

**THE EFFECT OF A LONG-TERM CONDITION  
MANAGEMENT PROGRAMME ON HOSPITAL  
PRESENTATIONS: A RETROSPECTIVE THREE  
GROUP STUDY**

---

Sara Mason

Masters in Nursing

MN9\_490 Masterate Research Thesis

20<sup>th</sup> of May 2017

I declare that the work presented in this thesis, *The effect of a long-term condition management programme on hospital presentations: A retrospective three group design study* is, to the best of my knowledge and belief, original and my own work, except as acknowledged in the text and reference pages.

## Acknowledgements

*Respect, Honesty and Tolerance are vital in nursing*

Input from many services has been used to shape the Trajectory of Long Term Care model and Pulmonary Long-Term Management Service including; general practices, community mental health support services, Iwi<sup>1</sup> providers, local gyms, and the Hawke's Bay District Health Board extensively, including the Māori<sup>2</sup> Health Service, Business Intelligence Team and community services. I would like to thank my husband Doug Mason and my daughter Milia Kushner who helped me through this journey from the very beginning with flash cards of microbiology, chemistry and pharmacology. I would also like to thank my friends and colleagues especially Anita La Monte, Rose McGillicuddy, Kerri Nuku, Maree Gladstone and Eileen Hall for letting me discuss in great depth the nursing stuff I know the rest of my family just would not understand. Thank you also Karen Munday, Olivia Maclaren and Rachel Forrest for being the best supervision and support with which the Eastern Institute of Technology could have paired me with. Finally, a big thanks to Dion Reid for proof reading this work and encouraging my thoughts to be clearer on paper. You have all made this journey possible. I would like to express my greatest adoration all the people who teach science and nursing. You are true heroes, saving lives by imparting your knowledge to others.

*Sara*

---

<sup>1</sup> Iwi: Tribe (New Zealand Government, 2016)

<sup>2</sup> Māori: The indigenous population of Aotearoa New Zealand

## Table of Contents:

Acknowledgements .....	iii
List of Figures and Tables .....	v
List of Abbreviations .....	vi
Abstract .....	vii
Chapter 1-Introduction .....	1
Long Term Conditions .....	1
Justification of study.....	6
Chapter 2-Literature review.....	7
Long term condition strategies to reduce hospital use.....	7
Training and use of health professionals .....	9
Chronic respiratory disease .....	10
Challenges in prescribing in primary care .....	11
Impact of system changes in prescribing.....	12
Impacts on patients and families.....	13
Long term care management models.....	14
<i>Self-Management</i> .....	15
<i>Care Coordination</i> .....	17
<i>Outpatient rehabilitation</i> .....	21
Tools used in measuring outcomes in LTC management.....	22
Challenges in enrolment, participation and retention .....	26
Targeting interventions to vulnerable populations .....	27
New Zealand context.....	31
Summary .....	33
Chapter 3-Methods .....	34
Null Hypothesis.....	34
Ethics .....	34
Reliability and validity of design.....	34
Intervention details .....	38
Study Sample.....	38
Sources of data .....	39
Collection of data .....	39
Methods.....	41
Chapter 4- Results .....	43
Demographic .....	43
Hospital Utilisation.....	44
Chapter 5-Discussion.....	47

Kaitautoko .....	47
Long term Conditions .....	47
Respiratory disease .....	49
Indigenous health.....	50
Limitations.....	51
Chapter 6-Conclusion.....	53
What does this mean for practice?.....	53
Recommendations for future research .....	53
Issues which were beyond the scope of this study.....	54
References .....	55
Appendices .....	61

## List of Figures and Tables:

Figure 1:Utilising community health and social services to support patients.....	2
Figure 2:Trajectory of Long Term Care Model: Interactions of different levels of care.....	3
Table 1:Details of interventions used in the study.....	5
Table 2:Group selection flowchart.....	40
Table 3:Demographic comparisons between interventions and non-participant groups.....	45
Table 4:Results of hospital admissions between interventions and non-participant group.....	46
<i>Appendices</i>	
Table A: Ethnicity Detail.....	61
Table B: Severity of chronic obstructive pulmonary disease and hospital .....	62
Table C: Hospital use for non- Māori and Māori with estimated mean and CI.....	63

## List of Abbreviations

AdLTC: Admissions to hospital with an exacerbation of a LTC

AdResp: Admissions to hospital with respiratory disease

AN-DRG: Australian national diagnosis related group classification system

ANOVA: analysis of variance

CASP: Critical Appraisal Skills Programme

CI: Confidence Interval

CNS: Clinical Nurse Specialist

COPD: Chronic Obstructive Pulmonary Disease

DHB: District Health Board

ECA: Electronic Clinical Application Database

EDLTC: Emergency room presentations with an exacerbation of a LTC

EDResp: Exacerbation of respiratory disease emergency room presentations

FEV1: Forced expiratory volume in one second

FORGE AHEAD: Transformation of indigenous primary healthcare delivery program

GARD: Global alliance against chronic respiratory diseases

GOLD: Global initiative for chronic obstructive pulmonary disease

HBDHB: Hawke's Bay District Health Board

HIV: Human immunodeficiency virus

ICCC: Innovative care for chronic conditions

IPF: idiopathic pulmonary fibrosis

LTC: Long term condition

MD: Mean difference

MDC: Medical Diagnostic Category

NHI: National health index

OECD: Organization for economic cooperation development

PAC: Patient assessment of chronic illness care score

PHC: Primary health care

PHO: Primary health organisation

PLTM: Pulmonary Long Term Care Management

QOL: Quality of Life

RCT: Randomised control trial

RN: Registered Nurse

SD: Standard deviation

SPSS: statistical package for social sciences

T<sub>2</sub>DM: Type two diabetes mellitus

TB: Tuberculosis

TLC: Trajectory of Long Term Care

WHO: World health Organization

## Abstract

**Background:** The Trajectory of Long Term Care Model (TLC) provides a framework for directing appropriate care to patients depending on where they are in the trajectory of their illness. It recognises that patients with long-term conditions (LTC) frequently move between different levels of healthcare services and escalates care depending on need. The Pulmonary Long-term Management (PLTM) Community Nursing Service developed a service based on the TLC model. The aim of this study was to ascertain if any reductions could be seen in emergency presentations or hospital admissions for patients who had participated in the PLTM service.

**Methods:** This study applied a quasi-experimental, retrospective design using a total of 287 participants. Presentations and admissions to hospital were analysed for both respiratory disease and overall LTC. To explore the differences between the groups (one-hour intervention, ten-week intervention, and non-participation group) general linear models were generated for emergency presentations and hospital admissions within LTC or respiratory disease. If a significant difference between the groups were detected, then pairwise comparisons were performed using Bonferroni corrections.

**Results:** When examining LTCs the ten-week intervention showed 75.7% less emergency room presentations compared to the non-participation group ( $p=0.006$ ) and a 58.9% less hospital admissions compared to the non-participant group ( $p=0.008$ ). Interestingly, no significant differences were found between the one-hour intervention group and the ten-week intervention group for emergency room presentations ( $p=0.677$ ), admissions to hospital with LTCs ( $p=1.0$ ), emergency presentations with respiratory disease ( $p=1.0$ ) or admissions to hospital with respiratory disease ( $p=1.0$ ).

**Conclusions:** Statistically significant reductions in hospital utilisation were seen when examining LTCs but not respiratory disease. This is noteworthy given that this study also found an average of three LTC per participant. This study could have significant implications for LTC management strategies especially given the difficulties seen in enrolment, participation and retention in LTC management programmes. Continuing inequities in health provide an argument for improved access to alternative choices in LTC management.

# Chapter 1-Introduction

## Long Term Conditions

A long-term condition (LTC) is any condition which lasts longer than three months, is slow in progression and impacts significantly on a person's life (Ministry of Health, 2009; Porth, 2010). Most LTC are preventable; 80% of cardiovascular diseases and respiratory diseases, 50% of type two diabetes and up to 63% of all cancers (Devol, et al., 2016; American Institute for Cancer Research, 2016). Globally increasing numbers of people are living with at least one LTC due to advances in medical knowledge, which have increased life expectancy, and the increasing impacts from non-medical determinates of health. People who live in lower socioeconomic situations are at higher risk of developing a LTC than any other cohort. This is because people who are socially or economically disadvantaged are more likely to experience modifiable risk factors including inadequate housing, insufficient exercise, poor diet and tobacco use (Ministry of Health, 2006). Compared to the Pākehā<sup>3</sup> population, people who identify as Māori or Pacific Island descent have lower incomes, higher rates of unemployment, poorer health outcomes (Ministry of Health, 2009) and therefore are more likely to have a LTC (Kruis, et al., 2013).

### *Trajectory of Long Term Care Model*

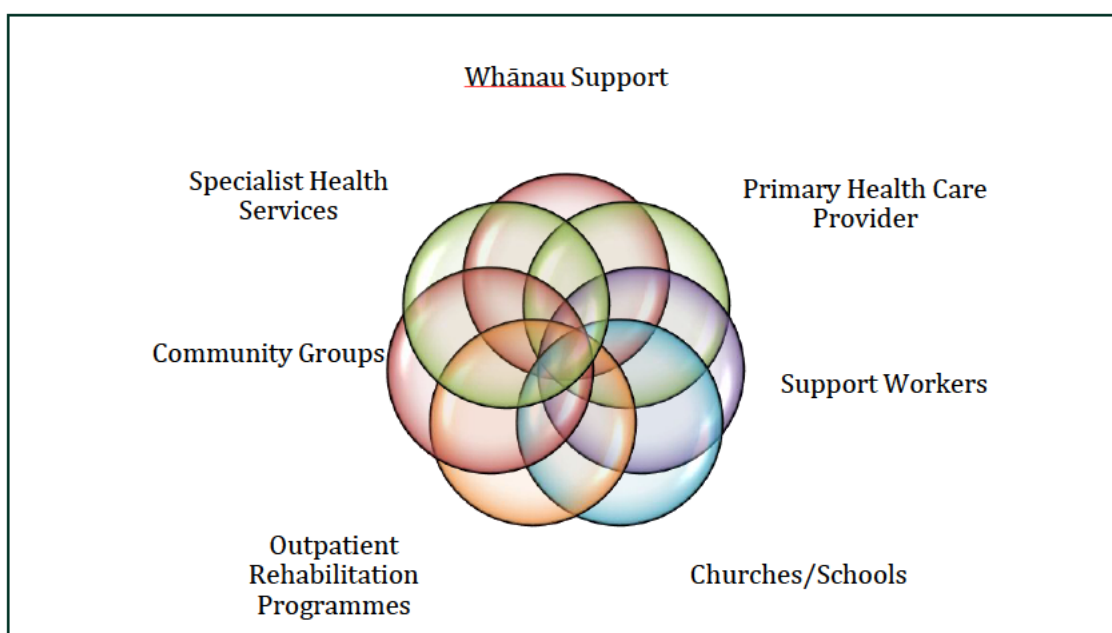
In 2014 Hawke's Bay District Health Board (HBDHB) implemented three new respiratory initiatives to detect undiagnosed respiratory disease, a highly prevalent LTC within the region. Unfortunately, the impact this had on other services was not predicted with a consequence of increased referrals of 300% to the pulmonary rehabilitation programme in less than eight months (Hawke's Bay District Health Board, 2015). Unable to cope with the volume of patients it became a priority to critically examine the traditional pulmonary rehabilitation programme. The traditional pulmonary rehabilitation programme in Hawke's Bay, consisted of eight weeks of supported exercised and disease specific self-management education to improve health literacy and increase exercise tolerance. Analysis of the pulmonary rehabilitation programme revealed the need for services to be directed more efficiently to decrease the risk of hospitalisation which included using services which were already involved in patient care to help deliver rehabilitation support. It also was apparent that there was a need to provide all patients referred to the service an alternative to a traditional pulmonary rehabilitation programme to increase health literacy and to acknowledge the low participation of 17% Māori in the pulmonary rehabilitation programme (Hawke's Bay District Health Board, 2014). This is in comparison to the regional 24.3% of people who identify as Māori within the region (Statistics New Zealand, 2013).

---

<sup>3</sup> Pākehā: Aotearoa New Zealander from European descent (New Zealand Government, 2016)

Trajectory of Long Term Care Model (TLC) was developed by combining the principles of bicultural nursing, rehabilitation, long term care management and focusing care dependant on where patients are in the trajectory of their illness. This model recognises that a patient with a LTC will slowly decline over many years and move between primary, secondary and tertiary health care sectors frequently (Schraeder & Shelton, 2011). The TLC model promotes the use of services that are customised for the individual's health status by using already established relationships in the community to support patients proactively throughout their lives (Figure 1). A hallmark of the model is the expectation for the service to link with whānau<sup>4</sup>, health providers and community services which the patient feels is important in their life.

FIGURE 1: UTILISING COMMUNITY HEALTH AND SOCIAL SERVICES TO SUPPORT PATIENTS

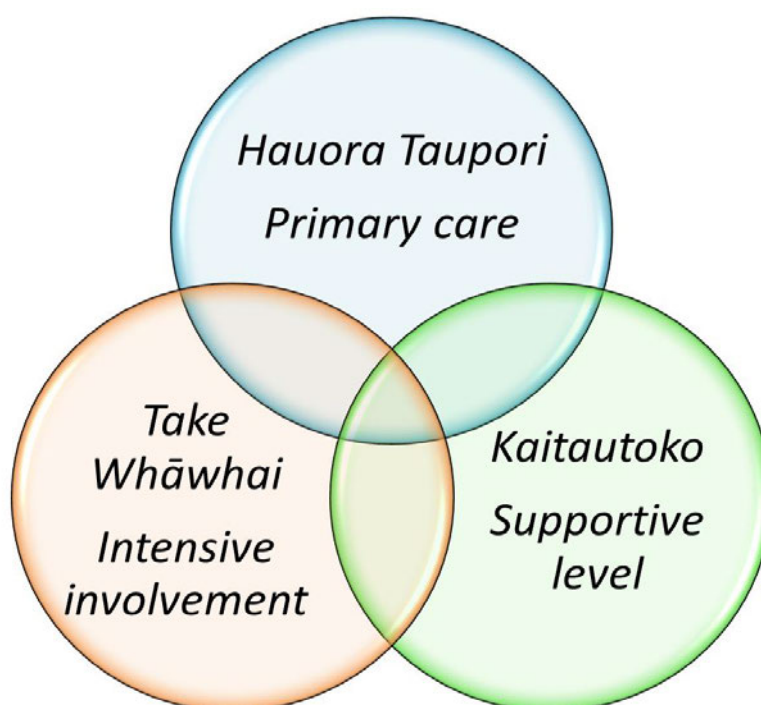


New Zealand is unique with its recognition of its treaty with the indigenous population, Te Tiriti O Waitangi. This is especially reflected in nursing which uses a bicultural approach. This is compared to a transcultural approach, based in anthropology, which looks at patient's behaviour as being influenced by cultural trends (Douglas, et al., 2011). Unlike transcultural nursing, bicultural nursing is based on cultural safety, where it is the nurse's responsibility to develop a relationship which is culturally appropriate in order to develop a plan of care in partnership with the person who is receiving the service (Nursing Council New Zealand, 2009). Cultural safety puts the onus on the nurse to recognise their own culture and how this will impact on the care they will deliver.

<sup>4</sup> Whānau is the family and / or the extension of who the person identifies as family (New Zealand Government, 2016)

Three levels of care are identified within the TLC model (Figure 2). The Hauora Taupori<sup>5</sup> level focuses on health promotion, prevention and maintenance of LTCs which is usually provided within primary care. The Kaitautoko<sup>6</sup> level has an emphasis on supporting patients with health literacy, empowering self-management, and modifying risky health behaviours. The goal is to enable patients to be more knowledgeable, independent and proactive in their own health care so they can be monitored effectively within the Hauora Taupori level in primary care. Take Whāwhai<sup>7</sup> not only supports patients as in the Kaitautoko level but also recognises that some patients will need additional resources to aggressively manage their complex needs as some patients are at high risk of hospitalisation. This is a fluid model where patients will move throughout different levels of support dependent on their needs at the time.

**FIGURE 2: TRAJECTORY OF LONG TERM CARE MODEL: INTERACTIONS OF DIFFERENT LEVELS OF CARE**



### *Pulmonary Long Term Management*

To reflect the philosophical and structural changes applied with the TLC model the Pulmonary Rehabilitation Service changed its name to Pulmonary Long Term Management (PLTM). The clinical lead of the community service is a Clinical Nurse Specialist (CNS) supported by a Registered Nurse (RN), two physiotherapists and one administrator. The purpose of the PLTM

<sup>5</sup> Hauora Taupori is the populations health (Eru, 2016)

<sup>6</sup> Kaitautoko: Supportive (Eru, 2016)

<sup>7</sup> Take Whāwhai: Urgent or to fight (Eru, 2016)

Service is to improve health outcomes and reduce avoidable hospital utilisation for patients with respiratory disease who live within the Hawke's Bay Region.

According to the 2013 census, the Hawke's Bay Region had a total of 151, 179 people of which a high percentage identified as being from Māori descent, a total of 34,662 (Statistics New Zealand, 2013). In the region 24% of people identify as being of Māori descent, compared with 14.9 percent for all New Zealand (Statistics New Zealand, 2013). Those of Pasifika descent account for 4% of the population compared to 7% for all New Zealand (Statistics New Zealand, 2013). People who live in high deprivation areas and people who identify as Māori or Pasifika are disproportionately affected by LTCs due to increased exposure to health risks such as tobacco use (Ministry of Health, 2009). These ethnicities also have higher rates of smoking, a risk factor associated with hospital use and mortality (MOH, 2016). This is particularly apparent in Hawke's Bay which has 36% Māori and 23% Pacifica reporting tobacco use (HBDHB, 2015). In a report by the Ministry of Health in 2016, respiratory admissions to hospital for people who identified as Māori were three to four times more than non-Māori (MOH, 2016).

The PLTM service is free to all participants as it is funded by the Hawke's Bay District Health Board (Hawke's Bay District Health Board, 2015). Patients are referred to the community nursing PLTM service by health professionals from primary care, secondary care or acute care if they have a diagnosis of obstructive or restrictive pulmonary disease. All patients referred are initially enrolled within the Kaitautoko level and are provided with a one-hour initial assessment with the CNS (Table 1). This is considered the first opportunity to develop a relationship and mutually agree on individualised strategies and goals. Whānau<sup>8</sup> are encouraged to attend as a support person and included in the education components. By involving whānau it is hoped to increase the likelihood that healthy behaviours would be extended into the whole whānau.

The Clinical Nurse Specialist during the one hour assessment, has the resources to thoroughly evaluate medical records and diagnostic tests, and clarify the patient's experiences. The current respiratory medications are compared with the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines and any changes of medication are suggested in the clinical letter to the primary physician. The one-hour assessment intervention allows time to provide education around emergency antibiotic use and assess the patients understanding. Education on cardiac medications is shared with the patient with the goal that patients will be able to differentiate between cardiac and respiratory symptoms and respond appropriately. Smoking cessation support is also given, if patients or whānau are still smoking, along with nicotine replacement therapy vouchers to anyone who attends the assessment.

---

<sup>8</sup> Whānau is the family and / or the extension of who the person identifies as family (New Zealand Government, 2016)

The one-hour assessment often uncovers physical issues that the patient has not revealed to their primary provider. A clinical letter is supplied to the primary health care provider with an overview of the patient's assessment and highlights any findings to help with future diagnosis. Occasionally findings are acute in nature and are dealt with immediately by either an urgent review from the primary provider or an emergency hospital presentation. The clinical letter presents other information such as a list of the referrals which were made, a list of health literacy education given, and any resources provided. This provides a continuity of care as the health literacy information can be reiterated by the practice nurses or Specialist Respiratory Champions in general practice during the patients follow up appointment. Patients who decline further intervention are discharged to their primary provider. If patients will benefit and agree to additional support, they are further enrolled into a ten-week programme also within the Kaitautoko level. If patients are complex and in need of further input, they are enrolled into the intensive intervention, the Take Whāwhai level.

Patients in the ten-week programme (Table 1) meet either twice a week for ten weeks as a group in a local gym or are provided an individualised home exercise programme with home visits, whānau education, educational materials, emailed materials and follow up by phone and or email. Ten-week programmes consist of twenty hours of customised exercise covering strength training, balance and aerobic exercise supported by the RN and physiotherapist. Sixteen hours of education from the multidisciplinary team and community services are also provided over the ten weeks. The ten-week intervention offers an opportunity for patients to develop personal relationships with other patients, with health professionals and community services. Having a diverse team to deliver education and assist exercise offers a comprehensive approach.

TABLE 1: DETAILS OF INTERVENTIONS USED IN THIS STUDY

<p><b>One-hour intervention:</b> One hour assessment, medication evaluation, needs assessment, education around conditions and self-management skills, identification of personal goals, relevant handouts and a clinical letter to the primary provider.</p> <p><b>Ten-week intervention:</b> One hour intervention <u>plus</u> twenty hours over ten-weeks of self-paced, customised exercise programme and sixteen hours of self-management and health education from the multidisciplinary team and community services.</p>
---

Patients are encouraged to have whānau attend the sessions, especially the education component. Education is specific for each community and covers subjects such as anxiety, diet, modifying the home environment, sex, travel, medications, breathing exercises, traditional medicines, local support programmes and self-management. Community programmes within the ten-week intervention include education by health and community service providers which are already (or could be in the future) involved in the patients support or care. Patients are provided the occasion

to ask questions of providers that they may not have had the opportunity to do in a patient setting. This provides a continuum of care and deeper trusting relationships. A study conducted by Paige, Stelfox, & Singh, 2016, reported that patients were more likely to enrol and continue to participate if they felt strong support from health care providers and programme facilitators. The gym settings which are used in the ten-week interventions subsequently change into a health hub within the community.

Home programmes are provided individually with education by the PLTM team over two to five visits after the one-hour assessment. The home setting is used for exercise and utilises everyday objects in the home to develop strength, balance and aerobic capacity. If a patient resides in an aged care facility or has support services such as home help or mental health support, free staff education is provided to help support the patient. Two, one-hour professional development education sessions for staff cover a general pulmonary assessment, disease management, physical assessment and end of life care. Input by the PLTM service is also given into organisational patient support plans that include specific goals developed with the patient.

Patients who deemed of high risk of hospitalisation by the CNS are placed into the Take Whāwhai level and are provided with regular visits and telephone follow up dependent on need. Plans of support are developed between the CNS, patient and whānau and include shared goals to increase quality of life, health literacy and empower self-management. Primary health providers, specialist hospital services and community health services are frequently consulted formally and informally to attempt to proactively manage care and stabilise the patient's condition. If multiple hospitalisations are identified, crisis plans are developed between the multidisciplinary services, patient, whānau and the primary care provider to attempt to deter hospitalisation or expedite care once in hospital. Once patients are considered stable by the CNS they are then encouraged to participate in the ten-week programme or in a home programme within the Kaitautoko level. This approach to health extends beyond the traditional borders of health into the community's where patients live. Take Whāwhai also provides support around the end of life in partnership with the patient, whānau and primary health provider with referrals, patient, whānau support and recommendations and education around symptom control.

## Justification of study

The aim of this study was to ascertain if any reductions could be seen in emergency presentations or hospital admissions for patients who had participated in the one-hour intervention or the ten-week intervention within the Kaitautoko level compared to a non-participant group. This study hopes to provide insight into the effectiveness of interventions within the community nursing PLTM service to reduce hospital use and consequently improve the lives of people who participate within the service.

## Chapter 2-Literature review

The purpose of this chapter is to further explore research in care management for LTCs, the factors influencing LTC management implementation and hospital use. Electronic searches of studies included terms; chronic disease management, long term conditions, indigenous health, self-management, disease management, rehabilitation, bicultural nursing, measurements in self-management, healthcare cost, and long term care. Searches were limited to years 2000-2016 and included empirical and theoretical data within Google Scholar, Cochrane library, Medline and the Cumulative Index to Nursing & Allied Health Literature. A total of seventy-two relevant studies were placed on a spreadsheet outlining author, theme, design, limitations of study, intervention, and major findings. Critical Appraisal Skills Programme (CASP) questions were used as a framework to critically appraise studies for validity and relevance (Critical Appraisal Skills Programme, 2013). Some studies which were examined will not be included in this literature review due to lack of information or reporting of outcomes which made it difficult to determine if the study met the expectations of evidence.

### Long term condition strategies to reduce hospital use

Historically, health systems have been designed to focus on the management of acute presentations that are usually episodic and require minimal ongoing support (Institute of Medicine, 2001). The management of LTC's on the other hand, requires support for patients over an extended period of time which the current New Zealand health system is not designed to do (Ministry of Health, 2009). This is not unique to New Zealand however, as globally LTC's and acute-focused health systems have placed an enormous burden on health systems and countries are recognising the need to drastically change to continue to serve their populations (World Health Organization, 2013). America's Medicaid, which is health funding targeted towards low income families', estimated LTC spending at 86% of its total health budget and has predicted that this trend will continue to increase over the next ten years (Gerteis, et al., 2012). Long term conditions are estimated to account for most of the overall health spend in New Zealand and Australia, placing an enormous burden on the health care system and society (Hamar, et al., 2015; Ministry of Health, 2015). By changing the focus of health care away from the reactive, acute service care to preventative care, the burden of LTCs could be lessened. But to change the way that health care has traditionally been delivered, challenges relationships between community primary focused care and secondary acute focused care.

In the 2015-2016-year, primary funding for health and disability services in New Zealand accounted for \$15868 million of the Annual Budget (Ministry of Health, 2016). More than 76% of this funding directly supported District Health Boards (DHB) so they could fund services, provide care and plan for future needs within their regions (Ministry of Health, 2016). In an

attempt to create an alliance between general practice and other health services, primary health care (PHC) funding was allocated from this amount. The difficulties with this approach was highlighted by Lauvergeon, et al., (2012), in a qualitative study examining barriers effecting the initiation of LTC management. This study included focus groups and personal interviews from patients, physicians, nurses, pharmacists, insurers, public health representatives, and companies proposing LTC management plans. Lauvergeon, et al., (2012), found that a lack of reliability of services and strategic direction occurred when allocation of national funding to primary care was at the discretion of larger organisations (Lauvergeon, Burnand, & Peytremann-Bridevaux, 2012). Another barrier expressed by healthcare stakeholders was the confusion over whose responsibility it was for initiating and financing LTC programmes (Lauvergeon, Burnand, & Peytremann-Bridevaux, 2012). The PLTM service has had the advantage of working within the DHB as a community nursing service, with an allocated permanent annual budget. This has allowed the service to strategically measure, plan and adapt services to meet the increased referrals to the service with a business case and budget bid which took over two years to accomplish (Hawke's Bay District Health Board, 2014). PHC providers may not have this advantage as their funding is contracted, competitive and vulnerable and they can lose these contracts if they are not seen to be reaching their performance goals (Ministry of Health, 2016).

In New Zealand several documents including *Reducing Inequalities in Health* (Ministry of Health, 2002), the *Report on New Zealand Cost of Illness Studies on Long Term Conditions* (Ministry of Health, 2009) and *Trends in the Service Design and New Models of Care* (Ministry of Health, 2010) have endeavoured to amalgamate LTC models and provide insight into the uniqueness of the New Zealand population but unfortunately these documents continue to re-state known problems within the current health system. Care Plus, a national scheme, has attempted to alleviate some of these growing pressures on the health system by providing patients who are higher users of healthcare with scheduled appointments with their health provider every three months and provide lower cost access of primary care services (Ministry of Health, 2015). Unfortunately, this approach has seen general practices target diseases which have the additional funding incentives attached and not targeting the high-risk patients of which this scheme was intended (Ministry of Health, 2015). Lack of consistency in measuring outcomes associated with the funding has also caused further difficulty in the implementation and evaluation of this initiative.

The World Health Organization's report, *Innovative Care for Chronic Conditions (ICCC): Building Blocks for Action*, addressed the need for change to manage LTC globally. In this report patient, policy, community and health care organisations are described as building blocks with a shared responsibility in the prevention and management of LTCs (Greenhalgh, 2009; WHO, 2002). Several problems with health systems were highlighted in this report including the lack

of dedicated time spent training health professionals in strategies to support LTC management, lack of standardised monitoring tools for interventions or quality assurance and the significant lack of coordination of activities in health and community sectors (WHO, 2002). The ICCC has not been without criticism though, as Oni, et al. (2014), argued that the framework lacked insight into impact of multiple morbidities, in particular the “colliding epidemics” of infectious chronic disease, such as human immunodeficiency virus (HIV) and tuberculosis (TB) and largely preventable LTCs also known as non-communicable diseases. The report does emphasise the complexity involved in undertaking a severe paradigm shift from reactive to preventative care. It also highlights the need for this shift to be reflected across all building within the framework.

### Training and use of health professionals

It was identified in the ICCC report that most health professionals are not specifically trained in strategies to support patients living with LTCs. However, a key component in nursing training is the understanding of the broader context of health and how health promotion can support wellness and prevent illness (Crisp & Taylor, 2006). *Fundamentals of Nursing by Crisp and Taylor (2006) is a classic nursing textbook that supports students learning by teaching the incorporation of health promotion and illness prevention across patient, policy and community in the treatment of illness. The central component to health promotion and illness prevention is the the assessment of risk, the identification of modifiable risk factors and the support for behavior change (Crisp & Taylor, 2006).*

Health promotion and prevention of illness strategies are not emphasised to such a extent in other health professions training (Lauvergeon, Burnand, & Peytremann-Bridevaux, 2012). In the qualitative study by Lauvergeon, et al. (2012), physicians believed that LTC management principles were already occurring in practice and the initiatives to implement LTC management were unnecessary. This could come however, from the lack of emphasis placed on LTC management interventions within medical training, leading to diagnosis driven decision making (Reidpath & Allotey, 2012). Hauer, Carne, Chang, and Satterfield, (2012), completed a systematic review of 2,788 articles, published between 1965 and 2011 evaluating medical curricula on behaviour change counselling, a major strategy used in LTC management strategies. In this study, 109 articles met the inclusion criteria of defining behaviour change counselling, the medical curriculum used, and the assessment method for evaluating the methods involved in teaching behaviour change. Behaviour change training topics within the studies included smoking (67 studies), nutrition (30), alcohol and drug use (26) and exercise (22). Out of the 109 studies identified 62 had fewer than eight hours allocated to behaviour change. The evaluation of studies found that most medical trainees learned behaviour change counselling from practice settings (Hauer, Carne, Chang, & Satterfield, 2012) and not as a structured component of their

training. Lack of consistency in training of health professionals make implementation of LTC management even more problematic.

## Chronic respiratory disease

Respiratory disease includes a variety of LTCs such as emphysema, bronchitis, asthma and pulmonary fibrosis (Kacmarek, Stoller, & Heuer, 2013; American Medical Association, 2013). New Zealand has the second highest rate of hospitalisations rates for respiratory disease out of countries with the Organization for Economic Cooperation Development (OECD) with Ireland being the highest and Australia and Austria not far behind (OECD, 2011). Furthermore, in New Zealand, patients who identify as Māori or of Pacific Island descent are five times more likely to die from chronic respiratory disease causes than non-Māori and die up to 20 years sooner (Ministry of Health, 2014). This cohort of patients is also four times more likely to be hospitalised in New Zealand with respiratory disease than any other ethnicity (Ministry of Health, 2014). This is compounded by the fact that most patients with chronic respiratory disease have multiple other LTCs that impact on their lives and half will die from these co-morbidities (Ministry of Health, 2002).

Portugal, France and Switzerland have the lowest hospital rates for respiratory disease in the OECD (OECD, 2011). These three countries all committed to the World Health Organisation's (WHO), Global Alliance against Chronic Respiratory Diseases (GARD) (World Health Organization, 2011). GARD is an international voluntary framework dedicated to controlling the impact that respiratory disease has on society and health funding (Pan American Health Organization, 2012). Apparent also in these three counties, is the development of systems which proactively target people who are at the highest risk of hospitalisation. Portugal, which uses a tier system suggested by GARD, recognises that a small proportion of highly complex patients use most of the health resources and targets interventions such as self-management and care coordination specifically at this population (European Observatory on Health Systems and Policies, 2011; World Health Organization, 2011).

The largest cause of inequality in preventable respiratory disease is tobacco use. Smoking tobacco is one of the highest risk factors associated with hospital use and mortality in patients with respiratory disease (Ministry of Health, 2014). Due to the risks associated with tobacco use including hospital utilisation, the Ministry of Health has made a commitment to reducing smoking prevalence to less than 5% by 2025. In Hawke's Bay 18% of people smoke of these 36% are Māori and 23% are Pasifika, well above the national prevalence (HBDHNB, 2015). Many national strategies have been implemented to attempt to reach this national target by 2025, including brief screening of smoking status provided by healthcare staff. This intervention is targeted at all patients in secondary, primary care, and maternity services. This screening

provides an opportunity for healthcare staff to provide smoking cessation advice, vouchers for free nicotine replacement therapy (NRT), and provide the number for the smoking cessation quit line for 24-hour support (Wilson, 2007). In a review of the data from the quit line services it was found that Māori were well represented as having quit cards and NRT vouchers dispensed at the rate equal to the national proportion of Māori smokers. Unfortunately, people who identified as from Māori descent were not obtaining the free prescriptions of NRT despite having the vouchers (Wilson, 2007). Highlighted in a review of tobacco control services by Social and health outcomes research and evaluation (SHORE) and Whariki Research Centre, high deprivation areas have higher rates of smoking and have not had success in smoking cessation strategies (2014). Hawke's Bay has a large proportion of high deprivation areas and, as previously mentioned, higher rates of smoking than the national average. In the 2015-2018 Tobacco Control Plan the HBDHB estimated that over 80% of people who are referred for smoking cessation support do not stop smoking. This was equal to the data from the Quitline service and the Ministry of Health (HBDHB, 2015; Wilson, 2007; SHORE & Whariki Research Centre, 2014). Within the PLTM service, smoking cessation support is offered to participants coupled with behaviour change counseling. No patients are denied the PLTM service because of their smoking status as it is hoped that with the support of other healthy lifestyle changes, willingness to change smoking behaviour will occur. In a study by Hjalmarson & Boethius (2007), two hospital based smoking cessation programmes were evaluated. The first intervention included brief advice on smoking cessation the other intervention included extended smoking cessation counselling and follow up. This study included 770 participants from five Swedish hospitals across 15 hospital wards. Eight wards provided brief smoking cessation advice and seven wards provided counselling and telephone support. One year post intervention self-reported smoking cessation rate was found to be 22% in the brief advice intervention and 28% in the counselling and telephone support intervention. Neither were found to be statistically significant or different than usual care. Tobacco use is a complex issue which is inequitable in its distribution across society. It is unclear from the data what can be effective in reducing tobacco use, as well as the harm and cost to society.

### Challenges in prescribing in primary care

Increased prevalence of LTCs such as respiratory disease places extreme pressure on acute and primary services (Ministry of Health, 2009). Presentations to both acute and primary health services have increased and pressure to direct patients to primary care has changed practice for physicians. Time constraints and funding have shortened appointment times with a reported average between 13-15 minutes (Crengle, Lay-Yee, Davis, & Pearson, 2005). If more time is needed for example, to assess another medical issue or for additional questions around mediations, a longer appointment time scheduled incurring additional costs to the patient. In a

qualitative study, three focus groups were used to explore the challenges faced by primary care physicians in Malaysia when prescribing for patients with chronic diseases. This study by Sellappans, Lai, and Ng (2015), used purposive sampling to include primary care physicians with various lengths of experience. Nineteen primary care physicians who were included in the study were grouped according to their years of clinical experience and provided with participant information sheet and consent form. They were reminded to discuss only the experiences when prescribing for patients with chronic diseases and were assured that anonymity would be maintained. Open ended questions were used which were audio recorded and transcribed verbatim. Researchers included one academic family medicine specialist and two trained research pharmacists who facilitated the focus groups. Thematic analysis was used to analyse data and develop themes from each focus group. The focus groups were between 50 to 100 minutes long and consisted of eight males and eleven females aged 30-62 years with 5 to 37 years of clinical experience (Sellappans, Lai, & Ng, 2015). Several key themes were highlighted that challenge primary care physicians when prescribing for patients with chronic conditions. Highlighted was lack of communication around medication changes during an acute hospitalisations leading to duplications and medication interactions (Sellappans, Lai, & Ng, 2015). The PLTM service one-hour interventions includes patient medication education and recommendations to the primary physician for any changes in medication (Table1). This supports patients in the self-management of their conditions and supports the primary physician who may not have the time to spend with the patient on self-management and medication education.

### Impact of system changes in prescribing

The transition from paper to electronic prescribing (e-prescriber) was also a challenge to many primary care physicians internationally (Sellappans, Lai, & Ng, 2015). Physicians reported that the reliance on the e-prescriber had led to unease from primary physicians. Physicians indicated that because of the transient nature of many of the patient's medication history was not always current in paper form. Patients also were found to have used several prescribing doctors due to which also made paper information unreliable and not up to date (Sellappans, Lai, & Ng, 2015). Patients with multiple comorbidities and multiple medications were a concern for physicians as when interactions or side effects occurred it was difficult to determine which agent caused the effect. They also felt they did not have the knowledge on the proper use or dose of some of the medications because of the abundance of new products (Sellappans, Lai, & Ng, 2015). Primary physicians overall believed they had a responsibility to advise and teach patients about medications they were prescribing but felt that they struggled to do this because of clinic time restrictions (Sellappans, Lai, & Ng, 2015). Highlighted also as a concern was the patient's beliefs about their medications. Physicians reported that patients chose to alter their doses to meet their lifestyle, or decreased or stop taking medication as they felt they were better (Sellappans, Lai, &

Ng, 2015). This study highlighted primary care physicians concerns to patient safety when prescribing for patients with LTCs and the importance for medication management and patient medication education to be included in LTC interventions.

## Impacts on patients and families

Studying the impact LTCs have on patients and families, provides rich insight into challenges which may affect how patients interact with health systems and interventions. In 2014 Gabriel, Figueiredo, Jacome, Cruz, and Marques, published a study on the perspectives of patients and families living with severe COPD. This cross sectional, exploratory study conducted interviews with 20 patients living with severe COPD and 20 of their family members (Gabriel, Figueiredo, Jacome, Cruz, & Marques, 2014). Participants were recruited from a hospital in Central Portugal and were contacted by telephone by a clinician assistant who gave information about the study and documented consent. Interviews were conducted by two gerontologists, audiorecorded and later transcribed for thematic analysis. Sociodemographic information was obtained through a structured questionnaire. Spirometry was conducted on patients during the interview and recorded according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines for categorising COPD. Self-reported breathlessness was recorded for patients using the British Medical Research Council questionnaire (mMRC). Patient families were specifically asked how many hours a week they are sole carers. Individual interviews for participants (patients and family members) included open ended questions around the impact COPD had on family life and personal life. Participants were also asked what their main difficulties or concerns were and how they have coped with COPD. Patients GOLD category included  $n=14$  GOLD stage 3 (severe) and  $n=6$  GOLD stage 4 (very severe). Family members had a mean age of 62 years and included 12 spouses and eight adult children. Half of the family members provided more than 20 hours of care per week. Patients in this study had six themes that emerged; symptoms impacting on personal and family life, overprotective family support, difficulties in couple communication, loss of self identity, fear of the progression of COPD, and coping resources (Gabriel, Figueiredo, Jacome, Cruz, & Marques, 2014). Patients voiced feelings of being restricted in their homes and not enjoying going out ( $n=20$ ). Patients also indicated that family members excessively focused on their disease and health status ( $n=16$ ) and that they felt embarrassed asking for help ( $n=7$ ). Some patients felt an extreme sense of loss of their identity ( $n=7$ ) and did not like their loved ones seeing them deteriorate. There was fear of the progression of the COPD and in particular the symptom of shortness of breath ( $n=12$ ). Coping strategies included acceptance that the disease state was bad but not as bad as it could be ( $n=4$ ), rationalising the cause of their COPD ( $n=2$ ) and self-management strategies ( $n=6$ ). Five main themes emerged from the families perspective; restrictions on social life, emotional distress, tension in couple relationships, financial strain, and coping resources (Gabriel, Figueiredo, Jacome, Cruz, & Marques, 2014).

Families voiced isolation from other family members and social events ( $n=18$ ). They described feeling worried and unable to leave their loved one alone at home. Tensions between couples manifested when patients with COPD felt embarrassed to go out or continued to do things family members felt they should not do. Financial strain was reported by two family members due to forced retirement and increased medical costs. Many family members voiced that being a carer for a person with COPD has helped them grow and find meaning in life ( $n=9$ ). Some family members indicated that they coped with being a carer by getting help from family and social networks ( $n=17$ ) and finding information on COPD ( $n=6$ ). People who have LTCs such as COPD have many facets of their lives impacted by the disease. Studies such as this can provide valuable information in designing interventions in LTC management which support patients and families as they transition through different stages of disease.

Ikonomou, Skapinakis, Balafa, Eleftheroudi and Damigos, (2015), conducted a cross sectional study on the impact of socioeconomic factors on quality of life for patients with chronic kidney disease (CKD). This study in three hospitals in Greece included 172 participants; 90 receiving haemodialysis, 39 receiving peridialysis, and 43 with CKD not receiving dialysis. Each of the participants completed the 36-short form survey (SF-36) a general quality of life evaluation with the support of a trained nurse (Ikonomou, Skapinakis, Balafa, Eleftheroudi, & Damigos, 2015). The SF-36 includes eight domains of physical functioning, physical functioning, body pain, general health, vitality, social functioning, emotional functioning and mental health. A higher score (0-100) indicates better quality of life. Patients were also asked to respond to questions on marital status, education level, and monthly household income. Participants were further asked to comment on how they or their family were coping with financial difficulties. This study found that within the SF-36 survey haemodialysis participants showed statistically significant ( $p=0.014$ ) lower ability to function physically and had more pain ( $p=0.002$ ) than the other peridialysis and non-dialysis CKD (Ikonomou, Skapinakis, Balafa, Eleftheroudi, & Damigos, 2015). In this study, 17.8% of haemodialysis, 23.1% peridialysis and 9.3% of non-dialysis participants ( $p=0.237$ ) reported some or a lot of financial difficulties impacting on their lives (Ikonomou, Skapinakis, Balafa, Eleftheroudi, & Damigos, 2015). Although not statistically significant this study highlights other stressors which may be impacting on patients lives when living with a LTC.

## Long term care management models

People who live with LTCs may live for a long time in relatively poor health. With each exacerbation of their condition, more of their function typically declines never fully returning to where they were before (Cleveland Clinic, 2013). Unfortunately, the connection between different health care services involved in patients' care has been superficial with introductions to services occurring during a patients' deterioration as services react to the crisis which is at hand

(Schraeder & Shelton, 2011). This downward trajectory speeds up as the patient nears the end of life where more exacerbations lead to personal suffering and complex, costly hospitalizations (Institute of Medicine, 2001). Self-management, care coordination, and outpatient rehabilitation are three LTC care management models which have been shown to improve quality of life, reduce emergency department use and hospital admissions in patients with long term conditions (Schraeder & Shelton, 2011). These models all focus on bridging gaps in care, coordinating information between services, educating patients and their families in self-management and ensuring patients are receiving the appropriate level of care (Schraeder & Shelton, 2011). Large professional bodies nationally and internationally have evaluated different models and strategies in the management of LTC in order to determine if care management could be one answer to the crisis in managing the impacts of LTC. The difficulty in examining LTC management programmes however, is the variety of structures and evaluation tools used in programmes which is compounded by the complexity of people who live with these conditions.

### *Self-Management*

A strategy that is often used within long term care management is the provision of self-management skills to enable patients to oversee their own health and health care. Self-management is a process by which the person self-assesses their LTC for any changes daily, sets goals around modifiable risk behaviours, and monitors and manages their symptoms with coping strategies and medications (Schraeder & Shelton, 2011; Ministry of Health, 2010). For self-management to be effective, patients must have good health literacy, knowledge of their condition and communicate regularly with their primary health provider (New Zealand Nurse Organisation, 2013).

In 2002 Kate Lorig, a Stanford University lecturer, developed chronic disease management programmes for patients with arthritis. This was based on the concept that patients could take control over their own health with education and motivational support, decreasing the need for health care input (Vadiee, 2012). The programme, usually led by lay people, has been further expanded to include a variety of LTC's and follows a prescriptive self-management and problem solving curriculum. Osborne, Wilson, Lorig and McColl (2007) in a longitudinal study, explored the effectiveness of this programme in improving health status and health care utilisation in patients with arthritis. It found some statistically significant reductions in pain by 4%, health distress by 12%, increased self-efficacy by 6% and no changes in acute or primary health care utilisation. Since its implementation, the standardised outcome measurements for this programme have become workshop information which includes demographics, number of participants, attendance, and organisation data (Kulinski, Boutaugh, Smith, Ory, & Lorig, 2015). In another study, Liddy, et al. (2015), conducted a pre- and post-participation design study to examine potential changes in health care utilisation before and after participation in the expanded

chronic disease programme. In this study 186 participant health care data were examined for patterns of health care utilisation pre and post participation in a chronic disease self-management programme developed by the Stanford Medical School Patient Education Research Centre (Stanford School of Medicine, 2016). This study also found no changes in acute or primary hospital utilisation (Liddy, et al., 2015). It is important to continue to evaluate health outcomes in health management interventions as different environments and targeted participants may impact on the effectiveness of programmes.

In 2015, Sari & Osman evaluated the Saskatchewan Lung Association intervention which provided spirometry and education around asthma and COPD self-management to patients. This study used score matching to create a control group spanning six years prior to the intervention. This allowed the researchers to identify individuals that had similar characteristics to the intervention participants. Using Saskatchewan health databases, the impacts on medication use for asthma and COPD were collected every year for four years after the intervention using a regression approach. The intervention included 185 participants with an average age of 47 years and the control included 1,726 patients with an average age of 46 years (Sari & Osman, 2015). The intervention consisted of spirometry to confirm diagnosis, one hour education session on how to manage COPD or asthma and a session with the primary physician to update medications. The education component included pathophysiology, medications, inhaler technique, environmental control for asthma and coping skills. The intervention individualised for each patient which included smoking cessation if the patient was still smoking. At the end of the session patients would see their primary physician for any changes in medication and emergency medications with an action plan (Sari & Osman, 2015). Patients in the intervention were then given a follow up in four weeks' time either with a fifteen-minute phone call or a one-hour follow up appointment. All patients had an opportunity to consult with their primary physician after the follow up. All data for medication use and cost came from the Prescription Drug Plan Historical Claims. Medications categorised as chronic management, acute and other asthma or COPD drugs unclassified (Sari & Osman, 2015). This study showed that intervention participants consistently used more chronic management medications during the four years following the intervention compared to the control ( $p=0.05$ ) (Sari & Osman, 2015). Other asthma and COPD drugs and unclassified drugs showed higher use only in the first year ( $p=0.02$ ) with no statistical difference found in the three other consecutive years. Acute medications showed no statistical difference between the intervention and the control. This study showed that self-management education delivered by health professionals can increase the use of chronic management medications which is essential in the management of asthma and COPD.

### *Care Coordination*

The communication and coordination between services involved in the care of patients can be complicated, especially if that person has multiple LTCs. Care Coordination, also known as Case Management, is a LTC intervention model which provides a designated care manager to organise and communicate care to services involved in patient care. Care coordination is usually provided by a registered nurse, who works in collaboration with the patients, family, primary health provider and other health and community service (Schraeder & Shelton, 2011). Care coordination requires a comprehensive assessment and plan of care that regularly monitors for changes in health status. Patients identified as being at high risk of hospitalisation are provided extra multidisciplinary input, contact and education around self-management. Any variations in care are communicated to a multitude of health providers involved in the patients' treatment as a long-distance healthcare team.

In 2010, Rice, et al. produced a large scale randomised control trial (RCT) in the United States that examined military veterans at five facilities who participated in a disease management programme for COPD. The intervention included 372 military veterans who participated in a one-and-a-half-hour single education session and compared them to non-participating military veterans control group ( $n=371$ ). Data was analysed for exacerbations leading to hospitalisation or emergency department use for COPD, cardiac or non-COPD pulmonary exacerbations, other than cardiac or pulmonary exacerbations, and overall non-traumatic exacerbations. Minor differences existed between the group ages which was an average of 69.1 in the intervention and 70.7 in the usual care control group. Lung function also differed slightly with the average forced expiratory volume in the first one second ( $FEV_1$  %) slightly higher than the control group (intervention = 36.1% and control = 38.1%). The veterans studied were predominately male with 363 males in the intervention group and 365 males in the control group. Outcome measurements of this study included hospital admissions and emergency department visits during a 12 month follow up period. The intervention consisted of one-hour of education on a variety of COPD self-management strategies, recommendations for optimisation of treatment, 24-hour telephone support, and monthly telephone calls to reinforce the COPD management education (Rice, et al., 2010). A pharmacist at each site monitored the number of times prescriptions of antibiotics had been filled that were specifically for the self-management of COPD. If prescriptions of these antibiotics were filled three times in three months, the case manager would be contacted to follow up with the participant. In this study the collaboration between the case manager and pharmacist provided an alert system for patients who were becoming at high risk of hospitalisation. A statistically significant reduction in non-traumatic hospitalisations 30% and non-traumatic emergency room visits by 50% was found in the disease management group compared to control ( $p=0.001$ ) was seen (Rice, et al., 2010). No significant reductions were found in COPD related

hospital admissions( $p=0.001$ ) however there was a significant reduction found in COPD related emergency presentations( $p=0.001$ ). The usual care group had an average of 1.71 non-traumatic emergency room visits, 0.8 non-traumatic admissions to hospital, 0.82 emergency room visits with an exacerbation of COPD and 0.4 admissions with COPD. Statistically significant differences in hospital use was found in both respiratory disease, cardiac or non-COPD pulmonary and all causes of hospital use. This comprehensive study showed the impact a modest disease focused programme has on all causes of hospital use.

A meta-analysis published in 2013 examined integrated care coordination for patients with COPD (Kruis, et al., 2013). The analysis examined 26 studies (2997 participants) which met the criteria; randomised control trial design, multidisciplinary with two or more providers, multi-treatment with two or more components to the intervention, and a duration of three or more months (Kruis, et al., 2013). The mean age of participants in the review was 68 years. Subgroup analysis was to be performed on the studies but due to the varying interventions used within the selected studies and lack of description around the components of interventions the review instead analysed the main components of each programme. Most studies used standardised measurement tools including quality of life measurements (22 of the studies) and standardised exercise tolerance tests (18 of the studies). In 15 studies, exacerbation related outcomes including hospital admissions, length of stay, and emergency department visits and were generated from organisation computer data reporting systems. The mean admission rate for respiratory disease was found to be 0.27 in the control groups and 0.20 for the integrated care programmes. This review showed statistically significant decreases in hospital admissions ( $p= 0.04$ ), decreases in length of stay (MD -3.78 days,  $p < 0.001$ ), improved quality of life scores, and improved exercise tolerance tests (Kruis, et al., 2013). This review also calculated that for every 100 patients who complete between three and twelve months of an integrated care programme, seven hospital days could be avoided. When admitted to the hospital with an exacerbation of COPD, the control groups stayed an average of ten days where as in contrast the integrated care programme participants stayed an average of four days in hospital. There was difficulty in comparing some studies due to the diversity of measurements used in evaluating programmes and the lack of details about interventions which led the analysis team to exclude 23 out of 49 studies. The use of standardised measurements including quality of life scores, six-minute walk test and hospital utilisation data provided an ability for quality analysis of the differing studies. The use of standardised, agreed upon measurements in LTC management interventions could provide an ability to objectively analyse interventions and identify components which provide the greatest impact on patient health.

Ireland, et al. (2010), used a qualitative research approach to look at case notes of a CNS who provided case management compared to a CNS who did not do case management work. This

study particularly looked at the number of hours the CNS spent counselling the patient including telephone consultation over six months and included an analysis of visit notes. Patients' blood pressure, cognition, medication self-efficacy, medication adherence and self-reported medication adherence were also measured (Ireland, et al., 2010). This study reported that the use of nurse led case management significantly reduced systolic and diastolic blood pressure, improved self-management, medication self-efficacy and adherence, with an average of 4.8 hours of CNS time used in case management for each patient. This study unfortunately did not acknowledge other influences that could have impacted on the outcomes.

A Cochrane review of chronic disease management in adults with asthma was published in 2015 looked at studies which met five criteria for chronic disease management; organisational targeting of patients, organisational targeting of health professionals, education or self-management, active involvement of two or more health professionals and a duration of three months or more (Peytremann-Bridevaux, Ardit, Gex, Bridevaux, & Burnand, 2015). This meta-analysis of twenty random and non-randomised control studies, showed incomplete evidence of success in disease management to decrease hospital utilisation in adults with asthma (Peytremann-Bridevaux, Ardit, Gex, Bridevaux, & Burnand, 2015). This review found that overall usual care participants presented to the emergency department as much as intervention participants. Although it was not statistically significant, participants in the interventions were admitted less to hospital than the usual care participants. Study designs and interventions that were reviewed varied considerably even though they all met the criteria. This led to difficulty in comparing various studies outcomes.

In a quasi-experimental study conducted by Sylvia, et al. (2008), 75 participants of Guided Care, a disease management programme for patients at high risk of hospitalisation, were compared to 75 high risk patients in usual care over six-months. This study compared primary care visits, health insurance costs, utilisation of health care services, days in hospital, hospital admissions and ED use. Patients were allocated to the Guided Care intervention if they were enrolled in a primary practice that took part in the study. Guided Care used a team care coordination approach which included a nurse, caregivers and a general practitioner (Sylvia, et al., 2008). The initial assessment was undertaken in the patient's home by the nurse who worked in collaboration with the general practitioner to develop a plan of care to promote self-management, coordinate health services and encourage healthy behaviours. Monthly, under the direction of the nurse, a caregiver followed up in the patient's home and reported back any changes or needs. This study found lower health insurance costs, lower utilisation of acute health care services including shorter days in hospital, decreased hospital admissions and decreased emergency department use in the Guided care group compared to the usual care group but this was not statistically significant. Unfortunately, prior to the commencement of the study, Guided Care and usual care groups

decreased from 75 participants in each group to 62 in the Guided care group and 65 in the usual care group. Further drop off occurred after the study began where the Guided Care group decreased to a further 31 participants which could have significantly impacted on the results. An average of three (2.9) comorbidities per participant was found in the studied groups which could have also impacted on health and everyday symptoms (Sylvia, et al., 2008). Measuring comorbidities is important in analysing LTC interventions as most patients who have a chronic disease also have other comorbidities impacting on their life and influencing the ability to participate in LTC interventions. As seen in the study by Hauer, Carne, Chang, & Satterfield (2012), most physicians learn LTC management strategies in clinical settings therefore, differences in primary health provider's approaches to condition management could have also impacted on results. In this study by Hauer, Carne, Chang, & Satterfield, participant insurance health spending information was used to analyse costs. One difficulty in this approach is that individual health plans differ and some services are limited or not covered in the health plan and therefore did not fully show the costs associated with the conditions. This can also be a difficult measure to obtain in New Zealand where public health care utilisation for hospital services is held within the public hospital data system and primary healthcare utilisation data is mostly held in private, mostly non-accessible databases.

In 2014, the PLTM Service conducted a pilot pre-post-test design study of 45 patients who had attended the community nursing PLTM ten-week intervention. The intervention included a patient assessment by a CNS including a letter to general practices with treatment recommendations and pre-post ten-week intervention results. An RN and physiotherapist supported patients over ten weeks with twenty hours of self-paced, customised exercise and sixteen hours of education covering strategies for living with pulmonary disease and self-management. Patients were also given telephone and email support when ill or if they had specific questions. Outcome measurements included hospital utilisation, exercise tolerance with the six-minute walk test and disease specific quality of life questionnaires. Inclusion was limited to patients in the PLTM ten-week intervention who had moderate to severe COPD according to the Global Initiative for Chronic Obstructive Lung Disease definition (Global Initiative for Chronic Obstructive Lung Disease (GOLD), 2015). Data from the number of hospitalisations of individual participants came from hospital statistical records for one-year pre-programme and total of one-year post programme. The results of the six-minute walk tests and the COPD quality of life tests were collected pre-participation in the programme and immediately post-programme at the end of the last day. The pilot study using the TLC model showed a decrease in hospitalisations with a mean difference (MD) of  $-.063$  ( $p=0.0001$ ), improvements in patient's ability to perform the six-minute walk test with an increase by an average of 76.5% and improvement in quality of life score by 71.9%. Anecdotal results also showed increased

communication between services and increased implementation of management plans and crisis plans for high risk patients. The six-minute walk test was collected by the CNS, who was the primary researcher and the physiotherapist and they were not blinded from the results. The six-minute test was also performed in different settings, one on linoleum floors and the other sometimes on carpet which could have led to differing results.

In 2015, Harvey, Buckley, and Scott-Chapman, evaluated a nurse led respiratory pilot project in Hawke's Bay. This project was supported by the Hawke's Bay Primary Healthcare Organisation, and included 18 general practices, 53 nurses and 2,154 patients. The project included training at least one Specialist Respiratory Champion in each general practice to identify patients at risk of COPD, perform spirometry for a definitive diagnosis and support patients with self-management education (Harvey, Buckley, & Scott-Chapman, 2015). This project's evaluation, held over nine months, found that nurses felt more empowered in their roles and enjoyed the autonomy and high needs patients had improved access to services.

### *Outpatient rehabilitation*

Outpatient rehabilitation has also been shown to reduce hospitalisation rates in LTCs, specifically with chronic respiratory disease and chronic heart failure (GOLD, 2015; Ades, et al., 2013). Outpatient rehabilitation provides a safe, structured environment to support physical exercise with supervision from a health professional as well as education in disease self-management (GOLD, 2015; Ades, et al., 2013). In 2014, Kim, Lee, Kim, Kang, and Ahn, reported on their quasi-experimental study which examined the effects of a cardiac rehabilitation programme on patients with heart disease. This study looked at 32 participants who took part in the programme and 29 participants in a control group. The cardiac rehabilitation programme provided support for exercise, self-management education, telephone counselling, and six months of support from a specialist cardiac nurse (Kim, Lee, Kim, Kang, & Ahn, 2014). The outcome measurements included quality of life, body mass index and waist circumference, all of which are considered risk factors for mortality in heart disease. This study found an improvement in quality of life scores within the rehabilitation group along with an overall decrease in body mass index and waist circumference. In another study of outpatient rehabilitation, a longitudinal design of 36 patients with COPD were measured pre-programme and post programme to determine if any changes could be seen in the average length of stay in hospital and the mean distance covered in a six-minute walk test (Hui & Hewitt, 2003). The COPD programmes intervention included 1.5 hours of exercise, two days a week, supported by a physiotherapist in an outpatient setting. This study found the length of stay decreased from 7.4 days to 3.3 days ( $p < 0.005$ ) and an increase in the six-minute walk test from 76 meters to 107 meters ( $p < 0.001$ ) (Hui & Hewitt, 2003).

In a pre-post intervention study conducted by Cecins, Geelhoed, & Jenkins, outcomes from a pulmonary rehabilitation programme in a physiotherapy department in Western Australia were

examined. 187 patients were included in the study who met the criteria of stable mild COPD, no changes in medications in the four weeks prior to beginning programme, no musculoskeletal impairment or uncontrolled cardiovascular disease. The eight week intervention included six to ten patients with an exercise programme consisting of 20 minutes of walking within a hospital corridor, flexibility and stretching exercises, and a six station circuit training. This study took place over six years from 1998-2003 and evaluated outcomes from six minute walk test, COPD quality of life questionnaire, hospital admissions for COPD and lengths of stay for exacerbations with COPD. Patients six minute walk test and quality of life was measured before pulmonary rehabilitation and after pulmonary rehabilitation and found this study found improvements in both categories ( $p=0.001$ ) (Cecins, Geelhoed, & Jenkins, 2008). Hospital admissions were recorded 12 months pre-intervention and 12 months post-intervention. Hospital admissions with COPD showed a decrease (-.46,  $p=0.001$ ) and so did bed days (-.62) (Cecins, Geelhoed, & Jenkins, 2008). However, bed days was not found to be statistically significant.

The use of outpatient rehabilitation in patients with COPD to improve health outcomes has been studied extensively but its use with other respiratory diseases is limited. Idiopathic pulmonary fibrosis (IPF) is a chronic respiratory disease of unknown cause in which scarring progressively occurs within the connective tissue of the lung, restricting movement and gas exchange (Kacmarek, Stoller, & Heuer, 2013). In a pre-post study design by Sharma, Bhatt, Luckhardt, and de Andrade (2014), outcomes of 456 patients with COPD (an obstructive pulmonary disease) were compared with 54 patients with IPF (a restrictive pulmonary disease) in an outpatient pulmonary rehabilitation programme. This study found comparable outcomes in patient's perception of depression which improved by MD -4 in IPF vs MD -3.5 in COPD and self-perceived breathlessness MD -10.3 with IPF and MD -10.3 in COPD (Sharma, Bhatt, Luckhardt, & de Andrade, 2014). Exercise tolerance, measured by a six-minute walk test, was also comparable with a total increase post programme of 47.2 meters in IPF patients while COPD patients increased by 52.2 meters (Sharma, Bhatt, Luckhardt, & de Andrade, 2014).

### Tools used in measuring outcomes in LTC management

Several tools have been used to measure the outcomes of LTC management strategies. They range significantly but all appear to be attempting to validate interventions which improve health outcomes in the hopes that this equates to less health spending. In a randomised control trial by Howard, Dupont, Haselden, Lynch, and Wills (2014), 222 participants with COPD were randomly allocated either to receive a COPD breathlessness manual or a COPD information booklet. Between January and August 2011, eight to 10 participants per week were entered the trial no major differences were found between groups on demographic measures, FEV1%, mood and health status. More people however, in the COPD breathless manual group attended the emergency room ( $p=0.005$ ) and were hospitalised ( $p=0.03$ ) 12 months' pre-study, compared with

the information booklet group (Howard, Dupont, Haselden, Lynch, & Wills, 2014). The COPD manual group consisted of a five-week intervention, with each week divided into six sections. Each section focusing on a variation of the weeks' theme and included basic health literacy, self-management, strategies for coping, daily exercises, DVD, and summary with a weekly record of accomplishment. The cognitive-behavioural maintenance cycle of breathlessness, panic, frustration and depression, was targeted with a specific goal to manage distress (Howard, Dupont, Haselden, Lynch, & Wills, 2014). Breathing control and mobility exercises were demonstrated on the DVD. Participants were asked to complete self-help tasks as well as a weekly mood and breathlessness rating. The manual also included a relaxation CD. The information booklet group received a British Lung Foundation COPD information booklet to work through at home. During the trial a trained psychologist in health related cognitive-behavioural therapy supported participants with one home visit and two phone calls at three and six weeks. Frequency emergency room presentations and frequency and duration of COPD-related hospital admissions 12 months pre- and post-intervention were recorded from district general hospital's electronic records. Mood and health status were measured at baseline, six weeks and six months using two standardised tools, the Hospital Anxiety and Depression Scale and the Self-Reported Chronic Respiratory Questionnaire (SF-36). The COPD breathlessness manual group showed a trend with less mean of  $-0.30$  compared to the information booklet group mean of  $0.06$ , ( $p = 0.047$ , CI  $0.01-0.73$ ) (Howard, Dupont, Haselden, Lynch, & Wills, 2014). At 6 months, there were also significantly greater improvements in anxiety ( $p=0.004$ ), depression ( $p\leq 0.001$ ) and dyspnoea ( $p\leq 0.001$ ) in the COPD breathlessness manual group compared to the information booklet group (Howard, Dupont, Haselden, Lynch, & Wills, 2014). The reduction in hospital emergency use was found to not be statistically significant but when analysing for cost effectiveness the amount was in pounds. This study showed a total savings from the COPD breathlessness manual group at 12 months at £30,197.12, or £269.62 per participant, compared to £50 cost of delivering the programme (Howard, Dupont, Haselden, Lynch, & Wills, 2014). Hospital use as a measurement in the effectiveness of a programme can be beneficial for providing an argument to expand services into mainstream use. The cognitive-behavioural COPD breathlessness manual could have added benefit for patients who are unable to participate in ongoing LTC management programmes.

In 2011, Peter, et al., evaluated a nurse led Ambulatory Care Coordination (PMH ACC) programme for children with complex needs, to determine if any reductions could be seen in hospital utilisation and healthcare costs. This 10-month, pre-post intervention study examined 101 children's medical histories who had participated in the PMH ACC programme. Hospital use data was collected and then used to calculate hospital utilisation costs for each child and potential overall cost savings from the programme. The PMH ACC programme included children

who were deemed high risk if they had complex care needs, or over the past year; presented to the emergency department more than four times, had more than two hospital admissions, or stayed longer than 14 days in hospital. The PMH ACC intervention included 24 hours seven days a week telephone support, individualised care plans, nurses who familiarised themselves with the enrolled children's medical care, facilitated communication between acute and community services, and proactively coordinated discharge from hospital (Peter, et al., 2011). This study found that targeting high risk children to coordinate care decreased emergency presentations by 15% ( $p=0.001$ ), admissions to hospital by 9% ( $p=0.019$ ), and length of stay by 43% ( $p=0.001$ ) with an overall cost savings of 1.9 million Australian dollars annually (Peter, et al., 2011).

A prospective clinical audit by Soltani, Reid, Wills, & Walters, (2015), examined predictors of acute exacerbations of COPD in a public hospital in Southern Tasmania, Australia. This study examined 150 patients with COPD for predictors of mortality, length of stay and hospital use between November of 2006-July 2008 (Soltani, Reid, Wills, & Walters, 2015). The audit included an investigation of clinical records for the time period of six months post exacerbation but occurred after eight months to allow time for any deaths or readmissions to hospital for COPD to be updated in the medical records. Cross group analysis was used to compare those discharged directly from the emergency department to those admitted to the ward from the emergency department with a primary diagnosis of an acute exacerbation of COPD. Participants were first identified during an acute exacerbation of COPD through the emergency department and evaluated independently by a investigating specialist physician. This evaluation also included a review of the patients medical notes and radiology diagnostics. After confirming a diagnosis of COPD they were included in the study. Spirometry severity was defined according to GOLD stage guidelines and were available for 83% of participants. GOLD stage 4 (very severe) made up 28% of participants, 39% were GOLD stage 3 (severe), 29% were GOLD stage 2 (moderate), and 4% were GOLD stage 1 (mild) (Soltani, Reid, Wills, & Walters, 2015). This audit found that decreased oxygen level, decreased blood pressure, higher severity of COPD and increased number of LTCs were predictors of inpatient hospital death after an exacerbation of COPD. Mortality after discharge from the hospital was predicted with a history of myocardial infarction, residing in an aged care facility, and a higher severity of COPD after an exacerbation of COPD. Length of stay in hospital with an exacerbation of COPD was predicted by older age, the number of LTCs and low blood pressure and higher blood sugar levels. Readmissions to hospital with an exacerbation of COPD were predicted by a diagnosis of osteoporosis, younger age, and increased severity of COPD. For readmissions to hospital this audit found that for every reduction in percentage predicted forced expiratory volume in one second (FEV<sub>1</sub>), risk of readmittence to hospital increased by three percent (Soltani, Reid, Wills, & Walters, 2015). Predictors of

mortality and hospital use can provide insight into developing LTC management interventions and providing support for patients once diagnosed with COPD.

Cost effectiveness appears to be the main driver in moving health related interventions into mainstream. Justifying cost effectiveness of health services is reflected in the predominate reporting of hospital utilisation in the research of LTC interventions. Other measurements have also been used to evaluate LTC management interventions but not to the same extent. Other measurements include quality of life tools, physiological changes, health behaviours and health literacy. The goal of these measurements is to document changes in important clinical measures that signal better control of the LTC and subsequently improvements in patient's quality of life and savings in health care resources. It is important to understand however, how measurements are associated with health and the use of health resources. For example, it is recognised that LTCs impact significantly on patient's lives and because of this self-reported quality of life tools have been seen as a means to measure outcomes in self-management (Casillas, Iglesias, Flatz, Burnand, & Peytremann-Bridevaux, 2015). In Switzerland, a cross-sectional study looked at the association between a diabetes specific health related quality of life scores and the patient's assessment of chronic illness care score in 519 patients with diabetes. Patient's assessment of chronic illness care score was used to measure six variables routinely used to monitor diabetic patient's health; HBA1c, retinal eye exam, annual urine microalbuminuria screen, foot examination, lipid test, and the uptake of the annual flu vaccination (Casillas, Iglesias, Flatz, Burnand, & Peytremann-Bridevaux, 2015). The result showed that there was no correlation between health-related quality of life and patient's assessment of chronic illness care score (Casillas, Iglesias, Flatz, Burnand, & Peytremann-Bridevaux, 2015). Using a quality of life measurement alone in a LTC management programme will not provide the measurements needed to ascertain whether a programme is successful in preventing health care utilisation and improving health. A patient may feel their quality of life has improved but this does not necessarily indicate that they are practicing positive health behaviours and taking steps to prevent further deterioration. The use of data on length of stay, hospital admissions and emergency presentations therefore, may be a more standardised way to determine if an intervention is successful in saving hospital resources and improving health outcomes. Another study by Hutchinson, et al., (2015), looked at associations between quality of life scores and comorbidity using the Charlson Comorbidity Index score which is a tool used to predict mortality in one year, based on disease and age (Hutchinson, et al., 2015). This prospective longitudinal study looked the relationships between these two standardised tests and acute hospital utilisation with 1999 patients with chronic disease. The measurements within the Charlson Comorbidity Index score tool predicts the one-year mortality for a patient who may have a range of comorbid conditions with each condition assigned a score depending on the risk of dying (Hutchinson, et al., 2015).

Scores are summed to provide a total score to predict mortality. Myocardial infarct, congestive heart failure, peripheral vascular disease, dementia, cerebrovascular disease, chronic lung disease, connective tissue disease, ulcer, chronic liver disease, and diabetes are assigned one point each. Two points each are assigned to hemiplegia, moderate or severe kidney disease, diabetes with end organ damage, tumour, leukaemia, lymphoma. Three points for moderate or severe liver disease. Six points for malignant tumour, metastasis, or acquired immune deficiency syndrome (Hutchinson, et al., 2015). Hutchinson, et al. (2015), found that quality of life did not equate to lower hospital utilisation in fact it showed comorbidities were better at predicting health care use. Standardised tools for predicting risk was easily found in literature. A standardised tool for determining the number of LTCs a person has however, was not found. Standardised measurements across studies are difficult to find. A standardised internationally agreed measurement would be beneficial to assist in developing and monitoring effective LTC management interventions. Cost effectiveness of interventions by their ability to reduce acute hospital use appears to be the most prevalent measurement in LTC management studies.

### Challenges in enrolment, participation and retention

Challenges in patient enrolment and participation in LTC management programmes are complex and should be considered when developing programme expectations. In a systematic review by Paige, Stellefson, and Singh (2016), three factors were identified which influenced enrolment and participation; predisposing factors, enabling factors and needs. Several studies reported patients not participating in programmes as they felt the programmes did not consider cultural aspects of disease management or were too specific to one disease and did not take into account living with multiple comorbidities (Paige, Stellefson, & Singh, 2016). The review showed that patients were more likely to enrol and continue to participate if they felt strong support from health care providers and programme facilitators. Transportation was found to be a significant barrier with many participants being completely dependent on support from their family members to attend and many patients did not want to burden them. Most studies identified patients not feeling comfortable in group settings, lack of understanding around why they needed to attend or what they would gain from it. Many patients in the studies did not enrol in programmes as they did not feel they needed the programme as they perceived their disease to be less severe and not susceptible to exacerbations. Patients who did understand the severity of their disease however, were more likely to complete programmes. Recognising challenges of enrolment and participation and the functional decline of a person with LTCs can help to adjust programmes to fit the needs of patients and control the costs.

In a descriptive study by Hudon, et al. (2016), 167 patients were invited into a Stanford Chronic Disease Self-Management Programme to ascertain what motivated patients to participate or decline the programme. Using maximal variability of age, sex, chronic disease and whether

patients accepted to participate, a sample of twenty-four patients were invited to be interviewed for one hour. Thirteen who had declined to participate in the Chronic Disease Self-Management Programme and 11 had accepted to participate (Hudon, et al., 2016). The interview was facilitated by a social worker and audiotaped for future analysis and coded by a social worker and an anthropologist. Seven peer leaders who had facilitated the programmes were invited to participate in two focus groups that were conducted by the coordinator who implemented the programme. Transcripts were also analysed by the social worker and anthropologist. Out of the 167 patients invited into the Chronic Disease Self-Management Programme, 107 (64%) declined (Hudon, et al., 2016). The most prevalent reason to decline was the group format of the programme with transportation concerns being the second most frequent reason. Of those who did accept, 17 (28%) did not start the programme because they believed their condition was better controlled or they were no longer interested in participating. Patients who did start the programme but did not complete, 15 (25%) indicated that their health had deteriorated or the programme was not specific enough for their needs. At the end of the programme 28 patients successfully completed and 15 attended all the sessions within the programme (Hudon, et al., 2016). The percentage of participants completing programmes significantly impacts on the goals of LTC management and its feasibility.

### Targeting interventions to vulnerable populations

Angstman, et al. (2014), retrospectively reviewed charts of patients who were enrolled in the Collaborative Care Management for depression. In the study, data from 773 patients were reviewed to determine if remission of depression could be an independent determinate of health care utilisation in patients who were enrolled in the programme. In the intervention, patients received a review by a nurse and psychiatrist and then followed up by a nurse weekly to review mental health status (Angstman, et al., 2014). Recommended changes to medication were communicated to the primary health provider with medications prescribed to patients the responsibility of the primary provider (Angstman, et al., 2014). Patients enrolled in the Collaborative Care Management Programme all had a clinical diagnosis of major depressive disorder or dysthymia and completed a patient health questionnaire, generalized anxiety disorder questionnaire, mood disorder questionnaire, and an alcohol use disorders identification test. Patients outpatient visits and patient health questionnaire were measured at six months after enrolment and 12 months after enrolment in the programme. This study found that targeting patients who were deemed high risk of relapse and provided proactive treatment improved their health status which lead to decreased utilisation of health care services by 48 % (95% CI  $P < 0.001$ ). As mentioned earlier, patients who have LTCs continue to have a decline of their health over an extended period of time. Collaborative Care Management for depression programme has shown that by working across sector to develop support plans and targeting

patients who are at high risk, proactive interventions and treatment can improve health and lower health care costs.

Johnson, Yin, & Berg, (2003), studied users of America's low income health funding scheme, Medicaid who were enrolled in an Asthma Disease Management Programme by McKesson Health Solutions. This study used three groups in a retrospective cohort design to evaluate for changes in healthcare utilisation and cost implications of attending or not attending the programme (Johnson, Yin, & Berg, 2003). The design used three groups to add validity to the study, as it allowed for two comparison groups in the pre-post design. Cost implications were also considered to better understand the financial impact of attending the Asthma Disease Management Program. All the participant data for the study came from administrative Medicaid data located in Pennsylvania. Data collected included inpatient admissions to hospital, emergency department visits and hospital outpatient visits. Poisson regressions was used to control for baseline levels of utilisation, demographics, and relative risk scores (Johnson, Yin, & Berg, 2003). The three groups included two non-participating groups; one, which included Medicaid recipients who were referred to the program but declined to participate (209) with a mean age of 15 years and the second comparison group which included Medicaid recipients who were identified through the medical claims data as having asthma but were not contacted or referred to the programme (592) with a mean age of 27 years. The third group, the intervention group, included 313 Medicaid recipients who were enrolled and completed at least 30 continuous days of the Asthma Disease Management Programme (mean age of 20 years). Participants in the intervention were provided with self-management information, health counselling and monitoring of their asthma by telephone and home visits if needed. Health care use was evaluated during the period of November 1998-April 1999 and compared with the same 30-day time period of for each person from baseline November 1997-April 1998. The baseline period and comparison time period were used at the same season to consider any seasonal effects on asthma illness, which was not found in any other study examined. All hospital utilisation was determined by disease specific codes (linked to the participant) with costs calculated from approved claim payments (Johnson, Yin, & Berg, 2003). All three groups had no group differences at baseline for hospital utilisation but did slightly differ in age and gender composition which was adjusted for. This study found that after regression analysis, Medicaid patients participating in the Asthma Disease Management Programme (intervention group) had a reduction in hospital admissions by 50%, reduction in emergency department visits by 28% and a reduction in outpatient visits by 6.2% (Johnson, Yin, & Berg, 2003). Patients in group one, (the non-participant group) had experienced greater decreases in outpatient visits by 10.3% and experienced a decrease in emergency department visits (8.8%). However, inpatient admissions for group one increased by 5.6%. Group two, (who were not referred to the programme) had increases in hospital admissions

by 25.5% and an increase in emergency department visits by 10.1% (Johnson, Yin, & Berg, 2003). Like group one and the intervention group, group two had a decrease in outpatient visits but only by 2.5% (Johnson, Yin, & Berg, 2003). This study did not show specifically if presentations were due to asthma or other non-catastrophic conditions but did provide an argument to the effectiveness of this programme to decrease health related use. This study used a return on investment calculation to provide credibility to the programmes ability to save on health care savings. This was calculated by showing the number of hospital admissions avoided by the programme, the cost of the admission, and the calculated avoided expenditures. The total savings and the Asthma Disease Management Programmes expenditures provided the estimated return on investment percentage. The overall savings on medical service utilisation for Medicaid patients who participated in the Asthma Disease Management Programme was \$116, 340 with a return on investment of 131% for each dollar spent on the programme (Johnson, Yin, & Berg, 2003). Use of the three-group design provided a better ability to compare pre-post outcomes of the intervention which normally would be limited by the intervention acting as its own control or only one control comparison group. Use of the same season pre- and post-evaluation period decreased the impact of season variances. The use of return on investment in this study provided a comprehensive argument that large-scale disease management can be cost effective and provide better health outcomes for patients.

When populations are geographically isolated it becomes even more difficult to develop programmes which meet the needs of the population. In Canada, a pre-post mixed methods observational design by Naqshbandi Hayward, Paquette-Warren, and Harris (2016), evaluated the TransFORMation of IndiGENous PrimAry HEALthcare Delivery Program (FORGE AHEAD). This five-year programme, now in its fourth year, has worked with eleven First Nations (indigenous population) communities across six provinces to develop community quality improvement initiatives to enhance chronic disease care (Naqshbandi Hayward, Paquette-Warren, & Harris, 2016). Projects in the FORGE AHEAD program are dependent on community engagement and participation for success. Working groups in each community were developed which consisted of clinicians, researchers and First Nations community representatives. A community profile survey was distributed to key stakeholders to help to establish an overview of current health capacity within the communities. The survey explored individual community health funding models, infrastructure and the number of health professionals working in each of the communities. Due to isolation of the communities, online formats were used as a mode of communication to help develop relationships and support. To determine if the communities would be ready for change the Community Readiness Tool was used to consult with community leaders, First Nations Elders, youth and the community Health Council. This tool ranked the level each community would be able to develop and adopt initiatives in chronic disease care by

identifying factors that could influence change. Community engagement workshops were then held in the communities facilitating education in the principles of chronic care management, specifically type 2 diabetes mellitus. The FORGE AHEAD programme developed a culturally relevant programme to support type 2 diabetes mellitus prevention and management in each of the communities (Naqshbandi Hayward, Paquette-Warren, & Harris, 2016). The study has not had its final results but has shown progress in completing most of the projects so far with good engagement from the communities. Many issues were highlighted in developing and implementing this programme including cost, lack of resources in the isolated areas and long timelines needed to establish rapport and trust (Naqshbandi Hayward, Paquette-Warren, & Harris, 2016). A systematic approach in developing programmes in vulnerable populations may lead to more sustainable initiatives.

Many approaches have been explored to try and achieve support for patients with long term conditions who may not have access to services or expertise to help in the management of their condition. In a retrospective study in Australia in 2013, Hamar, et al., looked at the impact of a chronic disease management program on hospital utilisation for 5,053 patients with cardiovascular disease or diabetes. This was compared to a control of 23,077 non-participating patients (Hamar, et al., 2015). The programme included personalised online health support, health assessments, health action plans, education and health behaviour tracking, and follow up phone calls by the RN. In this extensive four-year study, participants were measured at baseline, thirty days, twelve months and eighteen months. The results showed a reduced hospital admissions of participants with diabetes by 7.8% at 12 months and 13.4% at 18 months. Heart disease showed similar results with 7.2% reduction in hospital admissions at 12 months and 12% at 18 months. The diabetes group and heart disease group both found reductions in readmissions to hospital (5.8% and 14.1% respectively). Patients with cardiovascular disease had a statistically significant decrease in average stay in hospital by 12.6%. The diabetes group however, had a much lower result of average stay in hospital with a decrease of 4.4% which did not appear until 18 months (Hamar, et al., 2015). This study also found that after 6-7 phone calls no further change was found in hospital admissions or length of stay (Hamar, et al., 2015) which demonstrated that telephone and online communication can be a valuable tool in disease management. This study is another example of the success that can be made in vulnerable population's health, with the use of a comprehensive LTC management programme.

Alaska is geographically and tribally diverse and has the worst health outcomes for indigenous populations within the United States (Moore, et al., 2014). In Alaska, a case management programme was developed to reduce the risks of cardiovascular disease in Alaskan Indian Natives with diabetes (Moore, et al., 2014). The *Special Diabetes Program for Indians Healthy Heart Demonstration Project* was a large scale intensive case management intervention to reduce

the risks of cardiovascular disease among Alaskan Indian Natives. The programme developed relationships and worked with 138 tribes within the communities to determine what was appropriate for their specific needs. Many local culturally adapted group activities were developed to support the project including fun walks, community gardening, talking circles and traditional games. This project was led by a team of case managers including a RN, primary health provider, dietician and a pharmacist who identified risks, developed care plans and updated treatment goals including healthy weight and lifestyle choices (Moore, et al., 2014). Baseline information was gathered at the first assessment and measured at each visit and included weight, body mass index, blood pressure, blood glucose, lipid tests and a list of current medications. Health behaviour questions were also gathered such as amount of exercise, smoking status, and diet intake. Care plans were developed with patients and their families, with encouragement to include the individual local and cultural activities into the care plans to provide motivation and support (Moore, et al., 2014). Patients met with the team monthly until the team considered the patients' health to be stable. Specific diabetes and cardiac health education, lifestyle modification support, frequent contact and smoking cessation advice and support was provided to all patients. This study of 3,373 participants found that with an average of seven visits to the programme, participants had an overall decrease in blood glucose levels by an average of -2.31 mmol., systolic blood pressure by -1.47mmHg, diastolic blood pressure by -1.05mmHg and low density lipid control by -5.29 mmol( $P<0.001$ ) (Moore, et al., 2014). This study supported the involvement of communities in the development of programmes and including social networks and whānau in the plan of care to increase participation in activities that support healthy lifestyle choices.

### New Zealand context

According to Marriott and Sim (2015), Māori and Pasifika have worse health outcomes than what is found in Alaska within the indigenous populations. In a comparative study with data from 2013, Marriott and Sim examined 21 inequality indicators used in New Zealand replicating a study previously undertaken by the Ministry of Social Development in New Zealand in 2003 and 2004. Some of the measurements used in the previous studies could not be duplicated because the needed data was no longer being collected. The data was collected from census information by the Ministry of Health and Social Development and compared to previous results. Using the 21 indicators for inequality the ethnic groups of European, Māori and Pasifika people were examined. The indicators were five health indicators, four knowledge and skills indicators, five paid work indicators, four economic standards of living indicators, two cultural identity indicators and one social connectedness indicator. This study found that in every health status indicator Māori and Pasifika had higher disparities than that of New Zealand Europeans. Life expectancy at birth for non-Māori males was 80.2 years, females 83.7 years. Māori males 72.8

years, and females 76.5 years (Marriott & Sim, 2015). This was found to be an improvement on previous results but gaps are still apparent between Māori and non-Māori. Infant mortality rates for non-Māori, were 5.5, Māori 7.0 and Pacifica 8 deaths per 1,000 live births. Again, this showed an improvement but still a notable difference. This was more pronounced in data showing proportions of people who were overweight or obese and in suicide rates. Māori showed the highest number of people who were overweight or obese at 76.3% (Marriott & Sim, 2015). Suicide rates increased in both Māori and non-Māori females but decreased overall for males. Another social indicator of ethnic inequalities in health was smoking due to its adverse health outcomes (Marriott & Sim, 2015). Cigarette smoking continued to show the highest prevalence in Māori (30.9%) followed by Pacifica (21.6%) which has declined since the previous study (Marriott & Sim, 2015). Even with a decline it still was found to be much larger than with New Zealand Europeans which were 13.4% of smokers in New Zealand.

LTC management has had limited use in New Zealand and no research could be found which highlighted the bicultural approach of linking with whānau, health providers and the wider community. Kaupapa<sup>9</sup> Māori Mobile Disease State Management in Western Bay of Plenty is a service which highlights linking with whānau and the wider community to improve health outcomes. This service provides advanced community nursing input for the management of LTCs (Kaupapa Māori Nurse Specialists, 2016). The Kaupapa approach to nursing also has been integrated within the acute ward using the Whanaungatanga<sup>10</sup> Model of Care. This model of care emphasises the development of whānau and wider community relationships to help support patients within the acute setting and once they discharge back home. Cultural preferences are an important aspect in the delivery of nursing care and health professionals are expected to recognise the importance many patients place on traditional Māori customs and to include this into the management of care (Lyford & Cook, 2005; Kaupapa Māori Nurse Specialists, 2016).

An important aspect to working with patients is the development of relationships. In a book review by Avril Bell (2014) the ethnographic fieldwork for an anthropological examination of cross-cultural relationships was explored. This book titled *Among friends? On the dynamics of Māori -Pākehā relationships in Aotearoa New Zealand* was Agnes Brandt's doctoral thesis turned into a book form (Bell, 2014). The qualitative study which was reported, used fieldnotes, interviews, charts, and mapped friendships. Interviews were recorded with 80 people from several cultural, ethnic and social backgrounds. Analysis showed that for both Māori and Pākehā, relationships were voluntary and based on trust support and reciprocity. When given charts to describe relationships, Māori participants only showed friendship relationships in terms of groups rather than individuals (Brandt, 2013). The Māori world was more collective and whānau

---

<sup>9</sup> Kaupapa: Community desire (Rangahau, 2016)

<sup>10</sup> Whanaungatanga: Relationships between kin (New Zealand Government, 2016)

centred which was described as a point of difference between the two cultural worlds. The inability to connect within the Māori world in every day experiences was highlighted as the ongoing impact from colonisation. The Māori world was restricted to specific spaces whereas the Pākehā world is everywhere else (Brandt, 2013). Pākehā experienced discomfort when in the unfamiliar Māori setting and feelings of shame for not knowing how to behave or what to do. Pākehā also described feelings of shame for not knowing or understanding the Māori culture which they felt was expected of them. However, Māori felt suspicion and uncertain when Pākehā wished to engage and felt cautious about having Pākehā friendships due to the possibility of conflict based on the differences of values (Brandt, 2013). This highlighted the challenges experienced when health providers engage with patients and the importance of recognising culture and bicultural engagement to improve health. A limitation of using these publications in this literature review was that the information came from publications and not primary research. But it does highlight an approach here in New Zealand to include the wider community into patient support to improve health outcomes, which was like other studies used in this literature review. It also shows the importance of understanding how culture impacts on patient care and relationships.

## Summary

Many factors influence the relationship between illness and health care services especially with the complexities in LTCs. Training of health professionals does not appear to be consistent and approaches to the management of LTCs have been shown to be just as varied. This is compounded by the impact that living with multiple LTCs has on the ability to engage with health systems and LTC interventions. The growing number of people living with multiple LTCs also has impacted on health system. Internationally increasing use of health systems for people with LTCs has increased costs and stretched resources. Hospital use is an important benchmark in the evaluation of a LTC intervention. This study will examine the relationship between the Pulmonary Long Term Management one-hour assessment intervention, ten-week group intervention, a non-participant group and the use of hospital services.

## Chapter 3-Methods

### Null Hypothesis

There are two null hypotheses for this retrospective three group non-participant study:

1. No differences will be seen between hospital utilisation rates for the two intervention groups and the non-participating group.
2. No differences will be seen in hospital utilisation rates between the one-hour intervention group and the ten-week intervention group

### Ethics

The Hawke's Bay Māori Health Unit was consulted for their expertise, insight and to determine which particular outcomes would be of value for the Māori population. Later as part of the ethical process, the Māori Health Unit was consulted to obtain formal approval. Ethical approval was obtained through the HBDHB Ethical Research Committee (reference number 16/06/238) and the Eastern Institute of Technology Ethics Committee (reference number 16/19). Data were stored per the policies which govern the HBDHB, the Privacy Act 1993 and the Health and Disability Commissioner Act 1994. National Health Index numbers and data which were collected was given a unique identifier to ensure personal information could not be identified and privacy was protected. No payment was offered in this study.

### Reliability and validity of design

The philosophy of positivism, of knowing through the scientific method and observation was the foundation of this study. This study applied a quasi-experimental retrospective design because a randomised control trial (RCT) in this study could disadvantage patients who may benefit from the PLTM service and possibly jeopardise their future health. Three-groups were used in this study, two participant groups and one non-participant group. This allowed the opportunity to look in more detail at the cause and effect relationships of specific interventions within the PLTM service. Retrospectively evaluating two of the Pulmonary Long Term Management interventions can provide a realistic picture of the effectiveness of each of these interventions to reduce hospital use. This is because there was no preconceived knowledge that this study would occur. Cost effectiveness of programmes seems to be the main driver in the implementation of services. Hospital use is the most reported way that this is demonstrated therefore, reductions in hospital use were used in this study.

This study could be duplicated with some adjustments in the mining of demographic information. The use of a hard copy records and electronic records was time consuming and some of the information may have been missed. By only using only hard copy information, the information gathered could have been more consistently applied. The lack of primary health patient information and researcher error in mining the information must be considered when interpreting results. The use of hospital statistics for outcome measures does provide a level of certainty that this information is correct provided the coding was applied correctly to each participant's hospital use, however, human error again must be considered.

## Intervention details

All intervention groups were referred to the service by the patients' general practitioner. All patients who were referred to the service were provided with a one-hour assessment intervention. The one-hour intervention included an assessment, medication evaluation, needs assessment, education around conditions and self-management skills, identification of personal goals and relevant handouts. A detailed clinical letter is then sent to a primary healthcare provider which is copied into the patient electronic clinical database, ECA. The CNS also determined if the ten-week group programme was appropriate and safe for the patient.

If patient was deemed safe by the CNS and the patient felt they would benefit and agreed to additional support, they were further enrolled into the ten-week programme. The ten-week intervention included the one-hour intervention plus twenty hours over ten weeks of self-paced, customised exercise programme and sixteen hours of self-management and health education from the multidisciplinary team and community services.

## Study Sample

In this study, three groups were investigated: A one-hour intervention group, ten-week intervention group and non-participating group.

Study participant inclusion criteria were:

- The one-hour intervention group who were referred to and attended the one-hour intervention between 1 January, 2014 and 31 May, 2016.
- The ten-week intervention group who were referred to, participated in and completed the one-hour intervention plus ten-weeks of the group outpatient rehabilitation between 1 January, 2014 and 31 May, 2016.
- The non-participating group who were not referred to the service but discharged from hospital acute or outpatient services within the 2014 Calendar Year.
- Aged between 30 and 99 at time of service
- Domicile town/region was Napier City or Hastings District, New Zealand
- Had a confirmed diagnosis of COPD or a diagnosis of IPF by a respiratory physician

Participant exclusion criteria were:

- Patients who live in aged care facilities
- Patients attending a home exercise programme
- Patients who had or were receiving dialysis
- Patients who had no diagnosis of respiratory disease
- Patients who had been diagnosed with cancer and were undergoing active treatment
- Patients who were enrolled in another PLTM or LTC intervention

## Sources of data

National Health Index (NHI) numbers are unique numbers used in New Zealand to identify patients who utilise medical services. All personal information along with medical, nursing, allied health, social support, mental health, primary care and hospital interventions are recorded against the unique identifier and included in hard copies and digital health records. All diagnosis information is coded using the Australian national diagnosis related group classification system (AN-DRG) and recorded against the unique NHI. Specific medical diagnosis is further categorised with the Medical Diagnostic Category coding. These digital health records are held in the electronic information system, Electronic Clinical Application Database (ECA).

Only limited information that is supplied from primary care is available on the ECA as the primary care and the acute services electronic systems are not linked. Most primary health providers can access the district health boards standardised ECA system but access to primary care is complex as there are multiple medical record systems used within New Zealand within primary care. Spirometry results in primary care are not available in the ECA unless it is specifically uploaded on the system. Hardcopy results which are provided as part of the PLTM referral process are held with the patient's medical records.

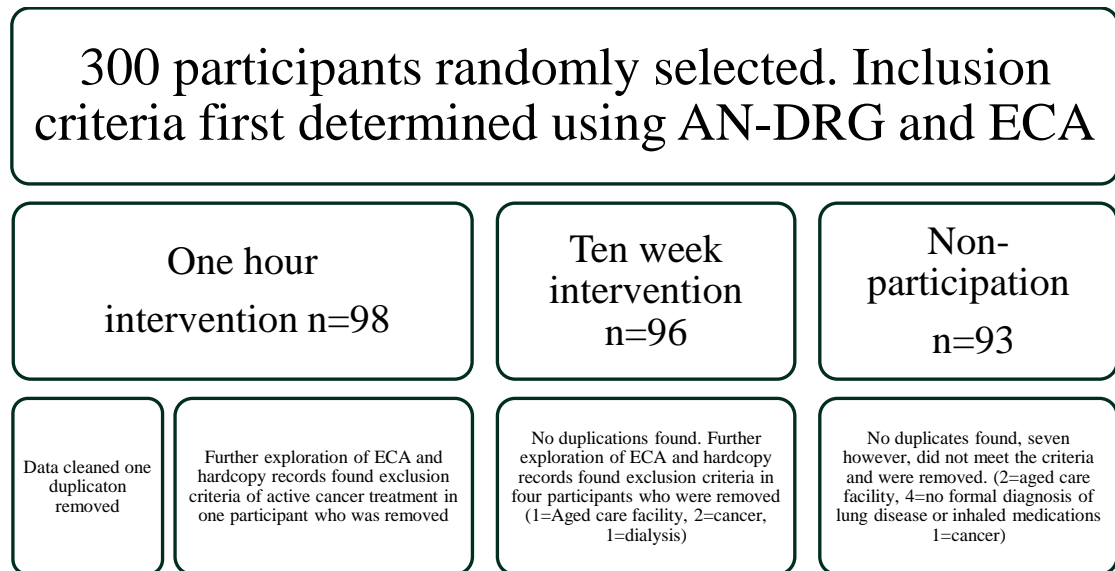
## Collection of data

Stratified probability sampling was used to select participants who had used hospital services in the HBDHB with COPD or IPF. The intervention groups were randomly selected from the HBDHB PLTM clinical letter file held within the ECA using the True Random Number Generator (Randomness and Integrity Services LTD, 2016) until 100 participants for each intervention group were collected. All participants were then coded and details recorded on an Excel spreadsheet. For the non-participate group, AN-DRG codes were used by the HBDHB Business Intelligence Team to randomly select 100 participants. From there it was determined if participant met inclusion criteria and determined their primary diagnosis on discharge from hospital services.

Participants from all groups were then combined on an Excel spreadsheet. Hard copies of medical records and electronic information on the ECA from the three groups was mined for data by the researcher at the same time the HBDHB Business Intelligence Team analysed the hospital utilisation of participants which blinded the researcher from hospital utilisation outcomes. Retrospective mining was used to record exact ages at the time of the intervention, gender, ethnicity, severity category of COPD or verification of diagnosis of IPF, and the number of long term conditions per patient. Mining also took place to further confirm inclusion criteria for the non-participate group and exclusion criteria for all groups by examining hardcopies of medical records and multidisciplinary clinical letters on the ECA. One hundred participants were

originally randomly selected for each group. Data was cleaned to ensure NHI numbers were complete, not transposed and check for duplicates or errors. One duplication was removed from the one-hour intervention group data set. Of the remaining 299 participants, randomly selected, 12 were found to have one or more of the exclusion criteria and therefore were removed from this study (Table 2).

**TABLE 2: PARTICIPATION GROUP SELECTION FLOWCHART**



Data collected for this study included: age, gender, ethnicity, lung function category, the number of LTCs per person and various hospital admission measures: emergency room presentations with an exacerbation of a LTC (EDLTC), hospital admissions with an exacerbation of a LTC on (AdLTC), emergency room presentations with an exacerbation of respiratory disease (EDResp), and admissions to hospital due to an exacerbation of respiratory disease (AdResp).

The severity of COPD was classified as per the GOLD guidelines: GOLD 1: Mild  $FEV_1 \geq 80\%$  predicted; GOLD 2: Moderate  $50\% \leq FEV_1 < 80\%$  predicted; GOLD 3: Severe  $30\% \leq FEV_1 < 50\%$  predicted; and GOLD 4: Very Severe  $FEV_1 < 30\%$  (GOLD, 2015). All the lung function values, GOLD classifications or a conformation of diagnosis of pulmonary fibrosis were available for the intervention groups as they were required for entry into the PLTM service. When lung function or GOLD classification in the non-participation group was not specifically recorded GOLD classification was estimated using the patients prescribed inhaled medications and matching this to the recommended medications for the GOLD category as per GOLD guidelines (GOLD, 2015). If this was ambiguous or no inhaled medications were recorded in patients electronic or hard copy records, the patient was subsequently excluded.

Long-term conditions are complex and can encompass a variety of diseases. LTCs were categorised into mental health conditions or via the systems affected; nervous, circulatory, respiratory, renal, digestive, endocrine, immune, skeletal, sensory, and exocrine. If a person had

more than one subset of a physiological system or mental health disorder, it was counted as one (e.g. angina and heart failure were counted as one).

The AN-DRG codes were used to determine the number of emergency presentations and hospital admissions in all three groups. Each emergency presentation and hospital admission that fell within 180 days of the last day of the month of discharge from hospital services were used in the calculations. This was determined by calculating the minimum date of the next day and a maximum date, 180 days later. Any medical emergency presentations or admissions to the hospital that fell within the minimum and maximum date were used in the calculation and recorded on the Excel spreadsheet.

Any AN-DRG codes that were linked to Medical Diagnostic Category codes for “diseases and disorders of the respiratory system” (J44.0-J44.9) (J84.1, J84.8, J84.9) were used to specifically determine if a patient utilised hospital services because of an exacerbation of their respiratory condition. Respiratory disease is a LTC. Therefore, all emergency presentations due to respiratory disease and all hospital admissions due to respiratory disease are subsets of the total emergency presentations with LTC and admissions with LTCs.

## Methods

Descriptive and inferential statistical analyses were carried out using Statistical Package for Social Sciences (SPSS, IBM® Version 24) software. For each group proportions (expressed as percentages) were calculated for each of the categories within gender, ethnicity (Māori and non-Māori), respiratory diagnosis (IPF and COPD) and severity of COPD (GOLD 1- 4) with differences between the group proportions being determined with *z*-tests. Means ( $\bar{x}$ ) and standard deviations (SD) for each group (one-hour intervention, ten-week intervention, and non-participation) were calculated for age and number of LTCs. Differences between the group means were tested using one way analyses of variance (ANOVA) and explored using pairwise comparisons with Bonferroni corrections. For both the one-way ANOVA and *z*-test, a significance level of  $\alpha = 0.05$  was used. The four independent variable categories of ethnicity; Pākehā, Māori, Pasifika and other European descent (Appendix B, Table 7), were collapsed down into two categories of Māori and other nationality due to small numbers of Pasifika and other European descent.

Pearson correlations were performed to determine associations between linear variable that may influence the number of hospital admissions, namely: age and number of LTCs. These variables were confounded and therefore not used together subsequent analyses.

To explore the differences between the groups (one-hour intervention, ten-week intervention, and a non-participation) and determine if an intervention effect existed, general linear models (GLMs) were used. A GLM was performed for each of the dependent variables of hospital

admission measures (i.e. EDLTC, AdLTC, EDResp and AdResp) which were corrected for age, gender and ethnicity. Age was included as a covariate while gender and ethnicity were included as factors in the model and only the main effects were tested. If a significant difference between the groups were detected, then pairwise comparisons were performed using Bonferroni corrections to determine which means differed. A significance level of  $\alpha = 0.05$  was used, thus, any p-values less than 0.05 indicated that there was a significant difference between the means and the null hypothesis was rejected.

## Chapter 4- Results

### Demographic

The demographic profile of all of intervention groups and non-participant group are provided in Table 3. There was a total of 287 participants in this study: one-hour intervention group (n=98); the ten-week intervention group (n=96); and the non-participant group (n=93). Of these, 280 participants were diagnosed with COPD; the majority of which were GOLD 2 moderate (53%). This was followed by GOLD 3 severe (27.1%), GOLD 4 very severe (10.4%) and then GOLD 1 mild (9.3%). The remaining seven participants of the total had a diagnosis of IPF.

Participants ranged in age between 36 to 92 years with a mean age of 70 years (69.88 years  $\pm$  11.312 *SD*) and had between one and seven LTCs with participants having on average three LTCs (2.66  $\pm$  1.236 *SD*). Age and LTCs were significantly correlated with the number of LTCs a participant was diagnosed with increasing as age increased (Pearson's  $r= 0.181$ ,  $p=0.003$ ).

When comparing the groups, the non-participant group had a significantly higher mean age of 72.4 years than both the one-hour and ten-week intervention groups (69.1 and 68.2 years, respectively) which did not significantly differ from each other. The one-hour intervention group had a significantly higher average for the number of LTC than both the ten-week intervention and non-participant groups.

The proportion of GOLD 2 moderate COPD in the one-hour intervention group was significantly higher (60.4%) than that of the non-participant group (45.1%) but not the ten-week intervention group (53.8%). There was no significant difference in any of the other COPD classification proportions between the intervention and non-participant groups (Table 3). The proportion of females in the one-hour intervention group was higher (65.3%) than that of the non-participant group (50.5%) but not the ten-week intervention group (58.3%). There was no significant difference in gender proportions between the intervention groups (Table 3).

No significant difference in the proportion of Māori was detected between any of the groups ( $z$ -test,  $p > 0.05$ ) indicating that Māori representation was similar in all the groups. Ethnicity were collapsed into the categories of Māori and Other for statistical purposes (Table 3) and shown in detail in Appendix, Table A. The intervention and non-participant groups within this study were found to be relatively even in participants identifying as Māori or Pasifika. The ten-week intervention group equalled the regional average of 24% for Māori participants however, only 1% of participants identified as coming from Pasifika descent. The one-hour intervention group however exceeded the regional average with 26.5% for Māori participants and met the regional average of 4% for Pasifika participants.

## Hospital Utilisation

The dependent variable of hospital use is provided in Table 4. When correcting for age, gender and ethnicity, the mean EDLTC and AdLTC admission rates were significantly lower in the ten-week intervention group when compared to the non-participant group ( $P=0.006$  and  $P=0.008$ , respectively) (Table 4). The two intervention groups were not significantly different to one another and the one-hour intervention group was not significantly different from the non-participant group (Table 3). No significant differences between the mean number of EDResp and AdResp admissions were detected between the groups, with the exception of the ten-week intervention group where the EDResp admission rates were ( $P < 0.100$ ) lower than that of the non-participant group (Table 4).

**TABLE 3: DEMOGRAPHIC COMPARISONS BETWEEN CARE MANAGEMENT INTERVENTIONS AND NON-PARTICIPANT GROUP**

Variable	One-hour intervention, <i>n</i> =98	Ten-week intervention, <i>n</i> =96	Non-participant, <i>n</i> =93	
	<i>Frequencies % (n)</i>	<i>Frequencies % (n)</i>	<i>Frequencies % (n)</i>	
Gender				
Female	65.3 (64) <sup>a</sup>	58.3 (56) <sup>ab</sup>	50.5 (47) <sup>b</sup>	
Male	34.7 (34) <sup>a</sup>	41.7 (40) <sup>ab</sup>	49.5 (46) <sup>b</sup>	
Ethnicity				
Māori descent	26.5 (26) <sup>a</sup>	24 (23) <sup>a</sup>	22.6 (21) <sup>a</sup>	
Other	73.5 (72) <sup>a</sup>	76 (73) <sup>a</sup>	77.4 (72) <sup>a</sup>	
Respiratory Diagnosis				
Idiopathic Pulmonary Fibrosis	2.0 (2) <sup>a</sup>	3.1 (3) <sup>a</sup>	2.2 (2) <sup>a</sup>	
COPD	98 (96) <sup>a</sup>	96.9 (93) <sup>a</sup>	97.8 (91) <sup>a</sup>	
COPD severity (GOLD predicted value)				
1 Mild (FEV1 ≥ 80%)	5.2 (5) <sup>a</sup>	5.4 (5) <sup>a</sup>	17.6 (16) <sup>b</sup>	
2 Moderate (50% ≤ FEV1 < 80%)	60.4 (58) <sup>a</sup>	53.8 (50) <sup>ab</sup>	45.1 (41) <sup>b</sup>	
3 Severe (30% ≤ FEV1 < 50%)	19.8 (19) <sup>a</sup>	32.3 (30) <sup>a</sup>	29.7 (27) <sup>a</sup>	
4 Very severe (FEV1 < 30%)	14.6 (14) <sup>a</sup>	8.6 (8) <sup>a</sup>	7.7 (7) <sup>a</sup>	
	<i>Mean ± SD (min-max)</i>	<i>Mean ± SD (min-max)</i>	<i>Mean ± SD (min-max)</i>	<i>P value</i>
Age (years) <sup>1</sup>	69.06 <sup>a</sup> ± 11.211 (39-92)	68.23 <sup>a</sup> ± 11.611 (36-91)	72.44 <sup>b</sup> ± 10.766 (42-89)	0.025
Number of LTC <sup>1</sup>	2.99 <sup>a</sup> ± 1.312 (1-7)	2.55 <sup>ab</sup> ± 1.272 (1-7)	2.41 <sup>b</sup> ± 1.035 (1-7)	0.003

<sup>a, b</sup> Differing superscripts indicate categories whose column do differ significantly,  $\alpha=0.05$

<sup>1</sup> P values derived from a one-way ANOVA (factor groups), superscripts derived from pairwise comparisons (Bonferoni corrected). LTC, number of long term conditions.

**TABLE 4: RESULTS FROM GENERAL LINEAR MODELS COMPARING HOSPITAL ADMISSIONS BETWEEN TWO CARE MANAGEMENT INTERVENTIONS AND NON-PARTICIPANT GROUP**

	One-hour intervention	Ten-week intervention	Non-participant	
	<i>Mean ± SD</i>	<i>Mean ± SD</i>	<i>Mean ± SD</i>	<i>P value</i>
Admissions <sup>1,2</sup>	<i>n = 98</i>	<i>n = 96</i>	<i>n = 93</i>	
EDLTC	0.60 <sup>ab</sup> ± 1.702	0.32 <sup>a</sup> ± 1.704	1.07 <sup>b</sup> ± 1.716	0.006
AdLTC	0.35 <sup>ab</sup> ± 1.386	0.17 <sup>a</sup> ± 1.391	0.76 <sup>b</sup> ± 1.398	0.008
EDResp	0.23 <sup>a</sup> ± 1.396	0.13 <sup>a</sup> ± 1.391	0.54 <sup>a</sup> ± 1.407	0.083
AdResp	0.13 <sup>a</sup> ± 1.128	0.08 <sup>a</sup> ± 1.366	0.36 <sup>a</sup> ± 1.138	0.165

<sup>1</sup> EDLTC, number of emergency department admission for patients with long term conditions; AdLTC, number of admissions to hospital for long term conditions; EDResp, number of emergency department admissions for patients with an exacerbation of their respiratory disease; AdResp, number of admissions to hospital with an exacerbation of their respiratory disease;

<sup>2</sup>Estimate marginal means, standard deviation (SD) and P values derived from general linear models (factors: gender, ethnicity, group; covariate, age), superscripts derived from pairwise comparisons (Bonferoni corrected).

## Chapter 5-Discussion

### Kaitautoko

Two interventions within the PLTM Kaitautoko (supportive) level, one-hour intervention and ten-week intervention were examined to ascertain if the PLTM services had been successful in reducing hospital use (Table 1). Compared to the non-participation group, less hospital use was found in the ten-week intervention in both hospital emergency presentations with LTCs ( $p=0.006$ ) and admissions to hospital with LTCs ( $p=0.008$ ) compared to the non-participant group. The one-hour intervention trended towards less hospital admissions with LTCs compared to the non-participant group as did the ten-week intervention group in emergency presentations with respiratory disease (Table 4). No statistical difference was found between the one-hour and the ten-week intervention in hospital use with LTCs or respiratory disease (EDLTC,  $p=0.677$ ; EDResp,  $p=1.0$ ; AdLTC,  $p=1.0$  or AdResp,  $p=1.0$ ). To determine the effectiveness of one-hour intervention or the ten-week intervention on hospital presentations, a three-group design was used in this study. Because all patients who are in the ten-week intervention are provided with a one-hour intervention, the ability to determine if the ten-week intervention alone was effective becomes impossible without examining the one-hour or the ten-week intervention independent from each other. The outcome of the ten-week intervention therefore, reflects the two combined interventions impact on hospital use.

### Long term Conditions

Participants within this study were found to have an average of three LTCs per person (Table 3) which is a predictor of hospital use and mortality (Soltani, Reid, Wills, & Walters, 2015). When comparing the groups, the non-participation group had a significantly higher mean age of 72.4 years than both the one-hour and ten-week intervention groups ( $p=0.025$ ). No associations were found with gender on age or LTC ( $p=0.905$ ,  $p=0.970$  respectively). Age could have been dependent factor on the non-participants increased hospital use however, because age and the number of LTCs were confounded they were not used together in the study outcome analyses nevertheless, this phenomenon was examined to better understand the patients who participate in the interventions compared to the non-participant group.

The Ministry of Health reports that health disability-adjusted life year (DALY) increases exponentially as people grow older leading to more LTCs, disability and mortality (MOH, 2016). However, the non-participation group did not have, on average, more LTCs than either intervention. The one-hour intervention group was found to have had a higher average of LTCs than both the ten-week intervention and non-participating groups ( $p=0.003$ ) (Table 3). Patients within this study ranged from 36-92 years with retirement age in New Zealand being 65 years

old with the provision of superannuation (New Zealand Government, 2017). In this study 38% ( $n=37$ ) of the one-hour intervention were still of working age and could have been disadvantaged from attending the ten-week programme due to work commitments. The ten-week programmes are available during work hours. Patients who are still working may not be able to attend a ten-week intervention that requires four hours off work a week. In addition, patients who are from low income employment, may also be financially disadvantaged by attending a ten-week programme. The Ministry of Health reports that people who live in low socioeconomic situations are more likely to have more LTCs at a younger age (2002). In Hastings, 30% of people fit into quintile five which is most socioeconomically deprived quintile group in New Zealand (Ministry of Health, 2016). Gabriel, Figueiredo, Jacome, Cruz, and Marques (2014), explored perspectives of both patients and families living with COPD and found that financial strain, breathlessness and fear of going out of the house impacted on patients quality of life. As shown in Table 3, statistically significant differences in LTC were found in the one-hour intervention compared to the other groups ( $p=0.003$ ). Patients indicated during the one-hour assessment if they wished to participate in the ten-week intervention. Self-selection into the ten-week programme therefore, may have influenced the fact that the one-hour intervention had more LTCs compared to the ten-week intervention and non-participants.

In the PLTM service one-hour intervention, the clinical nurse specialist has the time and resources to bring together diagnostic information, evaluate and educate regarding medications, implement self-management strategies, and clarify the patient's experiences and understanding. In the small focus group study ( $n=19$ ) by Sellappans, Lai, & Ng, 2015, concerns were highlighted by primary care physicians when prescribing for patients with LTCs, as they did not have enough time to provide detailed education to patients on their medications. The one-hour intervention is instrumental in developing a successful patient, health professional relationships and allows the clinical nurse specialist to provide a back up to the information given by the primary physician. The primary care physician therefore has the security of knowing that the clinical nurse specialist will consolidate and develop the information given. The comprehensive assessment can uncover issues previously not revealed, which in turn can be communicated back to the primary care physician in the form of a clinical letter; effectively establishing a three-way partnership between patient, primary care physician and clinical nurse specialist.

In this study, statistically significant less hospital use was found in LTCs rather than with respiratory disease. This may be because interventions within the PLTM programmes are directed towards decreasing risks associated with hospitalisation use and not disease specific education. Johnson, Yin, and Berg (2003), in their large scale study of the Medicaid Asthma Disease Management Programme, acknowledged that LTC management programmes are beneficial in reducing hospital use for a variety of LTCs (Johnson, Yin, & Berg, 2003). In the

RCT by Rice, et al, their COPD management intervention also found statistically significant less hospital admissions in cardiac disease and other LTCs rather than respiratory disease (2010). The exercise component of the programme builds exercise tolerance with strength, balance and aerobic exercise which has also been shown to reduce hospital use (Cecins, Geelhoed, & Jenkins, 2008; Hui & Hewitt, 2003). Topics such as diet, anxiety, depression, advanced care planning, and increasing exercise are important to the management of a variety of LTCs, therefore it is logical that the greatest impacts in hospital use in this study would be found in LTCs and not respiratory disease. The findings in this study provide an argument for shifting from the focus of disease targeted interventions into LTC management.

## Respiratory disease

As discussed in the literature review, PLTM Service conducted a pilot pre-post-test design study of 45 patients who had attended the community nursing PLTM ten-week intervention. The pilot study showed the ten-week intervention had statistically significant reductions in overall hospital admissions, improvements in the six-minute walk test and quality of life. Unlike this current study, the pilot study did not evaluate if hospital use was due to an exacerbation of any LTC or specifically an exacerbation of a respiratory disease. This current study however, looked at the impacts of overall LTCs and respiratory disease and found that impacts were significant in LTC rather than respiratory disease. The PLTM programmes provide education to patients and stress to providers the importance of patients obtaining emergency antibiotics. The PLTM interventions include education around how to recognise an exacerbation of their condition, how antibiotics, prednisone and regular medications work and are empowered to discuss emergency antibiotic use with their primary provider. Ireland, et al., 2010 found by using this approach, patients gained knowledge in medication and also adherence to treatments. Sari and Osman (2015), evaluated a 185 participants of a Saskatchewan asthma and COPD self-management intervention and found that participants who took part in self-management education used their COPD/Asthma chronic management medications more often than the control with effects that lasted four years following the intervention (Sari & Osman, 2015).

When adjusting for age and LTCs a trend was seen with less emergency presentations with respiratory disease in the ten-week intervention compared to the non-participant group. Analysis was then further explored including the severity of COPD as per the GOLD guidelines and excluding patients with IPF (Table 4). The stages of COPD are not consistent percent changes between differed categories of COPD GOLD standards. For example, GOLD stage 3 is between 30% and 50% predicted FEV<sub>1</sub> (20% difference) and GOLD stage 2 is between 50% and 80% FEV<sub>1</sub> predicted (30% difference). Therefore, results in this model needed to be interpreted with caution. In the analysis model, which included COPD, statistically significant less hospital use was still found in the ten-week intervention in hospital use with LTC, rather than with respiratory

disease. Unexpectedly, mild COPD (GOLD stage 1) tended to present more frequently to hospital compared to moderate, severe and very severe COPD (Appendix; Table B). This was especially evident with statistically significant less emergency presentations with LTC in mild GOLD 1 compared to moderate GOLD 2 COPD ( $p=0.05$ ). The results from this study contrasts the audit by Soltani, Reid, Wills, and Walters (2015), which found that the more severe COPD was a predictor of hospital use and mortality. Ministry of Health reports that people who live in low socioeconomic situations are more likely to have more LTCs at a younger age which includes COPD (2002). Younger patients, diagnosed with mild COPD may not be considered for the PLTM programme by some primary health providers, especially if they are still working. In the study on the Collaborative Care Management programme, conducted by Angstman, et al. (2014), found that by targeting patients deemed to be at risk of hospitalisation, hospital use was decreased. Physicians may also feel that patients with more severe disease gain more benefits from the PLTM service than patients with mild COPD. Therefore, it may be that the larger amount of mild COPD hospital use in this PLTM study may also reflect targeting more severe patients, decreasing more severe COPD hospital use.

## Indigenous health

The Ministry of Health in 2016 reported that respiratory hospital admissions for people who identified as Māori were three to four times more than non-Māori (MOH, 2016). Though not statistically significant, in all outcome measurements in this study, people who identified as Māori tended to have less hospital use than non-Māori which was most evident in emergency presentations for respiratory disease (Appendix, Table C). When considering that hospital admission rates for people who identify as Māori are three to four times more, this result could suggest that this approach to LTC management could be successful in closing the gap of health disparity between Māori and non-Māori. However, this research would need to be duplicated to ensure that this was not matter of chance.

People who live in high deprivation areas and people who identify as Māori or Pasifika are disproportionately affected by LTCs due to increased exposure to health risks such as tobacco use (Ministry of Health, 2009). People who identify as Māori have higher rates of smoking, a risk factor associated with hospital use and mortality (MOH, 2016). When patients with LTCs have increased knowledge around their conditions, they are able understand steps they can take to avoid illness. This empowers patients to participate in their own health decisions and present less frequently to hospital, improving health outcomes (Schraeder & Shelton, 2011). Hamar, et al., described this strategy of self-mangement in the prevention of admissions to hospital for patients living with LTCs (2015). This study evaluated the impact a disease management programme had on hospital use of patients with diabetes and heart disease and found that providing self-management strategies and tools for improving health lifestyles reductions could

be seen in admissions to hospital for both diabetes and heart disease (Hamar, et al., 2015). An essential component to the PLTM interventions is the provision of appropriate health literacy and self-management that builds on education from subsequent contacts. The one-hour intervention gives the bases of health literacy, self-management and aims to reduce risk factors associated with ill health. If the patient does not wish to have further input at the very least, there is a basic understanding of what is needed to keep well and improve health outcomes. This is an important aspect as it also provides a continuum of care when primary and secondary services are providing the same messages which are based on best practice. Patients who are further enrolled in the ten-week intervention learn more techniques and strategies from the PLTM team, the multidisciplinary team and community support services.

The ten-week intervention has shown statistically significant less hospital use in both the pilot study and this study. The ten-week intervention has added benefits such as extended education, support and exercise. However, the challenges of living with a LTC effects these gains due to ongoing attendance challenges in the ten-week intervention. This emphasises the importance of offering alternative treatment options such as the one-hour intervention. Paige, Stellefson, and Singh, in a review identified several reasons for not participating in LTC management programmes including transportation problems, financial issues, and living with more than one LTC (2016). Compared to the Pākehā<sup>11</sup> population, people who identify as Māori descent have lower incomes, higher rates of unemployment, and poorer health outcomes (Ministry of Health, 2009). Therefore, people who identify as Māori are more likely to be impacted by these factors which inhibit participation in LTC management programmes. The one-hour intervention provides a simple way to obtain the foundations of self-management, health literacy and develop personal goals for improving health in the future. When whānau attend the one-hour intervention this also is an opportunity to extend this knowledge into the wider whānau network. By providing opportunities for engagement patients can increase ownership of their conditions and actively participate in health.

## Limitations

Several limitations were found in this study including the ability to randomise participants into the interventions or non-participation group. Recruitment to the PTLM service may have also been influenced by referrers recognising participants who were particularly motivated and may not have been a true reflection of the population. Limited generalisability has been an issue of the participant sample size. A larger sample size could have enabled further analysis and interpretation of outcomes. The short 180 days' post intervention period limited the ability to see if any changes occurred over a longer length of time. Only hospital records were used to

---

<sup>11</sup> Pākehā: Aotearoa New Zealander from European descent (New Zealand Government, 2016)

determine diagnosis which may have led to an underestimation of comorbidities in patients who were not hospitalised. Recording the number of LTCs also was limited by categorisation of physiological systems and not a true indication of the amount of LTCs people in this study were living with. Limited information on severity of COPD was due to the inability to access general practice notes in the non-participation group. Differences in physician practices could have also impacted on results as some physicians may take recommendations for emergency antibiotics and changes treatments where others may not.

## Chapter 6-Conclusion

### What does this mean for practice?

The New Zealand population is experiencing an increase in the prevalence of LTCs which is estimated to account for most of the overall national health spend and consume a vast amount of health care resources (Ministry of Health, 2009). This study is relevant to the health management of the population of people living with LTCs. The impact this service has made in LTCs supports a holistic approach to LTC management in patient care and the provision of education. The PLTM service interventions dedicate time with patients to discuss their concerns, which leads to deeper relationships that provide opportunities for effective support. Expanding on education and support in the ten-week intervention, coupled with the exercise component solidifies the patient's journey into healthy lifestyle changes. These strategies increase patient's ownership of their conditions and empowers active participation in health. This study indicates benefits to integrate services which in the future should be considered across the wider health spectrum.

### Recommendations for future research

Particularly for the PLTM service, research should be conducted to further explore the impacts the one-hour intervention and the ten-week intervention, have on patients and whānau. Duplication of this study with a larger sample size would be valuable as it may provide an argument for less intensive interventions and more advanced nurse led LTC management. The other levels of care within the service (Hauora Taupori & Take Whāwhai) should also be explored to determine their effectiveness in improving patient health outcomes and the effects these interventions have on primary, secondary and tertiary care.

Very little research was found on the impacts of culture on LTC management interventions. Most literature including this study, described the LTC management interventions as being culturally inclusive, but did not explore if this specifically influenced patient health outcomes. A study of this nature could provide rich information to target many vulnerable populations and isolated communities.

As we have seen in scholarly studies and government policies there is a call to move away from the focus on disease and instead to focus on LTCs. This study provides useful information on differences between hospital use with respiratory disease versus LTCs. As suggested in this study it was the mild disease category impacted most on hospital use not the most severe disease category. This would be helpful information when allocating interventions for LTC management. Also, highlighted from this study was a need for efforts to be directed toward developing and researching a universally accepted tool for determining the number of LTC people have. If a

standardised measurement is used, regional and national reporting could help to direct healthcare funding and enable explore further exploration of the causes and impacts of LTCs.

### Issues which were beyond the scope of this study

Equitable LTC management cannot be accomplished without a drastic change to the existing healthcare funding models in New Zealand. Initiatives need to be targeted towards decreasing the prevalence of LTC rather than focussing on strategies to treat LTCs. However, to support patients and whānau living with LTCs, funding must be directed toward equitable quality interventions that improve health outcomes for populations. LTC management interventions must be targeted to appropriate populations, have reportable measurable outcomes and share responsibility of patient care. Strong leadership and bold policy changes are needed to meet the needs of the growing burden of LTCs.

## References

- Adams, O. (2016). Policy capacity for health reform: Necessary but insufficient. *International Journal of Health Policy Management*, 5(1), 51-54.
- Ades, P., Keteyian, S., Balady, G., Houston-Miller, N., Kitzman, D., Mancini, D., & Rich, M. (2013). Cardiac rehabilitation exercise and self care for chronic heart failure. *Journal of the American College of Cardiology*, 1(6), 540-547. doi:10.1016/j.jchf.2013.09.002
- Ahn, S., Smith, M., Altpeter, M., Belza, B., Post, L., & Ory, M. (2015). Methods for streamlining intervention fidelity checklists: An example from the chronic disease self management program. *Front. Public Health*, 2(294). doi:10.3389/fpubh.2014.00294
- American Institute for Cancer Research. (2016). *Estimating preventability*. Washington DC: American Institute for Cancer Research.
- American Medical Association. (2013, June 18). *AMA adopts new policies on second day of annual meeting*. Retrieved from American Medical Association : <http://www.ama-assn.org/ama>
- American Thoracic Society. (2012, March 15). An official American Thoracic Society workshop report: The integrated care of the COPD patient. *American Thoracic Society*, 9(1), 9-18. doi:10.1513/pats.201201-014ST
- Angstman, K., Oberhelman, S., Rohrer, J., Meunier, M., Rasmussen, N., & Chappell, D. (2014). Depression remission decreases outpatient utilization at 6 and 12 months after enrollment into Collaborative Care Management. *Population Health Management*, 17(1), 48-53. doi:10.1089/pop.2013.0004
- Arai, L., Panca, M., Morris, S., Curtis-Tyler, K., Lucas, P., & Roberts, H. (2015). Time, monetary and other costs of participation in family based child weight management interventions: Qualitative and Systematic Review evidence. *PLOS One*, 10(4), e0123782. doi:10.1371/journal.pone.0123782
- Bland, M. (2000). *An introduction to medical statistics* (3rd ed.). Oxford: Oxford University Press .
- Bourbeau, J., J. M., Maltais, F., Rouleau, M., Beaupré, A., Bégin, R., . . . Collet, J. (2003). Reduction in hospital utilization in patients with COPD: Disease specific self-managment intervention. *Archives of internal medicine*, 163(5), 585-591.
- Brady, T., Anderson, L., & Kobau, R. (2015). Chronic disease self-management support: Public health perspectives. *Frontiers in Public Health*, 2(234). doi:10.3389/fpubh.2014.00234
- Brooks, A., Andrade, R., Middleton, K., & Wallen, G. (2014). Social support: A key variable for health promotion and chronic disease management in hispanic patients with rheumatic diseases. *Clinical Medicine Insights: Arthritis and musculoskeletal disorders*, 7, 21-26. doi:10.4137/cmamd.s13849
- Brown, R., Ghosh, A., Schraeder, C., & Shelton, P. (2011). Promising practices in acute/primary care. In C. Schraeder, & P. Shelton, *Comprehensive care coordination for chronically ill adults*. Oxford, UK: Wiley Balckwell.
- Buresh, B., & Gordon, S. (2006). *From silence to voice: What Nurses know and must communicate to the public* (2nd ed.). New York: Cornell University Press.
- Campbell, M. (2001). *Statistics at square two: Understanding modern statistical applications in medicine*. London: BMJ Publishing Group.
- Carstensen, J., Andersson, D., Andre, M., Engstrom, S., Magnusson, H., & Borgquist, L. (2012). How does comorbidity influence healthcare costs? A population based cross sectional study of depression, back pain, and osteoarthritis. *BMJ*, 2(e000809). doi:10.1136/bmjopen-2011-000809
- Casillas, A., Iglesias, K., Flatz, A., Burnand, B., & Peytremann-Bridevaux, I. (2015). No consistent association between process of care and health related quality of life among patients with

diabetes: A missing link? *BMJ Open Diabetes Research and Care*, 3, (e000042).  
doi:10.1136/bmjdr-2014-000042

- Cecchini, M., Sassi, F., Lauer, J., Lee, Y., Guajardo-Barron, V., & Chisholm, D. (2010). Tackling of unhealthy diets, physical inactivity and obesity: health effects and cost effectiveness. *The Lancet*, 376, 1775-1784. Retrieved from <http://www.thelancet.com>
- Cecins, N., Geelhoed, E., & Jenkins, S. (2008). Reduction in hospitalisation following pulmonary rehabilitation in patients with COPD. *Australian Health Review*, 32(3), 415-422.
- Cleveland Clinic. (2013, May). *Disease management*. Retrieved from Center for continuing education: <http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/preventive-medicine/aging-preventive-health/>
- Critical Appraisal Skills Programme. (2013). *Critical Appraisal Skills Programme: Making sense of evidence*. Retrieved from CASP Checklists: <http://www.casp-uk.net/checklists>
- Dalziel, P., & Saunders, C. (2014). *Wellbeing economics: Future directions for New Zealand*. Wellington: BWB Texts.
- Devol, R., Brown, N., Kaufman, N., Miranda, K., Waters, H., & Webb Brawley, O. (2016). Economic impact of chronic disease. Milken Institute .
- Douglas, M., Pierce, J., Rosenkoetter, M., Pacquiao, D., Callister, L., Hattar-Pollara, M., . . . Purnell, L. (2011). Standards of practice for culturally competent nursing care: 2011 Update. *Journal of Transcultural Nursing*, 22(4), 317-333.
- Eru, M. (2016). Programme levels from Ngāti Kahungunu Kaumatua. Te Wāhanga Hauora Māori.
- European Observatory on Health Systems and Policies. (2011). *Portugal: Health systems review 2011*. Copenhagen: World Health Organization.
- Gabriel, R., Figueiredo, D., Jacome, C., Cruz, J., & Marques, A. (2014). Day to day living with severe chronic obstructive pulmonary disease: Toward a family based approach to the illness impacts. *Psychology and Health*, 29(8), 967-983. doi:10.1080/08870446.2014
- Gerteis, J., Izrael, D., Deitz, D., LeRoy, L., Ricciardi, R., Miller, T., & Basu, J. (2012). *Multitple chronic conditions chartbook*. Rockville, MD.: AHRQ Publications No, Q14-0038.
- Global Initiative for Chronic Obstructive Lung Disease (GOLD). (2015). *Global Strategy for Diagnosis, Management, and Prevention of COPD*. Global Strategy for Diagnosis, Management and Prevention of COPD, Inc.
- Greenhalgh, T. (2009). Chronic illness: Beyond the expert patient. *BMJ*, 338(b49), 629-631.
- Hamar, G., Rula, E., Wells, A., Coberley, C., Pope, J., & Larkin, S. (2015). Impact of a chronic disease management program on hospital admissions and readmissions in an Australian population with heart disease or diabetes. *Population health management*, 16(2), 125-131. doi:10.1186/s12913-015-0834-z
- Harvey, C., Buckley, C., & Scott-Chapman, S. (2015). *Nurse led respiratory clinics Hawke's Bay*. Napier: Eastern Institute of Technology.
- Hauer, K., Carne, P., Chang, A., & Satterfield, J. (2012). Behavior change counseling curricula for medical trainees: A systematic review. *Academic Medicine*, 87(7), 956-968. doi:10.1097/ACM.0b013e31825837be
- Hawkes Bay District Health Board. (2015). Pulmonary long term management service . *HBDHB/service plan/community nursing*.
- HBDHB. (2014). *Results 45 patients pre and post Pulmonary Manangement: hospital presentations, quality of life and six minute walk test*. Hastings: Hawkes Bay District Health Board.
- HBDHB. (2015). *Hawke's Bay District Health Board tobacco control plan 2015-2018*. Hastings : HBDHB.

- Hjalmarson, A., & Boethius, G. (2007). Effectiveness of brief advice and extending smoking cessation counseling programme when implementing routinely in hospitals. *Preventative medicine*, 45(2/3), 202-207.
- Howard, C., Dupont, S., Haselden, B., Lynch, J., & Wills, P. (2014). The effectiveness of a COPD breathlessness manual: A RCT to test a cognitive-behaviour manual vs informational booklet on health status, mood and hospital admissions in patients with COPD. *npj Primary Care Respiratory Medicine* 24 (2014) 14076. doi:10.1038/npjpcrm.2014.76.
- Hoy, W. (2014). Kidney disease in Aboriginal Australians: A perspective from the Northern Territory. *Clinical Kidney Journal*, 7, 524-530. doi:10.1093/ckj/sfu109
- Hudon, C., Chouinard, M., Diadiou, F., Baouliane, D., Lambert, M., & Hudon, E. (2016). The chronic disease self management program: The experience of frequent users of health care services and peer leaders. *Health Service Research*, 33(e2), 167-171. doi:10.1093/fampra/cmw007
- Hui, K., & Hewitt, A. (2003). A simple pulmonary rehabilitation program improves health outcomes and decreases hospital utilization in patients with COPD. *Chest*, 1(124), 94-97. doi:10.1378/chest.124.1.94
- Hutchinson, A., Graco, M., Rasekaba, T., Parikh, S., Berlowitz, D., & Lim, W. (2015). Relationship between health related quality of life, comorbidities and acute health care utilisation in adults with chronic conditions. *Health and Quality of Life Outcomes*, 13(69). doi:10.1186/s12955-015-0260-2
- Ikonomou, M., Skapinakis, P., Balafa, O., Eleftheroudi, M., & Damigos, D. S. (2015, December). The impact of socioeconomic factors on quality of life of patients with chronic kidney disease in Greece. *Journal of renal care*, 41(4), 239-246.
- Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st Century*. Washington DC: USA: National Academies Press.
- Ireland, S., MacKenzie, G., Gould, L., Dassinger, D., Koper, A., & LeBlanc, K. (2010). Nurse case management to improve risk reduction outcomes in a stroke prevention clinic. *Canadian Journal of Neuroscience Nursing*, 32(4), 7-13.
- Johnson, A., Yin, M., & Berg, G. (2003). Utilization and financial outcomes of an asthma disease management program delivered to Medicaid members: Results of a three-group comparison study. *Disease Management Outcomes* 2003, 11(7), 455-465.
- Kacmarek, R., Stoller, J., & Heuer, A. (2013). *Egan's fundamentals of respiratory care* (10th ed.). St. Louis, Missouri: Elsevier.
- Kaupapa Māori Nurse Specialists*. (2016). Retrieved from Te Manu Toroa Trust-Kaupapa Maori Health Care Services: <http://www.temanutoroa.org.nz/community/kaupapa-maori-specialist-nurses>
- Kim, S., Lee, S., Kim, G., Kang, S., & Ahn, J. (2014). Effects of a comprehensive cardiac rehabilitation program in patients with coronary heart disease in Korea. *Nursing and Health Sciences*, 16(1), 476-482.
- Kruis, A., Smidt, N., Assendelft, W., Gussekloo, J., Boland, M., Molken, M., & Chavannes, N. (2013). *Integrated disease management for patients with chronic obstructive pulmonary disease*. Cochran Airways Group.
- Kulinski, K., Boutaugh, M., Smith, M., Ory, M., & Lorig, K. (2015). Setting the stage: Measure selection, coordination, and data collection for a national self-management initiative. *Frontiers in Public Health*, 2(206). doi:10.3389/fpubh.2014.00206
- Lauvergeon, S., Burnand, B., & Peytremann-Bridevaux, I. (2012). Chronic disease management: A qualitative study investigating the barriers, facilitators and incentives perceived by Swiss healthcare stakeholders. *BMC Health Services Research*, 12(e176). doi:10.1186/1472-6963-12-176

- Liddy, C., Johnston, S., Guilcher, S., Irving, H., Hogel, M., & Jaglal, S. (2015). Impact of a chronic disease program on healthcare utilization in eastern Ontario, Canada. *Preventative Medicine Reports*, 2, 586-590. doi:10.1016/j.pmedr.2015.07.001
- Lukewich, J., Corbin, R., VanDenKerkhof, E., Edge, D., Williamson, T., & Tranmer, J. (2014). Identification, summary and comparison tools used to measure organizational attributes associated with chronic disease management within primary care settings. *Journal of Evaluation in Clinical Practice: International journal of public health policy*, 20, 1072-1085. doi:10.1111/jep.12172
- Lyford, S., & Cook, P. (2005). The Whanaungatanga model of care. *Nursing Praxis in New Zealand*, 21(2), 26-35.
- Marriott, L., & Sim, D. (2015). Indicators of inequality for Maori and Pacific people. *Journal of New Zealand Studies*, 20, 24-50.
- McEvoy, P., Escott, D., & Bee, P. (2011). Case management for high intensity service users: Towards a relational approach to care coordination. *Health and Social Care in the Community*, 19(1), 60-69.
- Ministry of Health. (2002). *Reducing inequalities in health*. Wellington: Ministry of Health. doi:0-478-27062-3
- Ministry of Health. (2006). *Meeting the needs of people with chronic conditions: Hāpai te whānau mo ake ake tonu*. Wellington: National advisory committee on health and disability. Retrieved November 2009, from <http://nhc.health.govt.nz/system/files/documents/publications/meeting-needs-chronic-conditions-feb07.pdf>
- Ministry of Health. (2009). *Report on New Zealand Cost of Illness Studies on Long Term Conditions*. Wellington: Ministry of Health.
- Ministry of Health. (2010). *Trends in service design and new models of care: A review*. Wellington: National Health Board. Retrieved from <http://www.nationalhealthboard.govt.nz>
- Ministry of Health. (2014). *Respiratory disease 50+ years*. Ministry of Health New Zealand. Wellington: Ministry of Health. Retrieved from <http://www.health.govt.nz/nz-health-statistics/health-statistics-and-data-sets/maori-health-data-and-stats/tatau-kura-tangata-health-older-maori-chart-book/nga-mana-hauora-tutohu-health-status-indicators-50-years/respiratory-disease-50-years>
- Ministry of Health. (2015, November). *Care Plus*. Retrieved from Ministry of Health: <http://www.health.govt.nz/our-work/primary-health-care/primary-health-care-subsidies-and-services/care-plus>
- Ministry of Health. (2016). *Vote health: The estimates of appropriations 2015/16 - Health sector*. Wellington: Ministry of Health.
- Ministry of Health and Long Term Care of Ontario. (2017). *Strategies for Prevention and managing chronic disease*. Retrieved from The Queens printer for Ontario: <http://find.gov.on.ca>
- MOH. (2016). *Health loss in New Zealand 1999-2013: A report from the New Zealand burden of diseases, injuries and risk factors study*. Wellington: Ministry of Health .
- Moore, K., Jiang, L., Manson, S., Beals, J., Henderson, W., Pratte, K., . . . Roubideaux, Y. (2014). Case management to reduce cardiovascular disease risk in American Indians and Alaska Natives with diabetes: Results from the Special Diabetes Program for Indians Healthy Heart Demonstration Project. *American Journal of Public Health*, 104(11), 158-164.
- Naqshbandi Hayward, M., Paquette-Warren, J., & Harris, S. (2016). Developing community driven quality improvement initiatives to enhance chronic disease care in Indigenous communities in Canada: The FORGE AHEAD program protocol. *Health Research Policy and Systems*, 14(55). doi:10.1186/s12961-016-0127-y

- New Zealand Government. (2016). *Te Reo Māori*. Retrieved from Te Ara – The Encyclopedia of New Zealand: <http://www.teara.govt.nz/>
- New Zealand Government. (2017). *New Zealand Superannuation*. Retrieved from New Zealand Work and Income: <https://www.workandincome.govt.nz/eligibility/seniors/superannuation/>
- New Zealand Nurse Organisation. (2013). *Position Statement for the use of self management plans in COPD*. Wellington: NZNO.
- Nursing Council New Zealand. (2009). *Competencies for registered nurses: Regulating nursing practice to protect public safety*. Wellington: Nursing Council New Zealand.
- OECD. (2011). *Health at a glance 2011: OECD indicators*. Organization for Economic Cooperation Development. Retrieved from [http://dx.doi.org/10.1787/health\\_glance-2011-en](http://dx.doi.org/10.1787/health_glance-2011-en)
- Oni, T., McGrath, N., BeLue, R., Roderick, P., Colagiuri, S., May, C., & Levitt, N. S. (2014). Chronic diseases and multi-morbidity; a conceptual modification to the WHO ICC model for countries in health transition. *BMC Public Health*, *14*(575), 1-7.
- Osborne, R., Wilson, T., Lorig, K., & McColl, G. (2007). Does self-management lead to sustainable health benefits in people with arthritis? A 2-year transition study of 452 Australians. *Journal of Rheumatology*, *34*(5), 1112-1117.
- Paige, S., Stellefson, M., & Singh, B. (2016). Patient perspectives on factors associated with enrolment and retention in chronic disease self-management programs: A systematic review. *Patient Intelligence*, *8*, 21-37. doi:10.2147/pi.s70185
- Pan American Health Organization. (2012). *Improving chronic illness care through integrated health service delivery networks*. Washington DC: World Health Organization .
- Peter, S., Chaney, G., Zappia, T., Van Veldhuisen, C., Pereira, S., & Santamaria, N. (2011). Care coordination for children with complex care needs significantly reduces hospital utilisation. *Journal for Specialists in Pediatric Nursing*, *16*(4), 305-312. doi:10.1111/J.1744-6155.2011.00303.x
- Peytremann-Bridevaux, I., Arditi, C., Gex, G., Bridevaux, P., & Burnand, B. (2015). *Chronic disease management for adults with asthma*. Cochrane Effective Practice and Organisation of Care Group.
- Porth, C. (2010). *Pathophysiology: Concepts of altered health states* (8th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.
- Randomness and Integrity Services LTD. (2016). *The true random generator*. Retrieved from Random.org: <https://www.random.org/>
- Rangahau . (2016). *Kaupapa Māori*. Retrieved from Rangahau: <http://www.rangahau.co.nz/rangahau/>
- Reidpath, D., & Allotey, P. (2012). The burden is great and the money little: Changing chronic disease management in low and middle income countries. *JOGH*, *2*(2).
- Rice, K., Dewan, N., Bloomfield, H., Grill, J., Schult, T., Nelson, D., . . . Niewoehner, D. (2010). Disease management program for chronic obstructive pulmonary disease. *American Journal of Respiratory and Critical Care Medicine*, *182*, 890-896.
- Sari, N. & Osman, M. (2015). *BMC Health Services Research* 2015; *15*: e332. doi: 10.1186/s12913-015-0998-6
- Schraeder, C., & Shelton, P. (2011). *Comprehensive care and coordination for chronically ill adults*. Oxford, UK: Wiley-Blackwell.
- Sharma, N., Bhatt, S., Luckhardt, T., & de Andrade, J. (2014). Short term pulmonary rehabilitation in idiopathic pulmonary fibrosis. *Chest*, *371A*(146). doi:10.1378/chest.1991557

- Sellappans, R., Lai, PSM., & Ng, CJ. (2015). Challenges faced by primary care physicians when prescribing for patients with chronic diseases in a teaching hospital in Malaysia: a qualitative study. *BMJ Open* 2015; 5: e007817. doi: 10.1136/bmjopen-2015-007817
- Shaw, S., Armin, J., Torres, C., Orzech, K., & Vivian, J. (2012). Chronic disease self management and health literacy in four ethnic groups. *Journal of health communication*, 17(sup3), 67-81. doi:10.1080/10810730.2012.712623
- SHORE & Whariki Research Centre. (2014). *Review of tobacco control services*. Auckland: Massey University.
- Shum, J., Poureslami, I., Doyle-Waters, M., & FitzGerald, J. M. (2016). The application of health literacy measurement tools (collective or individual domains) in assessing chronic disease management: A systematic review protocol. *Systematic Reviews*, 5(e2016). doi:10.1186/s13643-016-0267-8
- Soltani, A., Reid, D., Wills, K., & Walters, E. (2015, September). Prospective outcomes in Patients with acute exacerbations of chronic obstructive pulmonary disease presenting to hospital: a generalisable clinical audit. *Internal Medicine Journal*, 925-933.
- Stanford School of Medicine. (2016). *Patient Education*. Retrieved August 21, 2016, from Stanford Medicine: <http://patienteducation.stanford.edu/>
- Statistics New Zealand. (2013). *About a place: Hawke's Bay Region*. Wellington: New Zealand Government. Retrieved from [http://www.stats.govt.nz/Census/2013-census/data-tables/tables-about-a-place.aspx?request\\_value=24442&reportid=14&tabname=Populationanddwelling#](http://www.stats.govt.nz/Census/2013-census/data-tables/tables-about-a-place.aspx?request_value=24442&reportid=14&tabname=Populationanddwelling#)
- Sylvia, M., Griswold, M., Dunbar, L., Boyd, C., Park, M., & Boulton, C. (2008). Guided care: Cost utilization outcomes in a pilot study. *Disease Management*, 11(1), 29-36. doi:10.1089/dis.2008.111723
- Torgerson, C., & Hedstrom, L. (2011). Longitudinal care management: High risk care management. In C. Schraeder, & P. Shelton, *Comprehensive care coordination for chronically ill adults* (pp. 431-437). Oxford, UK: Wiley-Blackwell.
- Vadiei, M. (2012). The UK "Expert Patient Program" and self care in chronic disease management. *European Geriatric Medicine*, 3(2012), 201-205.
- WHO. (2002). *Innovative care for chronic conditions: Building blocks for action*. Geneva: World Health Organization.
- Wilson, N. (2007). *Review of the Evidence for Major Population-Level Tobacco Control*. Wellington : Ministry of Health .
- World Health Organization. (2011). *Global Alliance against Chronic Respiratory Diseases*. Retrieved December 2011, from World Health Organization : <http://www.who.int/gard/en/>
- World Health Organization. (2013, March 1). *Chronic Disease*. Retrieved from World Health Organization: [http://www.who.int/topics/chronic\\_diseases/en/](http://www.who.int/topics/chronic_diseases/en/)

# Appendices

TABLE A: ETHNICITY DETAIL

Variable	One-hour intervention, <i>n</i> =98 <i>Frequencies % (n)</i>	Ten-week intervention, <i>n</i> =96 <i>Frequencies % (n)</i>	Non-participation group, <i>n</i> =93 <i>Frequencies % (n)</i>	Overall, <i>n</i> =287 <i>Frequencies % (n)</i>
Māori descent	26.5 (26)	24.0 (23)	22.6 (21)	24.4 (70)
Pasifika descent	4.1 (4)	1.0 (1)	1.1 (1)	2.1 (6)
Pākehā/NZ European	56.1 (55)	64.6 (62)	71 (66)	63.8 (183)
Other	13.3 (13)	10.4 (10)	5.4 (5)	9.8 (28)

**TABLE B: SEVERITY OF COPD AND HOSPITAL USE**

GOLD category	Estimated mean	CI 95%
EDLTC		
GOLD 1	1.408	0.768-2.048
GOLD 2	0.475	0.192-0.757
GOLD 3	0.808	0.419-1.197
GOLD 4	0.603	0.008-1.199
AdLTC		
GOLD 1	0.909	0.384-1.434
GOLD 2	0.275	0.044-0.506
GOLD 3	0.554	0.236-0.873
GOLD 4	0.464	(-0.024)-0.952
EDResp		
GOLD 1	0.851	0.323-1.379
GOLD 2	0.206	0.027-0.439
GOLD 3	0.349	0.029-0.670
GOLD 4	0.136	(-0.355)-0.627
AdResp		
GOLD 1	0.671	0.242-1.099
GOLD 2	0.092	(-0.097)-0.281
GOLD 3	0.208	(-0.052)-0.468
GOLD 4	0.146	(-0.252)-0.545

**TABLE C: HOSPITAL USE FOR NON- MĀORI AND MĀORI WITH ESTIMATED MEAN AND CI**

Ethnicity	Estimated mean	CI 95%
EDLTC		
Non-Māori	.777	0.562-0.992
Māori	.547	0.170-0.924
AdLTC		
Non-Māori	.530	0.354-0.706
Māori	.326	0.018-0.634
EDResp		
Non-Māori	0.434	0.258-0.611
Māori	0.164	(-0.146)-0.473
AdResp		
Non-Māori	0.270	0.126-0.413
Māori	0.102	(-0.149)-0.353