program, mechanisms of CHN support, and the nature of CHN-patient relationships.

4.6 – Limitations:

With the exception of the ANCOVA of GAD-7 scores at 6-months, this study was underpowered to detect significant differences in depression and anxiety symptom scores (80). Furthermore, certain assumptions for ANCOVA were violated, which may have caused biased results (129), although some were addressed with data transformations. These aspects of the quantitative analyses were limitations to adequately assessing the association between CHN support and the mental health of patients with CHCs. However, employing a mixed-methods design proved helpful in addressing these limitations because of the ability to integrate findings with qualitative data sources.

Another limitation was the use of multiple statistical comparisons, which may have increased the risk of type I error and spuriously rejecting the null hypothesis. One way of addressing this issue is to apply statistical methods that modify the analysis parameters to be more conservative. An example of this is the Bonferroni correction, which adjusts the alpha value based on the number of statistical comparisons done (130). Since such measures were not used in this study, it is possible that the statistically significant differences observed in the primary 6-month GAD-7 analysis, and the low-income sub-group analysis may be due to type I error, thereby posing a risk to the internal validity of this study. However, we conservatively concluded that overall, there was no statistically significant effect on anxiety or depression symptoms scores, and we acknowledge the exploratory and hypothesis-generating nature of the subgroup analyses. Other strategies were in place to enhance the validity of findings, such as the assumptions testing for each of the ANCOVA performed, and the use of transformed data to address assumption violations for subsequent analyses. Additionally, a mixed-methods design was also helpful here, in that the ability to use the qualitative data to corroborate the quantitative results enhanced the internal validity of this study.

There are limitations surrounding use of RCT data in that they are vulnerable to missing data and attrition, and they may lack generalizability (128). Attrition and missing data in the context of the quantitative component of this study may lead to a form of selection bias that would lead to an inaccurate interpretation of the intervention-outcome relationship. In this specific project, this would depend on whether those with anxiety or depression were more or less likely to remain in a study or complete their health surveys.

Data from RCTs can be problematic if the goal is generalizability in other PN contexts. This study seeks to fill a gap in knowledge when it comes to the role of PNs in the context of anxiety and depression for people with CHCs. However, details surrounding program design and delivery (e.g., training, standard operation procedures, geographical context, and organizational composition) of the CHN program may be highly unique when compared to other PN programs. Therefore, the findings from this study may only be applicable to the CHN intervention in its context and no other PN roles. Nevertheless, study findings may prove valuable in their potential to fill the gap in knowledge around the impact of PN programs on the mental health of people with CHCs. Other programs may have similar elements when it comes to program design and delivery. Therefore, the insights of this study may still be valuable for programs that share similar characteristics and research elements.

Another limitation pertains to this study's use of secondary data during the qualitative phase. Secondary data sources may be difficult to use to accomplish a research purpose other than what they were collected for; it is also difficult to determine whether the data are rich enough until becoming fully immersed (131). The qualitative data used in this study were not originally collected to explore mental health specifically. While both the case notes and qualitative interviews were open-ended enough to capture experiences regarding mental health, these experiences represented a minority of patients. Additionally, the analysis of these sources was time consuming since all case notes and interviews had to be analyzed in order to capture enough relevant data. No doubt the richness of mental health experiences would have been enhanced if a targeted primary data collection method was undertaken (such as interviews or focus groups). However, the fact that the data were already collected meant that they were readily available for analysis. Furthermore, despite the limitations around data richness, there was enough to explain the quantitative results, which was one of the primary objectives of this study. Finally, the use of two sources of qualitative data was helpful for the supplementation and triangulation of findings.

Finally, as it relates data richness, this study examined a patient population that was mostly not anxious or depressed. The lack of mental health concerns is also evident in the qualitative data, where approximately only one-third of intervention patients had a mental health situation arise. As previously established, scores ≥10 for the GAD-7 and PHQ-9 produce high sensitivity for detecting significant changes (73,74,77,85). If this study population had higher mental health needs, the ability to assess impact may have been enhanced, and subsequently, so would the richness of the qualitative data. This is another limitation of using data that was not collected with the sole purpose of studying mental health.

4.7 - Significance and Expected Outcomes:

There are three anticipated outcomes from this research. Firstly, this research is expected to increase awareness and knowledge regarding the impact of patient navigator programs on the mental health of patients with CHCs, especially in the Canadian context.

Secondly, the findings of this research might be considered when informing care practices for patients with CHCs. Exploring all avenues of mental health care could mitigate the challenges that patients with CHCs face due to their physical and mental health comorbidities. Despite finding a lack of statistically significant effect on anxiety and depression symptom scores, this study's results may still enhance knowledge around providing care to patients with physical and mental health comorbidities. This is especially true if the quantitative results are taken together with findings in the qualitative data. Continued evaluation of the CHN program could identify it as an alternative tool to help individuals optimize their overall health.

Lastly, the insights from this study will inform future research on this topic, and methodologies to explore this topic further. For example, considering that the qualitative component of this study involves analysis of secondary data not focused on mental health, study insights might prompt future researchers to collect data via interviews and focus groups that directly explore mental health among patients with CHCs. Alternatively, future quantitative studies might target populations with higher mental health needs, and aim for larger sample sizes.

4.8 – Dissemination and/or Knowledge Translation plan:

The CHN program functions within PCN settings in Alberta. Therefore, one group of end-users that might benefit from these research findings are PCN leaders, managers, and healthcare providers, including physicians, nurses, social workers, mental health therapists, kinesiologists, and dieticians. Disseminating to this group could address the first and second expected outcomes of this study, which are to increase knowledge on this topic and inform primary care practice. In order to target these knowledge users, knowledge translation might occur through meetings with teams at PCNs accompanied by a presentation of summarized research findings, and a 3-5-page report summary. Meetings can be arranged by reaching out to PCNs with established connections through ENCOMPASS. Dissemination to healthcare providers might be accomplished by communicating through the Alberta Medical Association, or the Alberta College of Family Physicians. The researchers can seek support from a knowledge translation expert with experience disseminating to healthcare providers.

Another end-user group are patients with CHCs who have anxiety and/or depression that receive care from PCN healthcare providers. Disseminating to patients may increase their knowledge of the CHN role, and its potential impact in mitigating complications due to CHCs and mental health comorbidities. This may then inform their decision to seek out CHN support for managing their health. Knowledge translation for this group would also address the first and second expected outcomes of this study. Considering that patients may vary in their knowledge of CHCs, mental health, RCTs, and health research methods, summaries of research findings would use plain language, and come in formats that allow ease of content consumption. This may include one-pagers, waiting room posters, pamphlets, and social media posts with a grade 8 reading level, and in multiple languages. It is also important to keep in mind what research findings might not be appropriate to reveal to patients. Advice from a knowledge translation expert will be sought out to ensure these requirements are met.

Lastly, disseminating to academics and researchers would address the third expected outcome of this research project, which is to inform future research on this topic. The mode of dissemination for this group will be publications and presentations at conferences, such as those hosted by the Alberta College of Family Physicians and NAPCRG (North American Primary Care Research Group). Publishing in open access journals may also be considered.

The study findings that should be communicated are 1) receiving CHN support for up to six months may be beneficial for addressing the anxiety of patients with CHCs, and that CHN support may improve mental well-being and help people feel cared for, 2) CHNs address mental health directly or through the factors that exacerbate patients' mental health (e.g., physical condition and social determinants of health), and 3) CHNs can help with connection to resources, providing advice, providing emotional support, and supporting with physical activity. There are some recommendations based on these findings that could be incorporated in the knowledge translation plan. PCN leaders and staff should consider implementing the CHN program in their organization if the prevalence of anxiety and CHC comorbidity is high in the patient population they are serving. They should also ensure that appropriate mental health training is available for CHNs, and that there are processes and resources in place when integrating CHNs into their organization. Similarly, health care providers may want CHNs to be integrated within their primary care team, and consider referring patients with CHCs in need of support for their anxiety. Providers should perform adequate screening for conditions and needs assessments so that the patients that stand to benefit the most from CHN support are referred. Additionally, those considering CHN support can be reassured by the fact that anxiety and depression symptoms were not made worse by participating.

Chapter 5 – Conclusion:

This study set out to measure the impact that CHNs had on the mental health outcomes of adult patients with CHCs at CWC PCN in Calgary, Alberta. It did not find that CHN support had a significant impact on anxiety and depression symptom scores, apart from a potential beneficial effect on anxiety symptoms at 6-months. However, the study was underpowered and the population had low symptoms scores at baseline, on average. This study's mixed methods design facilitated further exploration of these findings. The fact that CHNs were underprepared to address mental health, together with individual and external factors that seemed to hinder patients' ability to address mental health, might explain why CHN support did not seem to have a significant impact on anxiety and depression symptom scores. However, patients reported the many ways in which working with a CHN was in fact beneficial to their mental wellbeing and psychosocial health. It could be that the individuals who benefited from CHN support had more mental health needs, and were not representative of the rest of the study population. It may be that the scales used to measure mental health outcomes did not capture the aspects of mental health that the CHN program addressed. This study contributed to the growing knowledge around the impact of patient navigation, the mental health of patients with CHCs in Canada, and raised some interesting questions that could drive future research studies on this topic.

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Appendix A: Interview Guide for CHNs

ENCOMPASS Interview Guide – CHN/Supervisor

DEMOGRAPHIC INFORMATION (Excel)

THE CHN PROGRAM

1. How would you explain/define the CHN program?
   Probes
   - From your experience, what do you think is the most important role/function of a CHN?
   - What types of services/support do CHNs provide to patients?
   - What types of duties are CHNs/you responsible for performing in their/your role? What duties do CHNs/you perform most commonly?
   - How do you think the CHN program works?

2. What skills or characteristics do you feel help CHNs/you most in their/your interactions with patients?

3. What do you think patients expect of CHNs/you as they/you help them to navigate the system?
   Probe for skills or characteristics, including but not limited to speaking their same language, sharing cultural values

4. What skills or characteristics do you feel help CHNs/you most in their/your interactions with providers?

5. What do you think providers expect CHNs/you to do when they refer a patient to the program?
   Probe
   - What do they expect in terms of actions with patients, medical appointments, and communication?

6. What do you consider to be an ideal timeframe for you/CHNs to work with a patient?
   Probes
   - What is an ideal caseload/ # of patients for you/CHNs to work with at one time?

SUCCESSES AND CHALLENGES

7. <u>For CHNs only</u>: Tell me about some successes you have experienced when working with patients
   Probes
   - What would you describe as your key successes?
   - What factors contributed to these successes? Probe for individual factors, community factors and institutional factors

8. For CHNs only: Tell me about some challenges you have experienced when working with patients

   Probes
   - How have you been able to overcome some of these challenges?
   - What specific challenges/barriers to meeting patient health care goals did you help your patients overcome?

   For Managers only: What challenges and successes do CHNs experience in their role?

   Probes
     - How do you think CHNs are able to overcome these challenges?
     - What would you describe as key successes?

9. How would you describe patients' engagement to the program?

   Probes
   - From your experience: How do you feel patient's adherence relate to their outcomes?
   - Can you think of behaviors or patterns that may explain differences or similarities between patients who follow-through the program and those who do not, or at least not consistently?
   - What are the characteristics of patients that did not improve or made any change?

10. What have you found to be the most successful strategies to motivate patients to work towards their goals?

    Probes
    - How do you think eliciting goals work for patients? Could you elaborate about the process of setting goals with patients?
    - What are some ways you found that work to involve your patients in making decisions regarding setting and achieving goals about their health care?
    - How do you think this impacts their experience as a patient?
    - What kind of advice or educational support do you/CHNs provide to the patients on self-care and self-management?
    - What happens when you/CHNs are done working with a patient? (Graduating process, contact after graduation, or discharge)

11. Can you tell whether your patients have a greater capacity to self-manage when they leave the program? Why/why not?

12. Have you perceived negative or unintended effects from the program on your patients, physicians, or clinic staff? Could you expand on that for me?

INTEGRATION WITH CLINICS

15. How do you feel the CHN role is perceived within the primary care clinics? (Physician offices and PCN)

    Probe
    - Do you think that the CHN program adds value to the PCN?

16. How has your role/the role of the CHN integrated with the roles of the physicians or MDT members?
    Probe
    - Do you think your role/the role of the CHN has conflicted with the roles of the physicians or MDT members? (Identify specific areas of conflict or otherwise)

      <u>For CHNs only</u>: How would you describe your relationship with clinical staff (PCN or clinic)?

17. Have you perceived differences between clinicians, MDT, clinics in adopting the program? This means referring, using, interacting with the program.

    <u>For CHNs supervisor only</u>: Do you think that the program is being delivered as intended across the clinics. What are the main differences/similarities between the clinics you have worked with and how do you think it might impact the program?
    <u>If all clinics were invited, any clinic said no?</u>

18. From your experience, do you feel that the program has been routinely incorporated into [PCN] practice and processes?
    Probes
    - What makes you feel that?
    - Would you say that clinicians think of the program when they see a patient with social barriers, two or more CC, high acute care utilization? (Most of the time, occasionally, barely)

19. Can you tell if the program engages with clinics and clinic staff on recurring basis about the scope of the program/recruitment? Have you seen the impacts of that on referrals/ perceived benefits?

TRAINING AND SUPPORT

20. Regarding the CHN training, are there any topics you wish had been added or changed or done differently?

21. <u>For CHNs only</u>: How would you describe your relationship with your supervisor?
    <u>For Managers only</u>: How would you describe your relationship with the CHNs?

22. Were adequate and appropriate supports/resources available (from PCN, community organizations, clinics) for you? If available, what kind of support/resources were most helpful for you? What supports/resources do you wish you had access to?

LESSONS AND RECOMMENDATIONS

23. What would you change, if anything, to the CHN program?

24. Is there any other information you would like to share about the CHN program and your experience with it?

Appendix B: Interview Guide for Patients

ENCOMPASS Interview Guide

Patients

Date of interview: ___/___/___ Location: ________________________

Interviewer: ____

Thank you for agreeing to participate in this interview. We are interviewing you to better understand the community health navigation program at Mosaic. We are interested in your thoughts and experiences so far. The interview should take approximately 60 minutes depending on how much information you would like to share. With your permission, I would like to audio record the interview because I don't want to miss any of your comments. All responses will be kept confidential. You may decline to answer any question or stop participating in the interview at any time and for any reason. May I start recording?

Note: Use CHN name instead of CHN or community health navigation; many patients won't know/remember the name of the program.

A. THE CHN PROGRAM AND ENGAGEMENT

13. What did you expect from the CHN program before you joined?
    Probes
    - What made you want to join the CHN program?
    - What did you think the purpose of the CHN program was?
    - What were the most important results you expect to see?

14. Can you describe your experience working with [CHN name/names]?
    Probes
    - Can you describe your interactions with [CHN name/names]?
    - What services [CHN] provided? What activities did you do together? What did [CHN] help you with?

15. What skills or characteristics did you appreciate in your CHN do you like in a CHN? What other skills/characteristics would you want if you had another CHN to work with in the future?"
    Probes

- Examples of skills or characteristics, including but not limited to speaking their same language, sharing cultural values, knowledge of resources/services.
- Would you have liked to be able to choose your CHN based on any characteristic in particular?

16. Would you say it was easy/simple or hard to work with a CHN?
    Probes
    - What made it easy or simple to participate in the program?
    - What made it difficult to participate in the program?
    - Was your CHN easy to reach? Can you tell me how your [CHN name/names] was able to maintain a relationship with you?

17. What do you think is a good length of time to work with a CHN?
    Probe
    - Would you have preferred to work with your CHN for a longer/shorter length of time?

B. SUCCESSES AND CHALLENGES

6. Can you please tell me about what has changed for you since you have been working with [CHN name/names]?

   Would you say that you have benefited in some way from participating in the program?
   Probe for connections with other health care providers, connections with community programs, following your care plan (self-care, appointments, medication, nutrition etc.)

   What do you think contributed to these changes?
   - *Probe* for individual, community, and institutional factors
     - Did you receive any advice and support from [CHN name/names] to better manage your health? Could you tell me an example?
     - Thinking of the services your CHN provided you, were you satisfied with how those services met your health needs?
     - Did your CHN refer/recommend you to services within your community that you found helpful? Could you tell me an example?

7. Have you experienced any changes in your [using previous responses and depending on patient: eating patterns? Physical activity? Smoking? Health care use?] Has [CHN's name] help you with these changes?

8. How likely are you to keep up with [behaviour change, if any] after finishing working with [CHN's name]? Do you feel that you have all the tools/resources/knowledge to keep [previous response, if any]?

9. Thinking about those supports (using response to the previous question) do you feel ready to (accomplish/attend appointments/ continuity of care or services) for yourself, or you feel that you will need the help of a CHN or a similar worker in the future?

10. What challenges do you still face in managing your health needs?
    Probe
    Is it hard to access the care you need? Is it hard to follow through on
    - recommendations from your care team? Why/why not?

11. Can you tell whether you experience any negative effect or consequence from working with [CHN]?

C. LESSONS LEARNED AND RECOMMENDATIONS

12. What would you change, if anything, about the CHN services provided to you?
    Probe
    What could a CHN do to better serve your needs?

13. What do you feel is most likely to motivate people with chronic conditions to work with a CHN? What do you think could be a good source of information about the program for patients?

14. Is there any other information you would like to share about working with a CHN and your experience with it?