Evaluation of the inclusion of an allied health assistant within an adult cystic fibrosis centre : Their role, scope of practice, and impact on physiotherapy services

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Evaluation of the inclusion of an allied health assistant within an Adult Cystic Fibrosis Centre: their role, scope of practice, and impact on physiotherapy services.

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Statement of Authorship

This thesis contains no material that has been extracted in whole or in part from a thesis that I have submitted towards the award of any other degree program in any other tertiary institution.

No other person's work has been used without due acknowledgement in the main text of this thesis.

The relevant Human research ethics committees approved all research procedures reported in this thesis.

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Publications

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Contributions by others to the thesis

The PhD candidate was principally involved in the study design, ethics applications, literature review, recruitment, data collection and analysis, and manuscript and thesis preparation and review for Studies 1 to 4. The PhD candidate contributed at least 70 % to the published manuscripts.

Robyn Cobb, Rebecca Chambers, Mark Roll, and Professor Scott Bell assisted in the study design, data collection, and review of manuscripts (Studies 1 and 3,4).

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Professor Suzanne Kuys provided considerable contributions to all study design, data analysis, and drafting of manuscript and thesis chapters.

Dr Lyndal Maxwell contributed considerably to the data analysis and drafting of manuscript and thesis chapters.

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Kathleen Hall / PhD Candidate and corresponding author Date 23/10/2022

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Professor Suzanne Kuys / Principal supervisor and co-author Date

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Abbreviations

ABC	Activity Bar Code
ACFDR	Australian Cystic Fibrosis Data Registry
AC	airway clearance
ACBT	active cycle of breathing techniques
ACFC	Adult Cystic Fibrosis Centre
ACT	airway clearance techniques
,	
ADOs	Accrued days off
AHA	Allied Health Assistant
AHP	Allied Health Professional
BMI	body mass index
CF	Cystic Fibrosis
CFRD	Cystic fibrosis-related diabetes
CFTR	Cystic fibrosis transmembrane conductance regulator protein
ECFS	European Cystic Fibrosis Society
FET	forced expiration technique
FEV1	forced expiratory volume in one second
FTE	full time equivalent
MDT	Multidisciplinary Team
OPD	outpatient department
OPEP	oscillating positive expiratory device
PEP	positive expiratory pressure
PTA	Physiotherapy Assistant
QALY	quality-adjusted life years

TPCH	The Prince Charles Hospital

Abstract

Cystic Fibrosis (CF) is a chronic, progressive disorder and the predominant genetic condition in Australia. The last few decades have seen a rise in the survival age and numbers of adults with Cystic Fibrosis attributable primarily to improved access to multidisciplinary care delivery via dedicated CF services and the impact of new medications, including, most recently, modulator therapies. These increased numbers and complexity of care delivery requirements have presented challenges for developing sustainable models of care delivery. Physiotherapy is a key component of the multidisciplinary care delivered to adults with CF. Several countries have developed clinical practice and standards of care guidelines, including physiotherapy clinical guidelines, that recommend requirements for care delivery, structure, staffing, and roles of the multidisciplinary team for adults with CF. However, it is not known if current physiotherapy services meet the recommended guidelines in terms of care delivery. Meeting service demands with growing numbers of patients will require innovative service redesigns to deliver efficiencies and services amenable to both staff and patients.

Implementing an allied health assistant (AHA) role into CF physiotherapy services may be feasible and sustainable for remodelling care delivery. Delegating clinical and non-clinical tasks to a specially trained AHA could improve physiotherapy care delivery and may change the scope of practice for CF physiotherapists. Currently, there is no published evidence on how a service redesign involving an AHA role may affect patient safety or the scope of practice of physiotherapists and AHAs in acute respiratory clinical settings, specifically in adult CF care. The overarching aim of this thesis was to establish current physiotherapy care delivery for adults with CF and then implement and evaluate a service redesign using an AHA role. Four studies were completed. The first study aimed to establish current CF physiotherapy care delivery and benchmark against current clinical guideline evidence. The second study examined the redesign of the CF physiotherapy service using a systematic workforce redesign system, the Calderdale Framework. Study three examined the changes to the remodelled CF physiotherapy care delivery for both physiotherapists and AHAs associated with implementing the AHA role. Finally, the fourth study examined changes in staff and patients' perceptions of the care delivery pre-and post-implementation of the AHA role.

Study 1 examined physiotherapy service provision, scope of practice, and skill mix in a large tertiary adult CF service using a cross-sectional observational study. Results showed that care was provided by 22 physiotherapists. Respiratory (n = 1058, 38%), and exercise treatments (n = 338, 12%) were provided frequently. However, other recommended activities, such as exercise testing (n = 20, 1%) and detailed treatment reviews (n = 79, 3%) occurred infrequently. Time for research was limited. Junior physiotherapists undertook more exercise treatments per day ($p < 0.001$), with senior physiotherapists attending outpatient clinics ($p < 0.001$). Findings from this study suggest that adherence to clinical practice recommendations could be improved. A redesign of services that would support and improve the existing staffing and skill mix within adult CF services to meet recommended standards of care was undertaken. Development and implementation of an AHA role were proposed as part of service redesign.

Study 2 examined the real-world application of the Calderdale Framework as a workforce redesign to implement an AHA role within an acute respiratory physiotherapy service. Staff perceptions were collected at four time points during the implementation to assess the Framework's serviceability. Clinical and non-clinical delegation tasks were developed for acute respiratory physiotherapy care. In addition to AHA competency training, all staff received training in delegation procedures, emphasising risk mitigation. Six new comprehensive clinical task instructions, guidelines and other resources were created. Using the Calderdale Framework to support implementation was perceived by staff to be a positive experience. A positive change in the perceptions of the value and role of an AHA and increased confidence in the understanding of delegation procedures was perceived by staff.

Study 3 explored the changes to physiotherapy care delivery following the addition of an AHA into CF physiotherapy service in a pragmatic pre-post design study. This study describes care delivery in terms of the service provision, scope of practice, skill mix and any safety implications for patients with CF and staff associated with the new model of care. Overall, physiotherapy care delivery Increased. Physiotherapists conducted fewer respiratory ($p<0.001$) and exercise treatments ($p < 0.001$) but increased complex review of care for inpatients ($p<0.001$). Physiotherapists' activity in multidisciplinary outpatient clinics increased (56% vs 76%, $p<0.01$). The AHA provided 20% of all service provision. The AHA delivered clinical care as delegated established respiratory (5%) and exercise treatments (10%) and completed the majority of all exercise tests (n = 25). Most AHA activity involved non-direct clinical care, such as managing equipment and patient-related administrative tasks. No adverse events were reported.

Study 4 examined patient and staff perceptions of, and satisfaction with, the physiotherapy care delivery pre-implementation of the AHA role and assessed any perceived change to care delivery post-implementation of a new AHA role in a pragmatic pre-post-study design. Pre/post response rates were similar: patients 35% (n = 63) vs 36% (n = 62), multidisciplinary team 51% (n = 18) vs 49% (n = 17). According to patients, physiotherapists provided good to excellent care (P1-87%, P2-88%, p=0.097) pre- and post-AHA implementation. Two-thirds of patients reported involvement with the AHA. Physiotherapy care delivery was perceived as effective by 72% of participants pre-implementation and increased to 87% post-implementation (p = 0.024). The multidisciplinary team acknowledged physiotherapy staff as valuable, despite 22% reporting that access to physiotherapy did not happen pre-implementation. As a result of the addition of the AHA, senior physiotherapists were more accessible for clinical discussion and clinical research, improving physiotherapy care delivery according to multidisciplinary team staff. Overall findings suggested that an AHA role did not change the perceived high quality of physiotherapy care but improved the care's perceived effectiveness.

Implementing an AHA role within an acute respiratory physiotherapy service has contributed new evidence regarding scope of practice and its impact on physiotherapy care delivery. It should be considered by physiotherapists and other allied health professionals to support remodelling care delivery. The development of AHA roles in other allied health professional services and other hospital and community settings should be supported by evidence demonstrating the scope of practice and acceptability of such roles. Other healthcare service delivery models can benefit from moving towards evidence-based care delivery recommendations, improving effectiveness and maintaining high quality. An evidence-based redesign system is recommended when redesigning a health service, particularly skill mix. An effective system must be comprehensive, systematic and engage all stakeholders, including comprehensive training for new and appropriate AHA activity, training for all staff in delegation procedures and ongoing mentoring and supervision for the role. Research is needed to provide robust data to support the effectiveness of these new models of care delivery, which extend the scope of practice for AHAs while enhancing the contributions of both junior and senior physiotherapists, demonstrating a better overall workforce delivery, as well as cost-effectiveness.

Chapter 1 – Introduction

Cystic Fibrosis (CF) is a life-limiting autosomal recessive genetic disorder (Elborn, 2016) and the most prevalent heritable condition in Australia (Cystic Fibrosis Queensland, 2016). Presently, median survival is rising, currently estimated to be in the mid to high fifties (Cystic Fibrosis Australia, 2020; Cystic Fibrosis Foundation, 2021). This is attributable to improved medications, treatments, and access to multidisciplinary care and expertise, provided by specialist CF services (Bell et al., 2020; Elborn,2019). Most recent publications have documented an exponential rise in survival age, with a corresponding increase in numbers of people with CF, particularly those in adult CF services (Bell et al., 2020; Conway et al., 2014; Cystic Fibrosis Australia, 2020; Cystic Fibrosis Foundation, 2021; Elborn, 2019; Simmonds, 2021;). This improved survival can potentially impact CF services' ability to deliver CF multidisciplinary team care. Demands are only expected to rise, as forecasts suggest that adult numbers will likely escalate between 2010 and 2030 by approximately 40 - 75% (Burgel et al., 2015; Elborn, 2016; Keogh et al., 2020; Madge et al., 2017; Wainwright, 2014).

Physiotherapy management for CF is integral to care delivery, including daily treatments with inhaled medications, airway clearance techniques, and exercise (Button et al., 2016). Physiotherapists are involved in collaborative and consultative processes with adults with CF to teach, treat, and optimise these treatments (Rand et al., 2013, Davies et al., 2020; Rowbotham et al., 2021). Adults with CF see physiotherapists at outpatient department (OPD) clinics and while hospitalised (Bell et al., 2008; Rowbotham et al., 2021), with improved outcomes demonstrated with physiotherapy (Button et al., 2016; Conway et al., 2014; Morrison & Parrott, 2020; Rand et al., 2013). Exponential increases in the number and type of physiotherapy treatments and, at times, the complexity of delivery of care have concomitantly risen alongside survival (Button et al., 2016; Conway et al., 2014; Rand et al., 2013; Rowbotham et al., 2021).

Several countries have developed standards of care and clinical practice guidelines to set standards for best practice in key aspects of CF care (Bell et al., 2008; Kerem et al., 2005; Flume et al., 2009, 2010; Smyth et al., 2014; Yankaskas et al., 2004). The standards recommend requirements for overall care delivery, organisational structures and facilities, multidisciplinary team roles and expertise, and staff-patient ratios (Bell et al., 2008; Conway et al., 2014; Kerem et al., 2005; Smyth et al., 2014). Physiotherapy discipline-specific CF guidelines advise on the scope of practice for CF physiotherapy, including expert knowledge and an advanced level of specific and specialised skills. Physiotherapy guidelines integrate clinical expertise from recognised expert CF physiotherapists with systematic reviews of current evidence (Button et al., 2016; Morrison & Parrott, 2020).

Delivering CF care based on the recommended standards is the objective of CF services and multidisciplinary teams (Conway et al., 2014; Smyth et al., 2014). However, meeting these recommendations while managing the exponential increase in adult numbers and complexity of clinical care poses a challenge to current and future sustainability of care (Burgel et al., 2015; Bell et al., 2020; Chin et al., 2021; Elborn, 2019; Flume et al., 2019; Keogh et al., 2020; Simmonds, 2021). Resources and strategies to manage this growth and projected demand are required (Burgel et al., 2015; Keogh et al., 2020; Madge et al., 2017; Simmonds, 2021). High-quality data documenting current care delivery is required to inform the development, implementation, and review of strategies to address this challenge.

A national CF patient registry in Australia has been established to collect information on disease diagnosis, treatments, and outcomes for people with CF (Cystic Fibrosis Australia, 2020). Outcomes from this registry are not inclusive of specific physiotherapy treatment information. No data currently exists that identifies the current level of expertise, scope of practice and skill mix for physiotherapists delivering care to adults with CF in Australia, nor benchmarks this against the recommended guidelines. A review process at one large adult centre in Australia documented reduced physiotherapy staffing levels (Greville et al., 2012) compared to recommended standards (Bell et al., 2008; Morrison & Parrott, 2020). The opportunity exists, therefore, to establish objective measurements of current CF physiotherapy care delivery in an adult CF service, which includes service provision, staffing levels relative to patient numbers, scope of practice and skill mix.

An opportunity arose to develop a new CF physiotherapy model of care that could potentially address staffing shortfalls whilst aiming to deliver quality CF care. The projected patient numbers growth necessitated a care model that delivered potential efficiencies and cost savings. An innovative service redesign implementing an Allied Health Assistant (AHA) role as part of the CF physiotherapy service is proposed. Allied health assistants have been identified as an underutilised and feasibly cost-effective resource in any remodelling of an allied health service

(Duckett & Breadon, 2014; Sommerville et al., 2016). Descriptive reports, audit, and survey outcomes have examined a wide variety of AHA roles; suggesting AHAs have the ability to perform clinical and non-clinical tasks, their roles are well received by patients, and improved efficiencies are achieved, allowing allied health professionals (AHPs) to spend more time in direct and complex clinical care (Allied Health Workforce Advice and Coordination Unit, 2012; Lizarondo et al., 2010; Munn et al., 2013; Snowden et al., 2020; Stanhope & Pearce, 2013). Clinical and non-clinical tasks currently undertaken by physiotherapists in a CF service could be delegated to a specifically trained AHA, potentially increasing the efficiencies of physiotherapy care delivery. A change to the scope of practice for CF physiotherapists, in conjunction with the development of clinical roles and scope for an AHA, may occur with this change to the care delivery. There is currently no published evidence reporting direct measures of patient safety and impact on the scope of practice of physiotherapists or AHAs associated with a service redesign involving an AHA role in an acute respiratory clinical setting, specifically in adult CF care. Improvements to care delivery have been identified as theoretically achievable, with delegation of appropriate tasks to AHAs, potentially allowing AHPs to work towards their recommended scope of practice, achieving 'best clinical care' delivered by the right staff member and, at an affordable price (Allied Health Professions Office of Queensland, 2014; Allied Health Workforce Advice and Coordination Unit, 2012; Duckett, 2005; Health & Human Services Victoria, 2016; KPMG International, 2014; Pearce & Pagett, 2015; Sommerville et al., 2016; Rushton et al., 2022).

This thesis will provide theoretical background information to explain current CF care delivery, including survival impact inferred on current and projected service provision. It will establish what is recommended for physiotherapy care delivery for this cohort of patients, including recommended physiotherapy service provision, scope of practice and skill mix. The evidence supporting the why and how to change the skill mix in the physiotherapy care delivery and to establish an AHA role will be discussed. The aim of the studies in this program of research is to establish the current physiotherapy care delivery for adults with CF and develop and evaluate a new model of physiotherapy care delivery within a CF service to address current challenges to sustainable physiotherapy care delivery. The proposed workforce redesign will use the Calderdale Framework to identify, delegate, and train AHAs to deliver care activities within the physiotherapy team. Care delivery, in terms of service provision, scope of practice and the skill mix of physiotherapists and AHAs, will be examined, and safety and perceptions of staff and patients of the proposed model will be explored.

Four studies were planned for the completion of this thesis with the following objectives

i. Study 1 will establish current CF physiotherapy care delivery in terms of service provision, scope of practice (clinical and non-clinical care activity) and skill mix of physiotherapists (investigating differences in physiotherapy care provided by junior and senior physiotherapists) for adults with CF and benchmark outcomes against established clinical guidelines.

ii. Study 2 will examine the application of the Calderdale Framework as a workforce redesign system in developing and implementing the AHA role.

iii. Study 3 will examine any change to the CF physiotherapy care delivery in terms of service provision, scope of practice (clinical and non-clinical care activity) and skill mix of physiotherapists (investigating differences in physiotherapy care provided by junior and senior physiotherapists) and AHA role for adults with CF after implementation of the AHA role. This study will also examine the safety of the AHA role in this acute care service.

iv. Study 4 will examine staff and patients' perceptions of the care delivery pre-and post-implementation of the AHA role.

This thesis comprises eight chapters. This introduction makes up Chapter 1. Chapter 2 – Background, Chapter 3 – Methods, Chapters 4 – 7 – Studies 1 -4 and Chapter 8 – Discussion and conclusion. Findings from Studies 1, 3 and 4 have been published as two papers.

Chapter 2 – Background

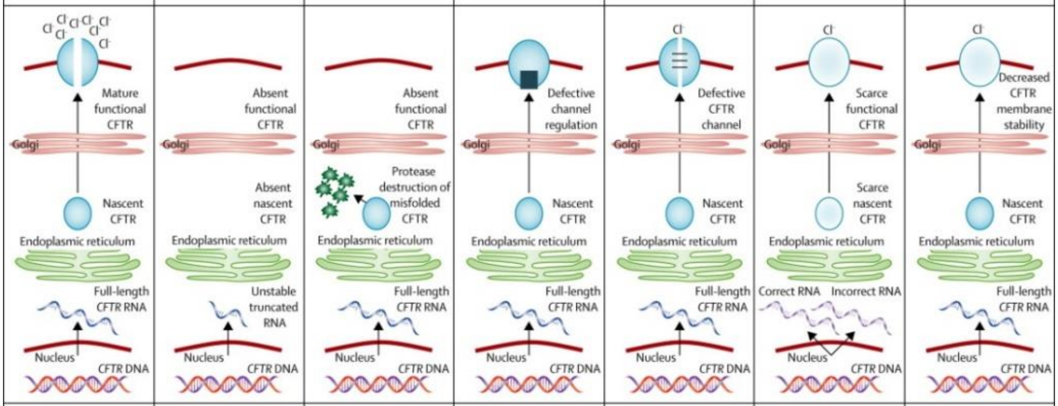
2.1 Cystic Fibrosis Care and Current Challenges with Care Delivery

This background section will include a brief discussion about what Cystic Fibrosis (CF) is in terms of pathophysiology, how survival for adults with CF is improving, and the impact of this on the provision of care for adults with CF.

2.1.1 What is Cystic Fibrosis?

Cystic fibrosis is a life-limiting autosomal recessive genetic disorder widely found in Australia, North America, and Europe (Elborn, 2016, 2019). Cystic fibrosis is caused by gene mutations in the CF transmembrane conductance regulator (CFTR) protein, which controls ion transport and airway mucociliary clearance (Stoltz et al., 2015). The CFTR protein defect causes abnormalities in both salt and fluid transport across epithelia, leading to a dehydrated airway surface and impaired mucociliary clearance (Matsui et al., 1998). This results in compromised lung defence, impaired bactericide mechanisms, and mucus accumulation. Repeated opportunistic infections and eventual colonisation with organisms such as staphylococcus aureus, haemophilus influenza, and pseudomonas aeruginosa occur. Resultant host inflammatory response associated with repeated infections and consequent tissue damage leads to the characteristic decline in lung function as the disease progresses (Rowe et al., 2005). With improving gene sequencing technology, more than 6000 gene variations have now been identified, falling within six classes of gene mutations, as shown in Figure 2.1 (Elborn, 2016, p 2020). The classes of genes may account for different presentations of the disease, with more severe disease progression seen in some people with CF. Using this information, newly emerging drug therapies are developing to focus on the functional consequences of the various mutations (Elborn, 2016,2019).

Figure 2.1: Classes of Cystic Fibrosis Transmembrane Conductance Regulator Mutations.



	Normal	I	II	III	IV	V	VI
CFTR defect		No functional CFTR protein	CFTR trafficking defect	Defective channel regulation	Decreased channel conductance	Reduced synthesis of CFTR	Decreased CFTR stability
Type of mutations		Nonsense; frameshift; canonical splice	Missense; aminoacid deletion	Missense; aminoacid change	Missense; aminoacid change	Splicing defect; missense	Missense; aminoacid change
Specific mutation examples[11]		Gly542X Trp1282X Arg553X 621+1G→T	Phe508del Asn1303Lys Ile507del Arg560Thr	Gly551Asp Gly178Arg Gly551Ser Ser549Asn	Arg117His Arg347Pro Arg117Cys Arg334Trp	3849+10kbC→T 2789+5G→A 3120+1G→A 5T	4326delTC Gln1412X 4279insA

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Important comorbidities exist and are caused by epithelial cell dysfunction in the sweat glands (dehydration), pancreas (malabsorption), liver (cirrhosis) and vans deference (infertility) (Elborn, 2016). Consequently, CF affects many systems; however, it primarily affects the lungs and the gastrointestinal system (Bell et al., 2008). Currently, bronchiectasis, small airway obstruction, and respiratory failure secondary to progressive lung disease remain the primary causes of both morbidity and mortality (Elborn, 2016,2019; Welsh et al., 2019). Manifestations of the disease and management complexity increase with age and disease progression, as summarised in Table 2.1 (Elborn, 2016, p2522). The implications of this will be discussed further in section 2.4 below.

Table 2.1: Onset of Cystic Fibrosis Disease.

System	0 – 10 years	10–20 years	20 – 35 years	>35 years
Airways	Early mucinous plugging and Bronchiectasis	Established bronchiectasis	Established bronchiectasis with haemoptysis/pneumothorax	Progressive respiratory failure/lung transplant
Predominant infection	*Staphylococcus aureus*	*S aureus*/ intermittent *Pseudomonas aeruginosa*	*P aeruginosa* and other non-fermenting Gram-negative bacteria, ABPA	“
Pancreas	Pancreatic exocrine insufficiency	‘	Cystic Fibrosis related diabetes mellitus	“
Liver	Abnormal liver function test Results	Cirrhosis	Portal hypertension (5 -10 %)	Liver Transplant
Gut	Meconium ileus	“	Distal intestinal obstruction syndrome	“
Reproductive system	Absence of vas deferens	“	“	“
Other	“	“	Arthropathy, cystic fibrosis-related bone disease (osteoporosis)	“
ABPA = allergic bronchopulmonary aspergillosis				

Note: Reproduced from ‘Cystic Fibrosis’ by J. S. Elborn, 2016, The Lancet, Volume 388, page 2520. Copyright 2016 by Elsevier Inc.

2.1.2 Improved Survival in Cystic Fibrosis

2.1.2.1 Increasing Survival and Burden of Care.

Over the last 60 years, the median age of survival for people with CF has increased progressively throughout developed countries almost linearly (Burgel et al., 2015; Simmonds, 2013; Simmonds et al., 2010). This improvement is thought to be attributable to several factors, including understanding the importance of augmenting airway clearance, aggressively treating infection, and correcting nutritional deficits (Chmiel et al., 2013; Stoltz et al., 2015). Improved understanding of the abnormal ion transport in airway epithelial cells has resulted in new drugs that can improve mucus movement (mucolytic and airway rehydration drugs) and target specific bacterial infections (anti-pseudomonal antibiotics) (Davies et al., 2014). Most recently, new drugs targeting the basic defect (Elborn, 2016,2019) have begun to change the care landscape for adults with CF (Bell et al., 2020; Simmonds, 2021). These drugs, known as CFTR modulators, have resulted in significant improvements in lung function, weight, health-related quality of life and reduced exacerbation rates in people with CF with specific gene mutations (Edmondson & Davies, 2016; Ramsey et al., 2011; Wainwright, 2014; Flume et al., 2019). In line with these pharmacological developments is a growing understanding that this patient cohort requires comprehensive and increasingly complex clinical care from a CF service delivered by a trained and experienced multidisciplinary team that includes CF physiotherapy (Chin et al., 2021; Elborn, 2016,2019; Kerem et al., 2005).

The healthcare burden of CF in Australia is significant. Individuals with CF require frequent and ongoing medical care, including specialist consultations, diagnostic testing, and prescription medications (Cystic Fibrosis Australia, 2021). The cost of care for people with CF is high, with estimates ranging from AUD 40,000 to AUD 120,000 per year per patient, depending on disease severity (Australian Institute of Health and Welfare, 2020). Moreover, the healthcare burden of CF is proposed to increase as more individuals with the condition live into adulthood, leading to increased demand for specialist care and resources (Borowitz et al., 2018). This growing burden may pose significant challenges for healthcare service providers and governments in terms of resource allocation and planning. The consequences of this growing survival and consequent number of adults with CF will now be discussed.

2.1.2.2 Impact on CF Care Delivery with Increased Numbers of Adults with CF

A major consequence of increased survival is that the number of adults with CF is increasing. Elborn (2019) reports that there are now very few childhood deaths in countries where CF care delivery is well established. People with CF aged 18 years and over are either equal to, or greater in number than, those under the age of 18 years (Elborn et al., 2016,2019). Data registries recording patient demographics, mortality, and morbidity, are established in Australia (Bell et al., 2011; Cystic Fibrosis Australia, 2020) and overseas (Conway et al., 2014; Cystic Fibrosis Foundation, 2021). These allow for comparisons of outcomes from CF services to facilitate an improved understanding of epidemiology of CF disease, quality of care, and research (Bell et al., 2011; Stevens & Marshall, 2014; McCormick et al., 2005). This data collection can also inform health economic outcomes and planning for current and future CF care delivery (Conway et al., 2014; Keogh et al., 2020).

Recent figures from registries in Canada, Europe, and America have demonstrated that median survival for people with CF is approximately 54 - 59 years and the median age for death is approximately 34 years (Cystic Fibrosis Canada, 2022; Cystic Fibrosis Foundation, 2021; European Cystic Fibrosis Society Patient Registry 2019, 2021). The Australian Cystic Fibrosis Data Registry 2014 report identified for the first time that more than 50% of the people with CF in Australia were now adults (Cystic Fibrosis Australia, 2016). Current Australian median age for death is 36.8

years (Cystic Fibrosis Australia, 2021), which has increased over time (Bell et al., 2011; Reid et al., 2011, Cystic Fibrosis Australia, 2020). In Australia, in 2021, there were 3616 adults with CF, a growth of 363 since 2014 (Cystic Fibrosis Australia, 2021). Over that same timeframe, the median or mean age had increased by approximately 2 years, with over 500 (14%) of people with CF now over 40 years of age (Cystic Fibrosis Australia, 2021). In Queensland in 2021, there were 473 adults with CF, representing 13% of the adult CF population of Australia (Cystic Fibrosis Australia, 2021). Finally, in Australia, 'the estimated 5-year survival has increased over a 5-year period from 47.4 years for people with CF born in 2010-14, to 56.9 years for people with CF born in 2016-20 (Cystic Fibrosis Australia, 2021). These changes in survival and overall numbers of people with CF reflect the same steady upward trend in survival age of Australians as shown in international registry data (Cystic Fibrosis Australia, 2021).

Increased survival has consequences for both current and longer-term CF care delivery. Forecasts from the European Cystic Fibrosis Society (ECFS) data registry suggest that adult numbers are expected to rise by 40 - 75% between 2010 and 2030 (Burgel et al., 2015; Elborn et al., 2016; Keogh et al., 2020; Madge et al., 2017). This forecast is considered conservative and does not account for the probable additional survival benefits associated with the new CFTR modulator therapies that further improve patient outcomes (Burgel et al., 2015; Elborn, 2016; Keogh et al., 2020).

This exponential rise in adults with CF numbers and survival rates both worldwide and in Australia will likely impact the multidisciplinary team's ability to deliver quality centre-based care. A proportional increase in CF multidisciplinary team staff numbers, as well as infrastructure (inpatient and outpatient facilities), is being called for (Chin et al., 2021; Conway et al., 2014; Madge et al., 2017; Simmonds et al., 2021). In the current economic climate, this poses a substantial challenge for hospitals and healthcare funding agencies to ensure appropriate resourcing to sustain and/or expand adult CF care delivery, both currently and into the future.

2.1.2.3 Growing Complexity of CF Care Delivery for Adults with CF

Complexity of CF clinical care, morbidity, and number of complications are increasing concomitantly with survival in adults (Chin et al., 2021; Elborn et al., 2016,2019). These require specialised treatments from the multidisciplinary team, including physiotherapy (Button et al., 2016; Conway et al., 2014; Kerem et al., 2005; Morrison & Parrott, 2020). Adult CF is associated with increased severity of lung disease (Parkins et al., 2011) and poor nutritional status

(Simmonds et al., 2010), with a progressive decrease in health-related quality of life and increase in healthcare utilisation (Elborn et al., 2019; Flume et al., 2019; O'Sullivan & Flume, 2009).

Specific complications such as CF-related diabetes (CFRD), metabolic bone disease, haemoptysis, and pneumothorax are now more common in adults with CF (Chin et al., 2021; Plant et al., 2013). Treating infections caused by multi-resistant micro-organisms becomes difficult due to accumulative sensitivities, adverse reactions, and toxicity to oral, inhaled, and intravenous medications (Plant et al., 2013; Roehmel et al., 2014). Emerging evidence suggests adults with CF living into their forties and beyond are developing complications of colorectal cancer (Chin et al., 2021; Gory et al., 2014; Maisonneuve et al., 2012). Furthermore, adults with CF on CFTR modulator therapies are developing an increased body mass index (BMI), leading to new challenges associated with the physical and metabolic consequences of being overweight or obese (Chin et al., 2021; Hanna & Weiner, 2015).

It is beyond the scope of this document to discuss all the specific management and treatment therapies that are developing because of this increasing complexity of clinical care; however, adults with CF are being identified as a "new ageing population" (Buckland, 2016). Adults with CF require more frequent hospitalisation and outpatient follow-up appointments than children, requiring increased delivery of expert and responsive care (Chin et al., 2021; Elborn, 2016, 2019). These complex clinical care demands are placing additional stresses on current adult CF care delivery, and despite the recent advances in survival associated with modulator therapies, care requirements are likely to increase over time (Bell et al., 2020; Chin et al., 2021; Davies et al., 2020; Ramsey et al., 2021; Simmonds, 2021). The specific implications of the growing complexity for physiotherapy care delivery will be discussed in section 2.4 of this document.

2.2 Provision of CF Care Delivery for Adults with CF

This background section will discuss how care is provided for adults with CF, including what documents are used to guide care delivery and what organisational structures are required to deliver care. The section also discusses what CF services are in terms of infrastructure and staff involved in CF care delivery.

2.2.1 Standards of Care

Collaborative working parties involving CF specialists from multidisciplinary teams have developed evidence-based and peer-reviewed guidelines that set comprehensive standards for the delivery of CF care (Bell et al., 2008; Conway et al., 2014; Kerem et al., 2005; Smyth et al., 2014; Stern et al., 2014; Yankaskas et al., 2004). These guidelines outline broadly care provision for diagnosis, pre-emptive treatment of lung disease, nutrition, complications, transplant/end-of-life care and psychological support (Smyth et al., 2014, p S23). Organisational requirements for recommended staffing and roles and the infrastructure necessary to deliver quality care are also included (Conway et al., 2014; Smyth et al., 2014). Sections 2.2 to 2.3 will discuss the broader organisational structure and requirements for care for adults with CF, and section 2.4 will present specific CF physiotherapy care delivery.

2.2.2 Organisational Structure of Adult CF services

Integral to delivering care for adults with CF are infrastructure (access to inpatient and outpatient care) and staffing (numbers and type of staff). This patient cohort requires comprehensive care from a CF service, with a trained and experienced multidisciplinary team that includes CF physiotherapy (Bell et al., 2008; Conway et al., 2014; Kerem et al., 2005). Comprehensive care delivery results in enhanced survival and quality of life (Johnson et al., 2003; Kerem & Webb, 2014; Mahadeva et al., 1998; Bell et al., 2020). Cystic fibrosis centre care services are now considered the model of care delivery for adults with CF in Australia (Bell et al., 2008), Europe (Colombo & Littlewood, 2011; Conway et al., 2014; Kerem et al., 2005), and the United States (MacKenzie et al., 2014; Yankaskas et al., 2004).

2.2.3 What is a CF Service?

2.2.3.1 Infrastructure

Cystic fibrosis services require facilities to deliver CF-specific expert care (Conway et al., 2014). Delivery of services occurs within CF centres, which are usually located within large teaching / tertiary hospital facilities, with inpatient and outpatient care (Bell et al., 2008; National Guideline Alliance (UK), 2017). Cystic fibrosis services requirements, delivered through CF centres, include patients having access to emergency services 24 hours a day and delivery of routine care. Routine care consists of outpatient reviews (minimum two-three monthly) and hospital admissions for exacerbations and complications, determined by individual patient requirements/severity of disease (Bell et al., 2008; Conway et al., 2014; Kerem et al., 2005;

National Guideline Alliance (UK), 2017). Cystic fibrosis services typically deliver care for 100 or more patients to maintain the dedicated facilities and the required expertise and level of staffing (Conway et al., 2014; National Guideline Alliance (UK), 2017).

2.2.3.2 Multidisciplinary Team

Cystic fibrosis services require a multidisciplinary team to deliver comprehensive CF care. In Australia, adult CF centre multidisciplinary teams should include a centre director, specialist/consultant physician, specialist nurse/centre coordinator, CF physiotherapist, CF dietitian, psychologist, social worker, pharmacist, clinical microbiologist, administration support staff, and resources for audit research and data registry support (Bell et al., 2008). It is likely that in many CF services, some disciplines may not have full-time roles in the CF service. However, all staff are ideally required to be experienced in delivering expert care to this patient cohort (Conway et al., 2014).

2.2.4 Cystic Fibrosis Service Staffing Numbers

Requirements for staffing numbers within Australian CF services are derived from the ECFS (European Cystic Fibrosis Society) standard of care framework (Conway et al., 2014), as outlined in the Australian CF Standards of Care (Bell et al., 2008). Discipline-specific recommendations expressed relevant to patient numbers are considered essential for adequate care delivery (Morrison & Parrott, 2020; Smyth et al., 2014). Physiotherapy staff levels recommended for adult and paediatric CF centre-based services are shown in Table 2.2 (Morrison & Parrott, 2020). The higher physiotherapist to patient ratio in adult CF services reflects the increased care requirements for this cohort (Conway et al., 2014; Morrison & Parrott, 2020).

Table 2.2: Recommended Physiotherapy Staffing Levels at CF Centre Based Services in terms of Full-time Equivalent Providing CF care.

	75 Patients	150 Patients	250 Patients	> 250 patients
Physiotherapist- Adult centre	2	4	6	Increase of 2 /75 patients
Physiotherapist–Paediatric centre	2	3	4	Increase of 1 / 100 patients

Note. Retrieved from Standards of Care and Good Clinical Practice for the Physiotherapy Management of Cystic Fibrosis Fourth edition December 2020. pdf. Copyright 2020 by Cystic Fibrosis Trust, UK.

2.3 Current Evidence for CF Care for Adults with CF

This background section will discuss the current evidence for care delivery for adults with CF in Australia, including processes used to evaluate this care delivery.

2.3.1 Cystic Fibrosis Services for Adults with CF

Planning for adult CF services growth and supply of expert care was called for nearly two decades ago (Yankaskas et al., 2004) and now requires urgent attention (Bell et al., 2020; Madge et al., 2017; Simmonds, 2021). Detailed information about current care delivery in CF services in Australia and worldwide is required to inform this planning. Standards of care and clinical guidelines, discussed in section 2.2.1, offer recommended “targets” for care delivery. Annual data registries provide valuable information about demographics and outcome measures for adults with CF. Still, they do not offer details of CF services in terms of the current structure, staffing disciplines and number of staff that contribute to the published outcomes (Cystic Fibrosis

Australia, 2020). This detailed information on CF care delivery was poorly documented worldwide (Stern et al., 2014).

One recent publication aimed to address this shortfall with a survey on current care for adults with CF in Europe (Madge et al., 2017). Two themes: *management* (funding, benchmarking against standards) and *clinical/practical care delivery* (what multidisciplinary team care is delivered in hospitals, outpatient departments or home care and ongoing training of multidisciplinary team staff), were explored. In this study, access to comprehensive multidisciplinary team care for adults with CF was considered limited; however, > 80% of people with CF could access some members of the CF multidisciplinary team, including physiotherapists (Madge et al., 2017). The CF care guidelines were followed by 70% of centres (Madge et al., 2017), though no objective benchmarking against standards was undertaken. No information about staffing numbers and discipline-specific expertise was reported. A low response rate (33%), with most respondents from large, well-established centres in Western Europe, makes data interpretation potentially biased (Madge et al., 2017). Despite these limitations, outcomes reported start to address much-needed information about current care for adults with CF and what potentially needs to be addressed in Europe to meet increasing demands.

No published data exist in Australia to inform CF service care delivery. Current staffing levels and expertise of physiotherapists across Australian CF services are unknown. Such information, if available, could be used to benchmark care delivery against the standards (Bell et al., 2008; Button et al., 2016; Morrison & Parrott, 2020) and inform future planning. Processes to evaluate CF care delivery in Australia are required. The next section of this document will discuss what is currently known about such care and any outcomes to date.

2.3.2 Processes to Evaluate CF Care Delivery: Peer review

2.3.2.1 What is Peer Review?

A process to document current CF care delivery in a CF service is required for future planning. Although systems differ across countries, peer review is a process to benchmark a CF service against the standards of care for that country (Boyle et al., 2014; Quon & Goss, 2011; Stern et al., 2014). Australian centres can undertake a peer review process similar to the UK CF Trust program (Cystic Fibrosis Trust UK, 2016). A committee comprising experienced CF multidisciplinary team professionals drawn from national and international CF services and representatives from the local patient cohort and/or family members examine the care. This identifies the quality of, shortfalls and opportunities to improve CF care within the service (Stern et al., 2014). The expert opinions of the committee members, alongside the care documents, inform the outcomes of the review (Cystic Fibrosis Trust UK, 2016). Key recommendations are reported to the CF service, hospital management, and any external funding services for that centre (Stern et al., 2014). The aim is to stimulate improvement in care delivery for that centre over time (Stern et al., 2014). In the UK, outcomes from the review process are publically available, outlining complete and independently analysed findings about the performance of a particular CF service (Smyth et al., 2014).

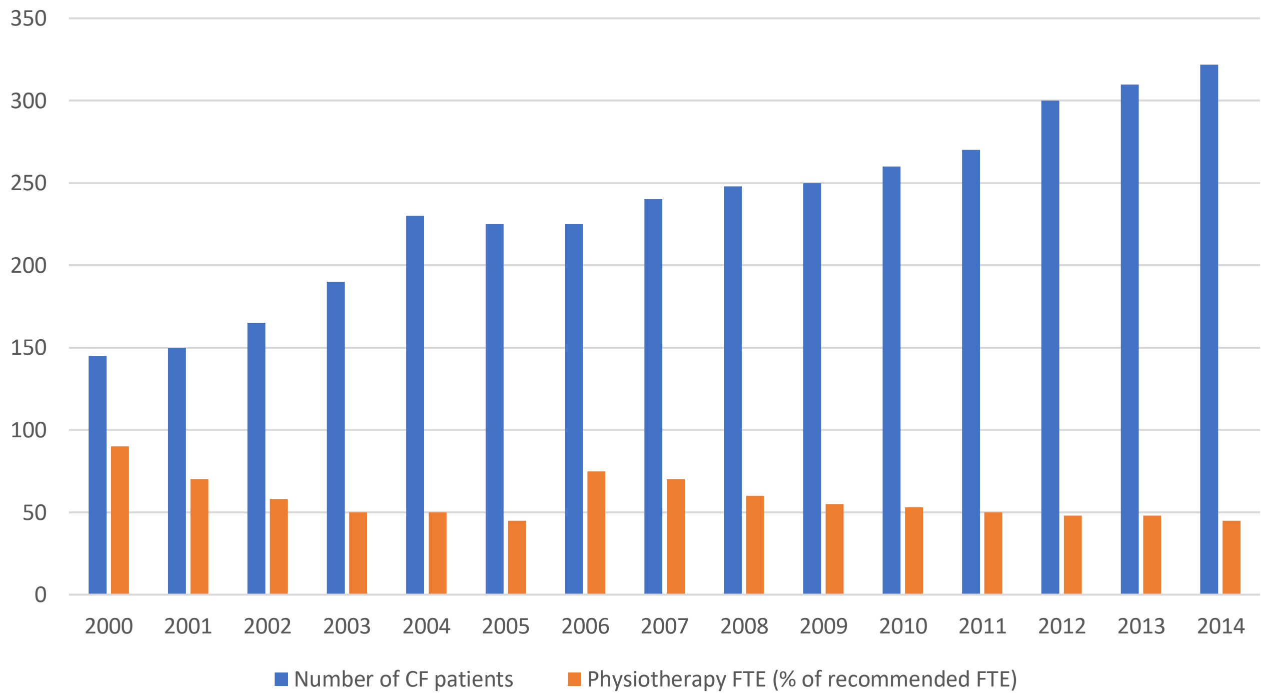
2.3.2.2 Peer Review in Australia

Several Australian centres have undertaken a peer review process funded through Cystic Fibrosis Australia, including a large, well-established adult CF service in Brisbane in 2012, with the findings made available to the candidate. Discussing this information establishes the current deficits at this centre as an example of the challenges facing adult CF services in Australia. The findings establish a need to examine options to address care delivery, particularly service provision inclusions such as staffing across the centre (Greville et al., 2012). The findings specifically highlighted CF physiotherapy care delivery and will now be discussed.

The Prince Charles Hospital (TPCH) in Brisbane provides care for more than 300 adults with CF across Queensland, the Northern Territory, and northern New South Wales (Greville et al., 2012). The peer review panel found that the CF service at this hospital provides excellent care delivery, with good leadership and a cohesive team. However, it faces problems associated with the large numbers of adults with CF and the geographic distribution of these adults with CF. A key outcome was that staffing requires immediate attention, with physiotherapy being staffed at only 50% of the recommended number per patient (Greville et al., 2012). The report states that 'physiotherapy staff felt unable to deliver even basic patient care delivery at times' (p6), and the perception was that not all adults with CF attending clinics were able to be seen by the physiotherapist. Staff reported to the reviewers that they 'needed to take overtime and extended work hours to fulfil their duties' (Greville et al., 2012, p 7). The review panel recommended the need for urgent discussions with Allied Health administrators to address the staffing challenge (Greville et al., 2012).

In response to the review, the Directors of Physiotherapy Queensland released a position statement emphasising the shortage in physiotherapy staff numbers compared to recommended levels and the impact on current and future sustainability of CF physiotherapy care delivery (Directors of Physiotherapy Queensland, 2014). The adult centre has three dedicated full-time equivalent physiotherapy positions, which have remained consistent over eight years from 2006 to 2014. No further increase in CF physiotherapy staffing has occurred, although patient numbers have increased by approximately 10% per year, as shown in Figure 2.2 (Cystic Fibrosis Australia, 2016).

Figure 2.2: Numbers of Adults with CF per Year (2000 -2014) and Physiotherapy Staff Numbers per Australian Standards for The Prince Charles Hospital.



Note: Numbers of CF patients per year from 2000 to 2014 [blue bars] and physiotherapy staff numbers as a percentage of recommended staffing levels as per the Australian Standards of Care [red bars] for The Prince Charles Hospital adult cystic fibrosis centre (Bell et al., 2008; Cystic Fibrosis Australia, 2016).

The peer review report and the Directors of Physiotherapy Queensland position statement provide evidence of the current and projected challenges for physiotherapy care delivery in an adult CF service based on resource limitations and establish the need for staffing to be addressed. The peer review panel also documented perceptions of reduced quality of care delivery, inferring that understaffing affects not just quantity but the quality of care delivery; however, no objective evidence benchmarking the care delivery was included in the peer review process.

The standards of care recommend that high-quality CF physiotherapy care delivery requires a level of expertise of the staff and a specific range of interventions to be delivered (Bell et al., 2008; Kerem et al., 2005). Thus, CF physiotherapy care delivery may require more than increased numbers of staff to ensure quality. Section 2.4 will discuss the expertise and scope of practice required by CF physiotherapists to meet the standards of care.

2.4 Cystic Fibrosis Physiotherapy Care Delivery for Adults with CF

The following section will discuss physiotherapy care delivery for adults with CF. This includes an introduction to the role, where and how often care activities are recommended to be provided, the skill mix required within a centre where more than one physiotherapist delivers care and an overview of the specifics of care delivery to inform working at full scope of practice as a CF physiotherapist.

2.4.1 Physiotherapy Care Delivery Model

For this program of research, a model to describe physiotherapy care delivery is proposed that includes all activity and staffing contributing to physiotherapy in CF (Figure 2.3). This model will consist of three aspects to describe physiotherapy care delivery:

Physiotherapy service provision

How is the service delivered for the CF service? This includes:

- Staff numbers
- Staff levels (junior/senior)
- How many times a day are patients seen as inpatients
- How many outpatients are seen in clinics by physiotherapists
- Where physiotherapy treatments are conducted

Physiotherapy scope of practice

What activity do physiotherapists undertake for the CF service? This includes:

- Clinical (direct and non-direct) care activity
- Non-clinical care activity
- Activities can be further defined in the activity code list (discussed in Chapter 3, Table 3.1).

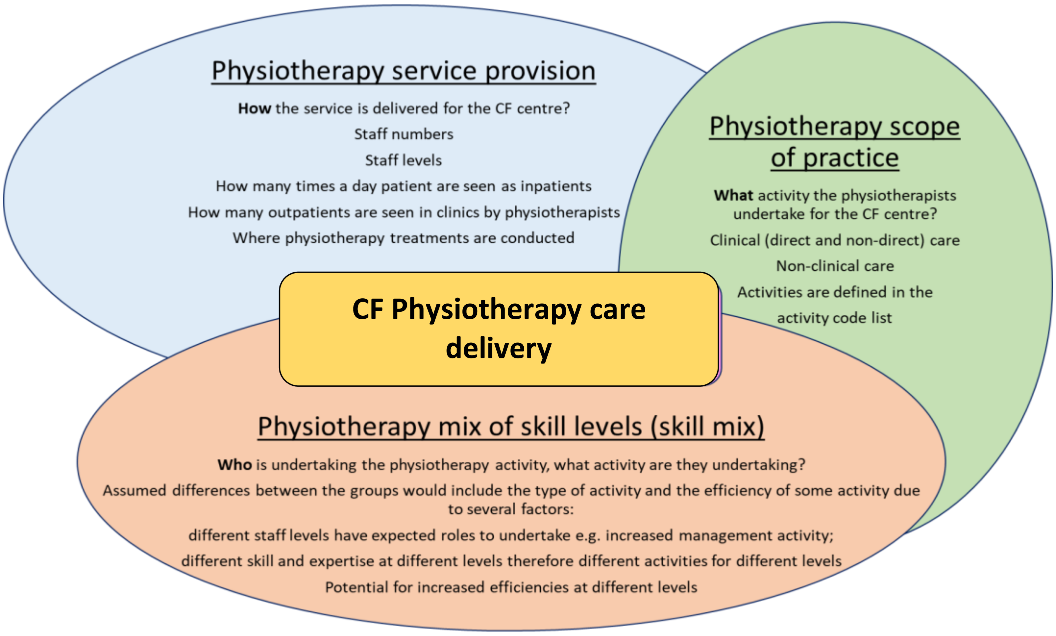
Physiotherapy mix of skill levels (skill mix)

Who is undertaking the physiotherapy activity, and what activity is being undertaken by junior and senior physiotherapists? It could be assumed that differences between the juniors and seniors may include the type of activity undertaken and the efficiency of some activity due to several factors:

- Different staff levels have expected roles to undertake, e.g. management activity;
- Different skills and expertise at different levels, therefore different activities undertaken by staff at different levels
- Potential for increased efficiencies at different levels occurring due to increased experience and expertise

All three aspects overlap at times and will be discussed in this discussion in the context of the current literature.

Figure 2.3: Schematic Representation of the Components of CF Physiotherapy Care Delivery.



2.4.2 Cystic Fibrosis Physiotherapy Service Provision

CF physiotherapists work collaboratively with adults with CF and families to provide assessments, education, and optimised treatments for airway clearance techniques (ACT), exercise, inhalation therapies, postural and musculoskeletal function, urinary incontinence, and management of other specific CF complications (Button et al., 2016; Conway et al., 2014; Morrison & Parrott, 2020). This includes managing patients in the end stage of their disease who may be listed for transplant or are being palliated (Button et al., 2016; Morrison & Parrott, 2020; McIlwaine & Van Ginderdeuren, 2009). The CF physiotherapist is required to have expert knowledge of CF pathophysiology, current CF physiotherapy techniques and devices, the clinical evidence and clinical reasoning for each technique, and any contraindications to specific treatments (Main & Denehy, 2016; Smyth et al., 2014). Additionally, understanding issues associated with adherence, as patients carry out physiotherapy daily for prevention and maintenance of their health, is required (McIlwaine et al., 2017; Rand et al., 2013; Rowbotham et al., 2021). Increasingly, time and effort spent working with patients to individualise their clinical care is required (Pryor et al., 2010; Rowbotham et al., 2021). Furthermore, physiotherapy routines change with age and disease progression (Conway et al., 2014; McIlwaine et al., 2017; Rand et al., 2013; Rowbotham et al., 2021).

Physiotherapists see adults with CF as both outpatients and inpatients. Recommended attendance at outpatient department (OPD) clinics is at least every three months, with access to a physiotherapist available at each visit (Bell et al., 2008; Button et al., 2016; Conway et al., 2014; Morrison & Parrott, 2020). A physiotherapist should review patients receiving OPD-based intravenous antibiotic treatment at each visit (Morrison & Parrott, 2020). Adults with CF require inpatient admissions to manage exacerbations and complications as required, with admissions typically becoming longer and more frequent as the disease progresses (Kerem et al., 2005; Smyth et al., 2014).

Physiotherapy assessment and treatment for all inpatients is recommended within 24 hours of admission, with treatment sessions ranging from one to four times a day, depending on the acuity of the patient’s presentation (Bell et al., 2008; Conway et al., 2014; Kerem et al., 2005). Acutely unwell patients, and those with more severe disease, often require modifications to physiotherapy treatments and/or more time-intensive and dependent treatments compared to their routine clinical care (Button et al., 2016; Elborn, 2016; Morrison & Parrott, 2020, Rand et al., 2013). Progression of treatments and individualised review of all aspects of a patient’s physiotherapy program continue to occur over the course of the admission (Bell et al., 2008; Button et al., 2016).

Current consensus is that a patient’s physiotherapy program and plans should be re-assessed three to six monthly as either an inpatient or outpatient (Morrison & Parrott, 2020). Adults with CF with severe or complex disease should be reviewed to modify and optimise their management more frequently (Button et al., 2016). A comprehensive yearly review, which includes formal assessment of exercise capacity, is also recommended (Hebestreit et al., 2015; Kerem et al., 2005, Morrison & Parrott, 2020).

For adults with CF, it is recommended that care be provided by physiotherapists with a suitable level of expertise in CF physiotherapy care delivery (Morrison & Parrott, 2020). Between two and six staff or more are recommended to maintain the standards of care, depending on the number of adult patients in the centre (Morrison & Parrott, 2020). A mix of staffing level and skill is likely to occur with increasing numbers of physiotherapists in larger CF services.

At least one physiotherapist within a CF service is required to have the skills and expert knowledge to lead CF physiotherapy care provision (Morrison & Parrott, 2020; Smyth et al., 2014). The recommended scope of practice for this lead CF physiotherapist encompasses delivering expert clinical opinion on CF physiotherapy assessment and treatments, contributing to service–wide quality improvements, research, patient data registries, supervision of junior staff, education and training for staff and students within the CF service and externally, and offer specific clinical advice and leadership on CF physiotherapy care at local, state and national levels (Conway et al., 2014; Kerem et al., 2005).

Other physiotherapists involved in CF care delivery are likely to be newly qualified or developing clinicians. Their skills may possibly involve more routine CF assessments and treatments in line with their experience level. Complex clinical decision-making and problem-solving would occur with the supervision of the expert CF physiotherapist, and all staff require access to ongoing training in CF-specific physiotherapy (Morrison & Parrott, 2020).

Since improved continuity of care and consequently improved health outcomes and patient satisfaction for people with chronic disease occur with consistent staff (Bodenheimer, 2008; Sveréus et al., 2016; Larsson & Rehnberg, 2017), recent recommendations suggest most of the physiotherapists in a CF service should be non-rotational (Morrison & Parrott, 2020). Careful use of rotational staff, at no greater than 10% of total staff numbers, is recommended due to increased training requirements and the inability to contribute to care continuity (Morrison & Parrott, 2020). There is currently no documented evidence describing the mix of rotational and non-rotational physiotherapists within adult CF services.

Thus, a range of skill mix and permanent and rotational staff will likely occur in delivering CF physiotherapy care in an adult CF service. In addition to the standards documents, discipline-specific clinical practice guidelines that integrate the clinical knowledge and decision-making of recognised expert CF physiotherapists with systematic reviews of current evidence have been developed to provide recommendations for CF physiotherapy clinical care activity (Button et al., 2016; McIlwaine et al., 2009; Morrison & Parrott, 2020).

2.4.3 Cystic Fibrosis Physiotherapy Scope of Practice

The Australian Physiotherapy Association position statement (Australian Physiotherapy Association, 2016) defines the profession's scope of practice as including "The full spectrum of roles, functions, responsibilities, activities and decision-making capacity that individuals within the profession are educated, competent, and authorised to perform". Physiotherapists are involved in direct and non-direct care that identifies and maximises quality of life and clinical outcomes, which can include health promotion, prevention, treatments, and rehabilitation (World Confederation for Physical Therapy, 2016). Scope of practice also includes an understanding of a patient's physical, emotional, psychological, and social well-being. The scope of physiotherapy practice is not restricted to direct patient/client care. It includes patient advocacy, teaching, supervision, delegation to others, managing, developing research, and contributing to local, national, and international health policy (World Confederation for Physical Therapy, 2016).

A further definition of scope of practice for AHPs emphasises the level of an individual AHP's approved clinical practice associated with a particular organisation, based on that AHP's skills, knowledge, performance and professional suitability, and the needs and service capability of the organisation (Australian Commission on Safety and Quality in Health Care, 2021). Therefore, scope of practice may be bound by workplace parameters set up via contracts, job descriptions, policies, and procedures, etc. to deliver a service within a set resourcing framework rather than a broader boundary of what an AHP may be capable of providing under legislative, regulatory and/or professional standards. For this research, scope of practice or changes to scope of practice refers to changes to the delivery of routine scope of practice (core scope of practice) based on qualifications, professional awards, and statements of competency from relevant education and training bodies such as a professional college in a speciality or sub-speciality area of practice (Australian Commission on Safety and Quality in

Health Care, 2021). The thesis does not consider changes to scope of practice that could be defined as extended scope of clinical practice, which requires specific credentialing based on additional training, the introduction of new clinical procedures, equipment, or where any other significant change in practice occurs (Australian Commission on Safety and Quality in Health Care, 2021).

The range of physiotherapy techniques, level of knowledge and clinical skill levels required to deliver CF physiotherapy treatments and roles in education, supervision, management, advocacy, and research all inform what is considered scope of practice for this thesis for CF physiotherapy and will now be discussed in detail.

2.4.3.1 Airway Clearance

Airway clearance techniques (ACTs) are fundamental in managing CF lung disease (Button et al., 2016; Main & Denehy, 2016; Mogayzel et al., 2013). ACTs involve breathing exercises alone or may be combined with manual techniques and/or different types of devices. Some techniques are taught and performed independently by patients, whilst others require a physiotherapist to apply (Daniels, 2010; McIlwaine et al., 2009). Table 2.3 summarises recommended ACTs and devices that may be included for CF patients (Rand et al., 2013).

Systematic reviews of ACTs conclude that no technique demonstrates an advantage over another (Elkins, Jones, & van der Schans, 2006; Flume et al., 2009; McIlwaine, Son, & Richmond, 2014; McKoy et al., 2012; Morrison & Agnew, 2009). Advantages and disadvantages of each technique are summarised in Table 2.3 (Rand et al., 2013). Some patients prefer independent techniques (Bott et al., 2009; Flume et al., 2009; van der Schans, Prasad, & Main, 2000; Rowbotham et al., 2021). Collaboratively working with patients to individualise their ACT routines based on preference, time efficiency, severity of disease, and any adverse experiences or events, may contribute to optimal adherence (Flume et al., 2009; Lannefors et al., 2004; Pryor et al., 2010; Rowbotham et al., 2021). A single treatment session to teach, achieve effectiveness and then further individualise and optimise ACT is not feasible, so regular supervision and review are required for all patients to achieve these outcomes (Pryor et al., 2010; Rand et al., 2013). Table 2.4 outlines examples of the optimisation process a CF physiotherapist may follow with their patient to develop a time-efficient ACT routine (Rand et al., 2013).

Table 2.3: Airway Clearance.

Airway clearance techniques and devices	Types	Advantages	Disadvantages
Breathing techniques	Active cycle of breathing techniques Autogenic drainage Assisted Autogenic drainage Forced expiration technique	No equipment required Can combine with other ACTs	AD difficult for some adults with CF to comprehend and perform effectively
Positive expiratory pressure (PEP) therapy devices	Facemask PEP Mouthpiece PEP Infant PEP	Portable Can combine with other ACTs Provides visual feedback when used with a manometer Individualised settings Different interfaces available Can combine with inhalation therapies	Cost to purchase device: relatively inexpensive Infection control risk No oscillatory component
Oscillatory PEP therapy devices	Acapella, Flutter, Aerobika, Bubble PEP	Portable Easy to use Vibratory component Majority can be used in different PD positions Can combine with inhalation therapies (Aerobika)	Cost to purchase device: relatively inexpensive Infection control risk Easy to break (acapella and flutter)
Conventional physiotherapy	Modified gravity assisted drainage with percussion and vibrations	No equipment required Can combine with other ACTs	Require assistance Can be passive if used in isolation
Non-invasive ventilation	Variable Positive Airway Pressure Bilevel Positive Airway Pressure Continuous Positive Airway Pressure	Can combine with other ACTs and inhalation therapy Different interfaces available Beneficial in the acute setting / increased disease severity	Cost to purchase device: Expensive Less portable Potential tolerability issues
High frequency chest wall oscillation	The Vest	Can combine with other ACTs and inhalation therapy Individualised settings Effort independent	Cost to purchase device: Expensive Less portable Can be passive if used in isolation Can be uncomfortable
Intermittent positive pressure breathing	'The Bird'	Can combine with OPEP and inhalation therapy Different interfaces available Beneficial in the acute setting	Less portable Usually only used in hospitals Outdated, not in use in many hospitals now

Note: Abbreviations: ACT – airway clearance technique; AD- Autogenic drainage; CPT – Conventional physiotherapy, PEP – positive expiratory pressure; NIV – Non-invasive ventilation

Adapted from " Physiotherapy in cystic fibrosis: Optimising techniques to improve outcomes" by S. Rand et al., 2013,Paediatric Respiratory Reviews,Volume 14(4), page 265. Copyright 2013 by Elsevier Ltd.

Table 2.4: Suggested Approaches to Combining Airway Clearance Techniques for Optimisation of Treatments.

Airway clearance technique	Suggested combinations
Positive expiratory pressure (PEP)	Combine with inhalation therapy +/- intersperse Combine with breathing exercises
Breathing techniques/ Conventional physiotherapy (CPT)	Combine with inhalation therapy +/- intersperse Combine with PEP, OPEP, IPPB, NIV
Oscillatory positive expiratory pressure (OPEP)	Combine with inhalation therapy +/- intersperse Combine with breathing exercises
Intermittent positive pressure breathing (IPPB)	Combine with inhalation therapy +/- intersperse Add OPEP
Non-invasive ventilation (NIV)	Combine with inhalation therapy +/- intersperse Combine with breathing exercises, CPT, exercise
Exercise	Combine with breathing techniques, NIV

Note: Abbreviations: CPT – Conventional physiotherapy IPPB – intermittent positive pressure ventilation, Intersperse – alternate inhalation of medication with cycles of ACT, OPEP – oscillating positive expiratory pressure, PEP – positive expiratory pressure, NIV – non-invasive ventilation

Adapted from " Physiotherapy in cystic fibrosis: Optimising techniques to improve outcomes" by Rand et al., 2013, Paediatric Respiratory Reviews, Volume 14(4), page 267. Copyright 2013 by Elsevier Ltd.

2.4.3.2 Inhalation Therapy: The Physiotherapist's Role

Cystic fibrosis inhalation therapies involve the administration of pharmacological agents via nebulisation that includes bronchodilators, mucolytics, inhaled antibiotics, hypertonic saline, and mannitol (Agent & Parrott, 2015; Button et al., 2016) and are another key aspect of CF management (Agent & Parrott, 2015; Morrison & Parrott, 2020). These treatments are adjunctive to and/or during ACT, as their effectiveness is fundamental to the success of both the ACT and the inhaled medications (Agent & Parrott, 2015). Cystic fibrosis physiotherapists in Australia do not prescribe these medications; however, expertise regarding the treatments and their delivery systems is required to maximise the efficacy of both interventions (Button et al., 2016; Morrison & Parrott, 2020). Ongoing education, review, and optimisation about the order of inhalations, timing of ACT and the delivery method of the medications through a range of nebulisers and compressor devices is undertaken with inpatients and in outpatient clinics by CF physiotherapists (Table 2.5) (Agent & Parrott, 2015; Button et al., 2016; Lannefors et al., 2004; Smyth et al., 2014).

Table 2.5: Recommendations for Individualised Inhalation Treatment Strategy.

Recommendations for individualised inhalation treatment strategy
1. Individualised but follow basic core principles of dosages, delivery devices and techniques
2. Bronchodilators: given prior to hypertonic saline, airway clearance techniques and inhaled antibiotics
3. Hypertonic saline/mannitol; given prior to/during airway clearance techniques
4. Inhaled antibiotics: always given post-airway clearance techniques
5. Inhaled mucolytic: rhDNase: individually assess benefit of giving ~One hr pre-airway clearance or immediately post-airway clearance (but >30 min away from taking inhaled antibiotics)

Note: Adapted from " Inhaled therapy in cystic fibrosis: Agents, devices and regimens" by Agent & Parrott, 2015, Breathe, Volume 11(2), page 116. Copyright 2015 by European Respiratory Society.

2.4.2.3 Exercise

Exercise and physical activity are essential components of CF physiotherapy services (Bott et al., 2009; Button et al., 2016; Morrison & Parrott, 2020). Exercise treatments and ongoing reviews are required to optimise the type of exercise and /or physical activity and the prescription of frequency and intensity for this exercise (Morrison & Parrott, 2020). Reduced exercise capacity is associated with a decline in respiratory function and survival in people with CF (Wheatley et al., 2011; Wilkes et al., 2009). In both short and long-term studies, regular exercise has been demonstrated to decrease the annual decline in lung function in people with CF (Hebestreit et al., 2010; Klijn et al., 2004; Moorcroft et al., 2004; Selvadurai et al., 2002).

2.4.3.4 Exercise Testing

Exercise testing monitors the impact of disease progression and informs targeted and individualised exercise prescription (Button et al., 2016;; Morrison & Parrott, 2020). Common exercise tests validated for use with people with CF include six minute walk test (Gulmans et al., 1996), modified shuttle walk test (Bradley et al., 1999), 3-minute step test (Balfour-Lynn et al., 1998) and quadriceps strength testing (Holland et al., 2011). An annual exercise test is recommended (Hebestreit et al., 2015; Morrison & Parrott, 2020) with additional regular testing required to facilitate exercise prescription (Hebestreit et al., 2015) and monitor the efficacy of admissions and treatment changes (Hebestreit et al., 2015) however this is known to be underutilised in the cystic fibrosis population (Stevens et al., 2010).

2.4.3.5 Other CF Physiotherapy Treatments

The multisystem manifestations of CF disease are likely to require additional physiotherapy assessments, treatments and modifications to treatments associated with co-morbidities and complications (Bell et al., 2008; Conway et al., 2014; Plant et al., 2013). Detailed description of these complications and co-morbidities is beyond the scope of this document. However, an introduction to the more common treatments used by CF physiotherapists is included.

Pain and musculoskeletal complications result from abnormal bone mineral density, changed mechanics of breathing and muscle loss and imbalances with progressing lung disease (Massery, 2005; McIlwaine et al., 2014; Sandsund et al., 2011; Wells et al., 2011). Sports injuries, CF-related arthropathies, and rib fractures can occur (Button et al., 2016), necessitating individualised musculoskeletal assessments, chest mobility treatments, spinal mobilisation, injury prevention management strategies for osteoporosis; and chronic pain management interventions (Lee et al., 2009; Sandsund et al., 2011).

Other complications and comorbidities that can have implications for physiotherapy clinical care include haemoptysis, pneumothorax, and cystic fibrosis related diabetes. No published data exist evaluating physiotherapy treatments for these medical complications in this cohort. Consensus guidelines suggest that CF physiotherapists should individualise treatments based on clinical reasoning and expertise in CF clinical care (Flume et al., 2009; Morrison & Parrott, 2020). Increased incidence of urinary incontinence has also been reported (Daniels, 2010; Morrison & Parrott, 2020), so screening (Cornacchia et al., 2001; Orr et al., 2001; White et al., 2000), and consequent preventative postures and techniques during ACT and rehabilitation exercises can also form part of physiotherapy care (Button et al., 2005; Helm et al., 2008; McVean et al., 2003).

Adults with CF may be considered for transplantation as their disease progresses. The CF physiotherapist may be involved in specific pre-transplant assessments and facilitate exercise training to maintain strength and fitness in the lead-up to a transplant (Li et al., 2013). The most common cause of death is respiratory failure (McBennett et al., 2022), and the CF physiotherapist’s role in managing end-of-life care requires expertise, skill and understanding as they continue to offer supportive and dignified clinical care with ACT and other comfort care such as positioning to minimise work of breathing, right up to the point of death (Agent & Tonkin, 2006, 2007; Tonelli, 1998).

2.4.3.6 Adherence

Reduced adherence to CF treatments has been reported as the biggest contributor to treatment failure (Modi & Quittner, 2006; Quittner et al., 2008; Sawicki et al., 2015; Sawicki et al., 2009). Cystic fibrosis physiotherapists are required to develop an understanding of what affects adherence and work with the patient and multidisciplinary team members to explore ways to improve adherence to maintenance clinical care (Morrison & Parrott, 2020; Rand et al., 2013). Applying expert knowledge in the technical capabilities of equipment and devices and how to combine treatments to develop individualised time-efficient plans while maintaining effectiveness may influence adherence (Geller & Madge, 2011; Lannefors et al., 2004). Research into successful strategies for improving adherence to physiotherapy treatments is still required (Morrison & Parrott, 2020). Cystic fibrosis physiotherapists are likely to use psychologically based interventions such as collaborative approaches to clinical care (Geller & Madge, 2011) and motivational interviewing (James et al., 2013) supported by psychologists and social workers (Daniels, 2010; Morrison & Parrott, 2020; Smyth et al., 2014). However, there is little evidence of the effectiveness of these interventions for people with CF (Goldbeck et al., 2014). Using these psychological-based interventions in the regular review, modification, and individualisation of CF physiotherapy treatments to facilitate adherence during hospital admissions and at OPD reviews requires knowledge, clinical expertise, and time to incorporate into care delivery (Rand et al., 2013).

2.4.3.7 Non-clinical CF Physiotherapy Scope of Practice

Several activities that do not involve direct patient clinical care also form part of the scope of practice for a CF physiotherapist. These activities will be discussed and will include teaching and training, supervision, management, advocacy, and research. Senior CF physiotherapists provide supervision and ongoing training in CF-specific physiotherapy care delivery for junior staff and the multidisciplinary team (Morrison & Parrott, 2020). They are recommended to attend and contribute to CF postgraduate courses, lectures, and national and international conferences (Conway et al., 2014). Guidelines recommend that CF physiotherapists contribute to research and development by undertaking clinical audits and research trials and collecting annual data to evaluate clinical care outcomes (Bell et al., 2008; Conway et al., 2014).

2.5 Summary of Cystic Fibrosis Care

A summary of CF is presented, including current clinical outcomes trajectory with increasing survival, subsequent increasing numbers, and complexity of clinical care for adults with CF. Additionally, implications for current and future care delivery for these patients, including CF physiotherapy care delivery, were discussed. Planning is required to meet the demands of continued quality care delivery, and research to address these challenges is necessary.

Standards of care and clinical practice guidelines recommend requirements to deliver quality care for adults with CF, including the structure and staffing in CF services and the scope of practice for CF physiotherapy clinicians. This chapter has summarised CF-specific physiotherapy assessments, treatments and other interventions and roles that inform the scope of practice for CF physiotherapy care delivery, as recommended in the guidelines. There is, however, no quantifiable evidence benchmarking CF physiotherapy scope of practice and the time taken to deliver this care for adults with CF available in the literature.

This program of research aims to quantify current CF physiotherapy care delivery in terms of service provision, scope of practice and the physiotherapy skill mix in an adult CF service. Benchmarking these outcomes against standards documents and clinical practice guidelines will examine if full physiotherapy care delivery and scope of practice are occurring in current CF services. Establishing the current service provision, scope of practice and skill mix for CF physiotherapy care delivery formed Study 1 of this program of research. Establishing this data then allowed for examination of any change to these outcomes with a proposed new model of physiotherapy care delivery. The new model of care delivery was established using a workforce redesign system, which is the subject of the next section of this document.

2.6 A New Model of Care Delivery for CF Physiotherapy for Adults with CF – Utilising Allied Health Assistants

This section will discuss a new model of care delivery utilising Allied Health Assistant (AHA) roles. Evidence for service redesign using AHAs, what AHA roles undertake and how these roles can be successfully implemented into care delivery models using workforce redesign systems will be included. Finally, this section will discuss the evidence for developing specific scope of practice for a clinical AHA role.

2.6.1 Service Redesign

Solutions are needed to ensure quality CF physiotherapy care delivery to meet the rise in the number of adults with CF and the growing complexity of the required care. Ideally, strategies will support and improve the existing staffing and skill mix within adult CF services to meet recommended standards of care for the delivery of CF physiotherapy (Bell et al., 2008) and scope of physiotherapy practice based on the CF physiotherapy consensus guidelines (Button et al., 2016; Morrison & Parrott, 2020). New, changed, or enhanced models of care delivery must also be sustainable to address current and future care delivery requirements (Bell et al., 2020; Burgel et al., 2015; Madge et al., 2017).

The challenge of managing an increasing number of adults with chronic health conditions is not limited to people with CF. Restructuring of healthcare care in Australia is an attempt to deal with "an ageing population, increasing demand on healthcare services, higher consumer expectations, rising health care costs, technological advancements in patient care and an increase in chronic disease" (Services for Australian rural and remote allied health, 2016). Innovative healthcare service redesign is directing change towards the reconfiguration of skill mix rather than just looking at increasing numbers of staff as the integral change to services (Dubois & Singh, 2009; Duckett & Breadon, 2014; Duckett, 2005; Huglin et al., 2021; Pearce & Pagett, 2015; Sommerville et al., 2015).

In 2014 the Queensland Health Ministerial Taskforce on health practitioner scope of practice identified improved patient-centred care and increased service capability by moving AHPs towards full scope of practice, in conjunction with the delegation of suitable tasks toAHAs (Allied Health Professions Office of Queensland, 2014). Similarly, a Victorian government review suggested that the greatest impact on service redesign in allied health would be achieved by increasing current efficiency of AHPs, combined with increasing the use of the skills of the AHA workforce, so that the best clinical care is delivered at an affordable price point (Health & Human Services Victoria, 2016; KPMG International, 2014). It has been reported that this shift towards examining skill mix, followed by restructuring and creating new models of care delivery that include AHAs, is currently underutilised within public health systems in Australia (Allied Health Professions Office of Queensland, 2014; Duckett & Breadon,2014; Health & Human Services Victoria, 2016; Health Workforce Australia, 2014; Sommerville et al., 2015, 2016; Rushton et al., 2022).

Therefore, this program of research aims to document and evaluate the development of an AHA role within a cystic fibrosis physiotherapy service to strategically assist with physiotherapy care delivery as an innovative model of care delivery to potentially meet current and future care delivery shortages. The scope of practice for the AHAs will be established. Any change to current scope of practice of the physiotherapists in an adult CF service because of this AHA role will also be determined. The following section will examine the current evidence for AHA roles in care delivery.

2.6.2 *Allied Health Assistants (AHAs)*

2.6.2.1 AHA Definition and Activities

An allied health assistant (AHA) is a person working with an AHP to assist therapeutic and program-related activities under the supervision and delegation of that professional (Allied Health Professions Office of Queensland, 2013, 2016a). An AHA role can involve clinical and non-clinical patient cares (Stute et al., 2013). The local healthcare service typically determines AHA duties, local care delivery model and the specific needs of the AHP delegating the workloads at a specific site (ACT Allied Health Office, 2014; Allied Health Professions Office of Queensland, 2013). Allied health assistants can carry out administrative tasks, prepare equipment, complete delegated clinical work with patients considered less complex in clinical presentation, and assist AHPs with care delivery for more complex patient groups (Duckett & Breadon, 2014; Lizarondo et al., 2010;). Allied health assistants may also be referred to as assistants, physiotherapy assistants, community rehabilitation assistants, therapy assistants, and aides (Lizarondo et al., 2010; Pearce & Pagett, 2015). These roles, however, all come under the definition described above and will be referred to as AHA/AHAs throughout this document.

2.6.2.2 Role of AHAs in Acute and Non-acute Services

As AHA roles develop within healthcare systems, the definitions of their roles, responsibilities and effectiveness are also being explored. The available evidence encompasses AHAs working across a varied range of healthcare locations (hospitals, community, rehabilitation, aged care and mental health) (Sarigiovannis et al., 2021; Turnbull et al., 2009) and with a large number of AHP disciplines (Snowden et al., 2020). The majority of evidence examining AHA roles and effectiveness centres on roles in acute and non-acute areas of healthcare involving orthopaedic, neurological and aged care rehabilitation patients and general medical patients (Snowden et al., 2020). This will now be discussed.

The first systematic review to examine the evidence regarding AHA roles and responsibilities was reported in 2010 (Lizarondo et al., 2010) and included ten peer-reviewed papers. Overall it was demonstrated that AHAs performed clinical and non-clinical roles, which are summarised in Table 2.6. The scope of practice of the AHA role was described as assistive and undertaking supportive duties, monitoring and maintaining care delivery (Lizarondo et al., 2010). Emergent evidence supporting improved outcomes for patients and the delivery of healthcare included “increased patient satisfaction, increased intensity of clinical cares, more free time for AHPs to concentrate on complex tasks, and improved clinical outcomes” (Lizarondo et al., 2010, p152). Areas of research still to be addressed included detailed examination of how AHA roles are developed to complement or, at times, replace an AHP role, how competency training for AHAs is undertaken and comprehensive analysis of the effectiveness of the AHAs in these roles.

Table 2.6: Clinical and Non-clinical Roles and Responsibilities of Allied Health Assistants

Clinical duties	Non-clinical roles
Assist allied health professional	Administration
Physical and social support to patients	Stock ordering/requisition
Administer clinical care and modalities	Prepare/maintain environment
Transfer patients	Equipment maintenance
Communication of patient progress/communication with other staff	Monitor and update healthcare-specific database
Assist with mobility and gait	Health promotion
Provision of equipment	Recording/statistics / database entry
Patient education	Housekeeping
Provision of healthcare to patients	Cleaning
Supervise/conduct exercise classes	
Prepare patients for treatment	
Individual or group therapy	
Coordination and assist in the operation of care delivery	
Assist and coordinate delivery of care	

Note: Adapted from " Allied health assistants and what they do: A systematic review of the literature" by. ***Lizarondo et al., 2010, Journal of Multidisciplinary Healthcare****, Volume 3, Page 150. Copyright 2010 by Lizarondo et al., publisher and licensee Dove Medical Press Ltd.*

The literature becomes challenging to interpret when searching for evidence of the effectiveness of AHA roles. There is enormous diversity and heterogeneity in the clarification of the roles and the healthcare settings that report these outcomes, and a complete analysis of this literature is beyond the scope of this thesis. Recent literature in this area also describes AHA roles in terms of full scope or advanced scope of practice (Allied Health Professions Office of Queensland, 2016a). However, both terms refer to AHAs working under the supervision and delegation of an AHP as defined previously (Allied Health Professions Office of Queensland, 2016a). For this program of research, all activities undertaken by an AHA will be referred to as AHA roles.

Findings from a second early systematic review investigating the overall effectiveness of AHA roles provided an initial comprehensive summary of the literature (Stanhope & Pearce, 2013). Fifty-three studies were included, with the majority detailing the extent of AHA roles. Still, only four studies examined these roles' effectiveness in process outcomes and AHP and patient perspectives (Stanhope & Pearce, 2013). A wide range of AHPs (dietetics, occupational therapy, pharmacy, psychology, social work, physiotherapy, and podiatry) worked with AHAs. Allied health assistants worked with varied patient groups (people with intellectual disabilities, long-term neurological conditions, cancer, limited mobility and falls risk) and in a range of settings (homes, community centres and hospitals) (Stanhope & Pearce, 2013). Allied health assistant roles were well accepted by patients and appeared to provide more time for patient treatments (Stanhope & Pearce, 2013). However, these findings were primarily qualitative, with only one study demonstrating time savings of 50 hours per month for the AHP, which was then directed to more patient-focused care delivery (McKee & Zimmerman, 2011).

More recently, two systematic reviews have further examined AHA roles and outcomes associated with AHA roles (Sarigiovannis et al., 2021; Snowden et al., 2020). Both reviews were rigorous, following the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines for high-quality reporting of systematic reviews and meta-analyses (Liberati et al., 2009; Moher et al., 2009). These findings were unavailable when the methodologies and study design for this program of research were being synthesised. However, these reviews offer comprehensive summaries and meta-analyses of current evidence on the roles of AHA, and each will now be discussed.

Snowden et al. (2020) examined the effects of AHA roles on clinical and organisational outcomes (Snowden et al., 2020). Twenty-six papers reporting on 22 studies met eligibility for review inclusion. Studies were either randomised control trials or cohort studies (pre-post design). As with previous reviews, AHA roles were found to be diverse across studies and included undertaking tasks such as supervised upper and lower limb and mobilisation exercise programs (Britton et al., 2008; Hastings et al., 2014; Howe et al., 2005; Jones et al., 2006; Niamela et al., 2012; Nolan &Thomas, 2008), cognitive behaviour therapy (Parry et al., 2016), speech and language therapy (Boyle et al., 2006; Dickson et al., 2009; Wenke et al., 2014), activities of daily living retraining (Parson et al., 2018, Shearer & Gutherie, 2013), nutrition and feeding screening and assistance (Duncan et al., 2006; Salisbury et al., 2010), and post-hospital admission transition care (Isabel et al., 2014). The AHA roles were undertaken across a wide range of settings, including acute and sub-acute hospital wards (aged care, general medical, neurological rehabilitation, and orthopaedic wards) and non-acute community settings (community outpatient centres and home-based care) (Snowden et al., 2020).

Data from individual studies were used to calculate means, standard deviations, and risk ratios across a range of outcomes and, where possible, meta-analysis was performed. Four studies investigated the effect of additional patient exercise undertaken with an AHA on discharge to home versus discharge to a care facility (Hastings et al.,2014; Jones et al., 2006; Nolan & Thomas, 2008; Ramsey et al., 2016). Analysis of 696 participants resulted in very low-level evidence in favour of discharge to home with additional AHA exercise (RR 1.28, 95% CI 1.03 t0 1.59) (Snowden et al., 2020). Another study found a reduction in the number of aged care assessment referrals (RR 0.52, 95%CI 0.18 to 1.44) and approvals (RR 0.46, 95%CI 0.24 to 0.90) in participants undertaking additional exercise with an AHA in hospital (Nolan & Thomas, 2008). Additional exercise with an AHA led to a small reduction in overall length of stay for inpatients (0.28 days) (RR 1.28, 95%CI 0.03 to 0.54) from a meta-analysis of six studies that included 1787 participants (Hastings et al., 2014; Jones et al., 2006; Nolan & Thomas, 2008; Pengas et al., 2015; Siebens et al., 2000; Walsh et al., 2015; Ramsay et al., 2016). An additional study, not included in this meta-analysis, demonstrated that home-based AHA exercise and ADL retraining reduced hospital length of stay by 5.9 days (95% CI 0.55 to 11.25) (Parsons et al., 2018). Finally, an AHA providing nutritional supplements and feeding assistance to post-hip fracture patients resulted in a large increase in energy intake over twenty-four hours (SMD 0.91, 95% CI 0.67 to 1.16) and a reduction in mortality (RR 0.57, 95% CI 0.34 to 0.95) (Duncan et al., 2006). Whilst this represents evidence supporting AHA role effectiveness, most of the studies included in this review demonstrated no changes to reported patient outcomes such as measures of activity limitation, quality of life or patient satisfaction associated with additional AHA interventions (Snowden et al., 2020).

Six studies in the Snowdon et al. (2020) systematic review focused on an AHA role being substituted for an AHP role (Lincoln et al., 1999; Parry et al., 1999; Cannell et al., 2018; Lord et al., 2008; Boyle et al., 2007; Wenke et al., 2014). An AHA delivered either physiotherapy (three studies) (Lincoln et al., 1999; Parry et al., 1999; Cannell et al., 2018; Lord et al., 2008), occupational therapy (one study) (Cox et al., 2014) or speech pathology (two studies) (Boyle et al., 2007, 2009; Dickson et al., 2009) activity. Importantly, all AHA activity was prescribed, delegated, and supervised by an AHP. There was no significant difference between groups regarding activity limitations or other participation outcomes reported across these studies (Snowden et al., 2020). None of these study outcomes inferred that an AHP intervention was more or less superior to an AHA intervention (Snowden et al., 2020). The details of how this delegation and supervision were undertaken were not included in any study details. As previously discussed, this continues to be a major limitation in study designs reporting on AHA roles.

In Snowdon et al. (2000) systematic review, the methodological quality of studies was examined using validity items from the Downs and Black (1998) checklist for non-randomised controlled trials. Most of the studies were considered of low methodological quality as they did not use a randomised control study design, and significant statistical heterogeneity of results between studies occurred (Snowden et al., 2020). However, the authors argued that cohort-designed studies provide valuable research outcomes that are likely more reflective of what occurs in real-world healthcare settings (Snowden et al., 2020). Despite the discussed limitations, AHAs have been shown to undertake a range of roles and activities across acute, sub-acute and non-acute healthcare settings, which can improve patient outcomes.

Finally, Sarigiovannis et al. (2021) published a systematic review aiming to investigate the clinical and cost-effectiveness of AHA roles (Sarigiovannis et al., 2021). Thirteen papers met eligibility for review inclusion. Randomised controlled trials, non-randomised controlled trials, and observational, descriptive, and qualitative studies were included. Six studies involved physiotherapy AHA roles (Lincoln et al., 1999; Parry et al., 1999; Parry et al., 1997; Saunders et al., 1998,1995; Wazakili et al., 2000), three occupational AHA roles (Mackey et al., 2004,2005; Russell et al., 1998), two speech pathology AHA roles (Nancarrow, Moran et al., 2015; Schwarz et al., 2018) and one involved multiple AHA professions (Somerville et al., 2015). Direct cost-effectiveness of an AHA role was not addressed by any study (Sarigiovannis et al., 2021). These authors defined clinical effectiveness as a change to a clinical outcome achieved as a direct result of an AHA role substituting for an AHP role only. As such, the same minimal clinical improvements achieved in stroke rehabilitation patients with mild impairments (Parry et al., 1999) were considered evidence of clinical effectiveness in this review. It is important to note that in Snowden et al. (2020), this was not considered a clinically significant change for the same study.

The strength of this systematic review was that data from all qualitative studies (ten studies) was combined and analysed thematically, identifying themes relating to the perceptions of AHPs and AHAs and patients towards the use of AHA roles and the barriers and facilitators to role creation (Sarigiovannis et al., 2021). Themes that emerged will be discussed further in this background chapter under delegation (section 2.6.5.1); however, they aligned closely with those of Lizarondo et al. (2010) and Stanhope & Pearce (2013).

Notably, most papers (ten) included in this systematic review were published before 2013. Only three new papers (Nancarrow, Moran et al., 2015; Somerville et al., 2015; Schwartz et al., 2018), all qualitative study designs, offered any additional research findings post the previously discussed systematic reviews by Lizarondo et al. (2010) and Stanhope & Pearce, (2013). The quality of the qualitative literature was evaluated using the mixed methods appraisal tool (Hong et al., 2018) and again highlighted the poor methodological quality of many of the studies. As this was synthesised data from several papers, it does suggest that the themes that emerged were important and should be considered when designing future studies (Sarigiovannis et al., 2021). Further details will be discussed when delegation is considered later in this chapter (section 2.6.5.1). This current systematic review again highlighted the paucity of literature demonstrating clinical and cost-effectiveness of AHA roles. There remains a paucity of evidence detailing what skill mix and scope of practice is occurring in AHA roles (Sarigiovannis et al., 2021).

All systematic reviews discussed have identified that many of the included studies over the last twenty years were poorly designed (Stanhope & Pearce, 2013; Sarigiovannis et al., 2021) and of low methodological quality (Lizarondo et al., 2010; Snowden et al., 2020). Included studies varied in methodology and comprised audit, survey, descriptive and semi-structured interview data collection methods primarily. More recent studies have included cohort pre-post designs; however, limited randomised controlled trials have occurred. Objective evidence detailing the scope of practice of AHAs was poorly reported (Lizarondo et al., 2010; Sarigiovannis et al., 2021), nor detailed descriptions of how AHA role development may facilitate changes to or replace AHP roles (Lizarondo et al., 2010, Snowden et al., 2020).

Clinical and non-clinical roles for AHAs described in acute and non-acute areas of care delivery are occurring and appear to improve outcomes for clinical care delivery. Currently, there are no published data examining whether an AHA role can be established and used safely and /or effectively within a CF physiotherapy service. Limited evidence for AHA roles in other acute respiratory services is described to inform the establishment of an AHA role within CF physiotherapy services and will be discussed in the next section of this thesis.

2.6.2.3 AHA Roles in Acute Respiratory Services

Allied health assistant roles, scope of practice and safety in acute respiratory services have received little investigation in the literature. However, AHA roles have been described in intensive care, medical and surgical units. A narrative report outlined that implementing an AHA in intensive care reduced the number of days patients experienced ventilator pneumonia (4.1 days vs 3.7 days) (Conti et al., 2007). This report also suggested reduced skin breakdown rates, increased mobility, and fewer complications in patients. Physiotherapy interventions delivered by an AHA on an acute medical ward were reported to result in an 8.8% reduction in length of stay and increased discharge directly to home versus an acute service facility (74.4% vs 62.2% respectively) (Nall et al., 2007). These findings suggest AHA roles can be established within acute care services; however, both these papers lack rigour in their methodology. No methodological or data analysis was included in the former report (Conti et al., 2007). The latter provides no details of the study design, physiotherapy interventions undertaken by the AHA, safety and impact on physiotherapist workloads (Nall et al., 2007).

Eden (2010) described the development of an AHA role in an acute cardiorespiratory surgical unit. The AHA role was established to provide physiotherapy treatments for noncomplex patients after surgery. Physiotherapists assessed patients and then delegated patient treatments (Eden, 2012) following local delegation guidelines (Miller, 2015). Once delegated into their care, the AHA could progress patient treatments and refer back to the AHP staff if more complex issues occurred (Eden, 2012). The AHA was involved in physiotherapy treatments that could include breathing exercises, physical exercise or other airway clearance techniques. Non-clinical activities included stock audits and departmental administration. The role was viewed as positive for both staff and patients, allowing AHPs to carry out their clinical workloads with an "improved matching of skills to patient needs" (Eden, 2012, p426). There was no change to overall physiotherapy care provision or discharge rates. Establishing an AHA role was recommended when planning for future staffing numbers in this and other acute settings (Eden, 2012). This study demonstrates that an AHA can be involved in airway clearance and exercise in an acute care service such as a cardiac surgical unit.

An AHA role has been explored in acute cardiorespiratory settings in Australian and New Zealand hospitals. Allied health assistants were found to be safe and effective in providing early mobilisation of patients following major upper abdominal surgery in a large prospective observation multicentre trial (Boden, 2015). Three hundred and fifty-nine patients were mobilised independently by AHAs for a total of 472 sessions (46% of all mobilisations) from Day 2 onwards after surgery, once assessed and deemed safe for the standardised post-operative early mobilisation program by the treating physiotherapist. There were no adverse events, and the authors suggested AHAs were a low-cost option to provide early mobilisation programs, allowing physiotherapists to redirect their care and resources towards higher-risk patients. Boden (2015) is the first study to report safety for AHA treatments in an acute surgical area. No information was presented on how this change to care was perceived by the patients or the staff (Boden, 2015).

Therefore, the evidence for AHA roles in acute respiratory care settings is limited. Evidence does suggest an AHA role in mobilising patients is safe, however. Despite limited evidence, AHA roles are being endorsed and implemented in acute care clinical areas throughout Queensland Health facilities (Allied Health Professions Office of Queensland, 2013, 2016a). In a CF physiotherapy service, an AHA role may potentially include delegated clinical tasks of mobilisation and the supervision of respiratory physiotherapy treatments such as airway clearance and exercise and exercise testing for non-complex CF patients. To date, no data exists examining the development of such a role or documenting the scope of practice for an AHA, safety and potential impact on AHP roles resulting from any change to the skill mix in an acute respiratory care service such as a CF service.

2.6.3 How to Implement Changes to the CF Physiotherapy Model of Care Delivery

2.6.3.1 Inclusions in Successful Changes to Models of Care Delivery

Evidence supporting systems or tools that result in successful service redesign, establishing AHA roles and new models of care delivery is growing. Therefore, the process of developing and implementing an AHA role in CF physiotherapy care delivery needs to be considered in light of this evidence. It is suggested that health service redesign should involve an inclusive approach that engages all health professionals involved in care delivery. Service redesign should also examine 'the full spectrum of patient care' so that the most efficient distribution of services, roles and a balanced skill mix is developed (Dorning & Bardsley, 2014; Dubois & Singh, 2009; Health & Human Services Victoria, 2016; Health Workforce Australia, 2014; Lizarondo et al., 2010; Sommerville et al., 2016). The next section of this thesis will examine what is known about systems and/or tools used in health service redesign to determine what is currently considered 'best practice' for this process and inform the methodology for this phase of the program of research.

2.6.3.2 Establishing the AHA Role

Several studies have examined the specific requirements to successfully implement care delivery changes involving establishing an AHA role. Key factors identified with the successful implementation of AHA roles in community-based rehabilitation care included: multidisciplinary team input into training, clear communication regarding clinical task delegation, supervision, skill sharing, and ongoing training that addressed perceived barriers to all staff working at full scope of practice (Moran et al., 2015; Sarigiovannis et al., 2021). Reported staff perception during the two-year observational study was that both AHA and AHP staff were efficient and productive in care delivery (Moran et al., 2015).

Two systematic reviews have outlined suitable strategies to develop successful AHA clinical roles (Munn et al., 2013, Sarigiovannis et al., 2021). Both reviews found that successful implementation projects included a comprehensive training structure, engagement from AHAs taking on any additional training; and that accountability, responsibility, supervision, and mentoring processes were clearly outlined for AHPs and AHAs (Munn et al., 2013; Sarigiovannis et al., 2021). Barriers to success included the lack of definition of roles and a negative perception of the development of AHA roles by the AHPs (Munn et al., 2013; Sarigiovannis et al., 2021). 'Addressing these influencing factors contributed to positive relationships between AHAs and AHPs, encouraging constructive working interactions for models of care delivery' (Munn 2013, p14). Ten studies met the inclusion criteria for the Munn et al. (2013) review. Thirteen studies were included in the Sarigiovannis et al. (2021) review, with only one paper included in both reviews. Qualitative outcomes from open-ended questions, semi-structured interviews, and reflective journaling were synthesised and thematically analysed to determine the outcomes for each review. Detailed training and supervision were also reported as key contributors to establishing 41 successful AHA roles in regional Queensland Health services (Kuipers et al., 2015).

An inductive logic reasoning tool was applied to describe changes to workforce outcomes from 55 pilot projects undertaken within Queensland Health facilities where changed models of care were implemented (Nancarrow, Roots, Grace, et al., 2013). The projects focused on using AHPs to work towards full scope of practice alongside better use of AHAs. Engagement of key stakeholders and clear identification of the processes and procedures used to develop, train, and implement the roles were associated with better outcomes and sustainability of the new models of care delivery (Nancarrow, Roots, Grace, et al., 2013). The projects were heterogeneous and used 14 different AHP disciplines across a variety of activities and workplaces. Key learnings from the projects resulted in a detailed workforce change checklist (Nancarrow, Roots, Moran, Grace, & Lyons., 2013) which is suggested as the most effective way to develop new models of care delivery in health.

Several authors have reported on perceived barriers to developing an AHA role, including issues relating to professional status and role security (Lizarondo et al., 2010; Sarigiovannis et al., 2021). Staff culture has been identified as a significant barrier to skill mix redesign (Duckett & Breadon, 2014; Health & Human Services Victoria, 2016) and any potential impact on staff and the opportunity to address such concerns during the design process is considered vital (Barrett et al., 2015; Stanhope & Pearce, 2013). Therefore, it will be essential to consider these potential challenges in the development and implementation process associated with a new AHA in a CF service.

Key processes have been identified to optimise the successful establishment of a new AHA role (Nancarrow, Roots, Grace, et al., 2013; Nancarrow, Roots, Moran, Grace, & Lyons., 2013; Nancarrow, Roots, Moran, Grace, Lyons, Hulcombe et al., 2013). These processes have been considered as part of this program of research design:

- ensuring patient safety is central to any change
- engagement of all staff in service redesign, including the AHAs
- examining current skill mix and scope of practice to inform potential changes to these
- establishing the new roles the AHA could potentially undertake – clinical and non-clinical
- developing comprehensive training
- addressing the approach to delegating and supervising clinical workloads to the AHA, which takes into consideration the accountability and responsibility of both AHAs and AHPs
- ensuring ongoing sustainability of these processes and any changes made to workloads

Logically, ensuring that these processes are accounted for and addressed is more likely to guarantee the successful development and implementation of a new AHA role. Workforce redesign systems are available to address these inclusions as part of workforce redesign. The next section of this thesis will discuss the benefits of using a workforce redesign system and explore the Calderdale Framework, the workforce redesign system used in this program of research.

2.6.4 Using Workforce Redesign Systems

2.6.4.1 Why use a workforce redesign system?

Imison (2016) released a practical guide for workforce redesign based on current literature and interviews of stakeholders in the United Kingdom National Health Service (Imison, 2016). Relevant to the methodology of this program of research is the key message that a comprehensive and systematic approach using workforce planning systems is recommended to ensure the success of any skill mix redesign process (Imison, 2016). Queensland Health established nine projects trialling AHA roles working with various AHPs, clinical settings and locations within Queensland (Allied Health Workforce Advice and Coordination Unit, 2012). Monitoring documentation and processes used in these projects to establish the AHA roles occurred. The importance of good project management strategies to successfully implement AHA roles was emphasised (Allied Health Workforce Advice and Coordination Unit, 2012). Systems or frameworks that establish clear communication strategies, executive support, clear governance structures and involvement of the whole team were considered critical to workforce redesign (Allied Health Workforce Advice and Coordination Unit, 2012). A formal recommendation from this 2012 report specifies that "a rigorous project and change management process, and evaluation framework needs to be developed prior to any further implementation of new AHA roles" (Allied Health Workforce Advice and Coordination Unit, 2012, p32). Therefore, using a workforce redesign system to guide the development of the AHA role appears necessary for this program of research.

The Calderdale Framework (Smith & Duffy, 2010) is one such recommended system, supporting and incorporating many of these desirable key inclusions (Barrett et al., 2015). This system has previously been used in the implementation of AHA roles with published outcomes (Nancarrow, Enderby et al., 2012). Smith and Duffy suggest that by following the Calderdale Framework, maximum efficiencies and managed or minimised risk associated with AHA roles and delegated tasks will occur (Smith & Duffy, 2010). The following section will discuss what is known about the use of the Calderdale Framework in the literature.

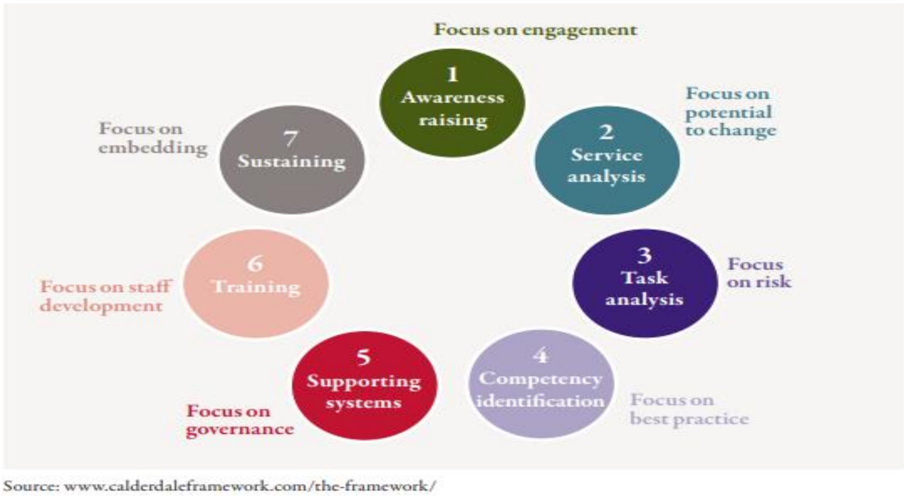
2.6.4.2 What is the Calderdale Framework?

The Calderdale Framework is a system to support skill mix review and new role development for both AHP and AHA (Allied Health Professions Office of Queensland, 2016b; Smith & Duffy, 2009). The Calderdale Framework is patient-focused and engages clinicians in seven-facilitated stages (Figure 2.4) (Smith & Duffy, 2010), aiding the acceptance of role changes at the local centre (Smith & Duffy, 2010). Each stage involves management and clinical staff taking ownership of and engaging in inclusive decision-making about skill mix changes and developing new roles for both AHAs and AHPs (Nancarrow, Moran et al., 2012). Working through the stages of the Calderdale Framework maps the functions and tasks of the current service care delivery, identifies what tasks could be delegated through a risk-based analysis, develops comprehensive clinical task instruction documents and associated resources to deliver competency-based training, assessment and other clinical governance processes that are required to safely implement a delegation model of care delivery (Smith & Duffy, 2010). The systematic structure of this framework has demonstrated reduced risk and improved patient safety and role consistency (Smith & Duffy, 2009, 2010).

The Calderdale Framework has been used as a retrospective appraisal system to evaluate outcomes of three completed AHA role development projects: a new speech pathology assistant

(Australia), an occupational therapy assistant practitioner role (United Kingdom) and a podiatry assistant role (Australia) (Nancarrow, Moran et al., 2012). Utilisation of the seven stages within a project resulted in more effective and efficient use of the AHA role overall.

Figure 2.4: The Seven Stages of the Calderdale Framework.



Note. Adapted from Smith and Duffy (www.calderdaleframework.com/theframework/). Copyright 2021 by the Calderdale Framework.

Absence of a systematic approach resulted in drawn-out, time-wasting processes (Nancarrow, Moran et al., 2012). Whilst absence of a comprehensive analysis of service and task delivery resulted in a lack of clarity regarding the scope of practice for AHAs and ambiguity of the new role (Nancarrow, Moran et al., 2012). The authors suggest that using the Calderdale Framework prospectively will contribute to role sustainability, with staff engagement, consultation, and an emphasis on thorough initial service analysis enabling positive outcomes (Nancarrow, Moran et al., 2012). Similar positive outcomes associated with the use of the Calderdale Framework include increased productivity, risk stratification, and staff satisfaction (Kaltner et al., 2011).

The Calderdale Framework has been used to streamline the development of a standardised multidisciplinary team screening system in an Australian rehabilitation service (Patterson et al., 2015). Using a pre-post mixed methods design, multidisciplinary team focus group interviews identified enhanced team dynamics, a deeper understanding of multidisciplinary team roles, and a shift to client-focused rather than profession-focused care delivery (Patterson et al., 2015).

Increased numbers of patient appointments at a reduced cost per appointment were also reported (Patterson et al., 2015).

The Calderdale Framework has also been used in a prospective randomised controlled trial to establish a professional skill-sharing model between different AHPs in a community setting (Pighills et al., 2015). Participants in the control group received usual uni-professional care (from physiotherapists and occupational therapists), while the intervention group received care from a trained "skill share" professional. No significant differences were reported between the groups across a range of functional outcome measures, suggesting the Calderdale Framework successfully developed and delivered safe and effective care for patients with a changed scope of practice for the 'skill sharing' practitioner (Pighills et al., 2015).

Outcomes from these studies suggest that the Calderdale Framework can be used as a systematic system to undertake service redesign and inform the implementation of new roles and models of care delivery. At local levels in the Queensland Health system, the Calderdale Framework is available to guide skill mix redesign and the development of new AHA roles. The process is supported by access to analysis systems and trained facilitators to guide teams through the steps of the Calderdale Framework (Allied Health Professions Office of Queensland, 2013, 2016a, 2016b).

The Calderdale Framework, therefore, offers a process to systematically and comprehensively define and implement a new clinical AHA role within the CF physiotherapy service and may potentially ensure methodological quality for service redesign.

2.6.5 AHA Clinical Role – Developing Specific Scope of Practice for a Clinical AHA Role

The Calderdale Framework system will provide a framework for a physiotherapy service to determine the specific clinical and non-clinical tasks AHAs may undertake (Allied Health Professions Office of Queensland, 2013). This approach is required as the scope of practice for AHAs in a CF physiotherapy service has not been established. As discussed in section 2.6.2.3, AHAs have been utilised successfully in physiotherapy acute care delivery in surgical units (Boden, 2015; Eden, 2012). However, details about developing AHAs' scope of practice and training methods for these roles have not been published. Therefore, an opportunity exists to describe the scope of practice for a new AHA role in CF physiotherapy and potentially inform future training and development of similar AHA roles across acute care services.

2.6.5.1 Delegation

The actual process of determining the clinical tasks an AHA may undertake daily is known as delegation. "Delegation to an AHA is defined as the process by which an AHP delegates activity to an AHA who has appropriate education, knowledge, and skills to undertake the activity safely" (WA Country Health Service, 2020). The AHP authorises the AHA to provide treatment or care on their behalf (Physiotherapy Board of Australia, 2014). An AHP delegating a task remains responsible for the decision that the patient's treatment is suitable for delegation and the overall management of that patient (Physiotherapy Board of Australia, 2020). The AHA undertaking the delegated task is accountable for their actions and decisions when undertaking the treatment (Physiotherapy Board of Australia, 2014). There must always be sufficient information communicated by both the AHP and AHA about the patient and the treatment to ensure the patient's continued care (Physiotherapy Board of Australia, 2014).

2.6.5.2 Delegation Tasks and Training

Delegation of tasks may be a direct reallocation of a task from an AHP to an AHA (Dubois & Singh, 2009; Nancarrow & Borthwick, 2005; Niezen & Mathijssen, 2014) or may require the AHA to initially develop a new set of skills to perform the task (Dubois & Singh, 2009; Duckett & Breadon 2014; Niezen & Mathijssen, 2014; Pearce & Pagett, 2015). Allied health assistants cannot conduct initial assessments or evaluate the effect of, nor progress, patient treatments as part of delegation (ACT Allied Health Office, 2014; Allied Health Professions Office of Queensland, 2016a; Duckett & Breadon 2014; Health & Human Services Victoria, 2016). Delegation requires the AHP to decide that the AHA has suitable training, skills, and knowledge to safely undertake patient interventions (Physiotherapy Board of Australia, 2014).

A structured process for delegation is required (Allied Health Professions Office of Queensland, 2016a; Barrett et al., 2015). At local levels throughout Australia, services have developed guidelines for delegation processes for staff (ACT Allied Health Office, 2014; Allied Health Professions Office of Queensland, 2016a; WA Country Health Service, 2020). Training in delegation procedure is also recommended as part of this process (Allied Health Professions

Office of Queensland, 2013, 2016a). Delegation procedure training outlines the level of accountability and responsibility for both AHPs and AHAs when supervising and handing over clinical tasks to AHAs and is suggested as integral to any AHA role development (Stanhope & Pearce, 2013; Sarigiovannis et al., 2021).

It has been identified that delegation procedures can often be relatively informal, and AHAs and AHPs may not be aware of their responsibilities regarding delegation (Allied Health Professions Office of Queensland, 2014; Sarigiovannis et al., 2021). Audit outcomes from the nine AHA projects undertaken by Queensland Health (discussed in section 3.5.1) reported that only 68% of the roles established used delegation training, despite being asked to include this (Allied Health Workforce Advice and Coordination Unit, 2012). Sixty-one percent of the audits reported that AHPs were unwilling to delegate tasks because they were unclear about what tasks could be delegated safely, how to effectively undertake the process of delegation, and had not undertaken recommended delegation training (Allied Health Workforce Advice and Coordination Unit, 2012). An audit of 41 AHA roles, compared against their duty statements, found that AHAs were underutilised (Kuipers et al., 2015). Improving the skills and confidence of AHPs in delegation and supervision may improve this. A Delphi survey of 107 AHAs and AHPs identified that AHPs have little training on how to delegate and work effectively with AHAs (Stute et al., 2013). Additionally, the skills of AHAs as recipients of delegated tasks also need to be addressed (Stanhope & Pearce, 2013; Sarigiovannis et al., 2021).

Therefore, delegation procedure training, with an emphasis on the quality of that training, for both AHPs and AHAs, must be part of any role development process (Allied Health Workforce Advice and Coordination Unit, 2012). Comprehensive guidelines for delegation practices are available (ACT Allied Health Office, 2014; Allied Health Professions Office of Queensland, 2016a; Queensland Health, 2015) alongside a Queensland Health delegation training program (Queensland Health, 2013) and have been included in the methodology of this program of research.

2.7 Summary of a New Model of Care Delivery for CF Physiotherapy for Adults with CF – Utilising Allied Health Assistants

Allied health assistant roles have been developed in non-acute settings, supported by positive qualitative outcomes demonstrating AHA role acceptance by patients and staff, with positive changes to AHPs workloads. Limited objective data about changes to the physiotherapy care delivery, which includes service provision, scope of practice (clinical and non-clinical care activity) and skill mix for AHAs or AHPs, and changes to occasions of service for each discipline exists. The evidence for AHA roles in acute respiratory care settings is less well established, with only two studies demonstrating safety with AHAs in acute surgical wards.

This program of research proposes to investigate establishing a new clinical AHA role as part of CF physiotherapy service in an adult CF service to address the staffing issues identified in section one of this document. Section 2.6 reviewed the requirements of an effective service redesign system, establishing the Calderdale Framework as a system to underpin this redesign and develop the new AHA clinical role. Reporting on the process and outcomes of redesign using the Calderdale Framework in an acute respiratory clinical setting has not been done. Study 2 of this program of research examines the real-world application of the Calderdale Framework to implement an allied health assistant (AHA) role within an acute respiratory physiotherapy service.

No quantitative outcomes reporting safety and the scope of practice for an AHA in acute respiratory care settings exists, and this research establishes this information. Additionally, no data objectively measuring physiotherapy care delivery that includes service provision, scope of practice and the skill mix for AHPs in CF physiotherapy care delivery for adults with CF exists. No data exists that examines change to physiotherapy care delivery after introducing an AHA role in an acute respiratory care area. Examining the impact of an AHA role on safety and any changes to CF physiotherapy care delivery, including service provision, scope of practice and skill mix for AHA and AHP, will form Study 3.

This chapter also discusses the perceived barriers to developing an AHA role, including issues relating to professional status and role security (Lizarondo et al., 2010; Sarigiovannis et al., 2021). Staff culture and perceptions are significant barriers to skill mix redesign (Duckett & Breadon 2014; Health & Human Services Victoria, 2016). The evidence examining staff and patients' perceptions of and satisfaction with an AHA role in an acute care setting is limited (Conti et al., 2007). Adults with CF and CF service multidisciplinary team staff perceptions of physiotherapy care delivery will offer new information about an AHA role in an acute respiratory clinical setting and form Study 4 of this program of research.

Chapter 3 - Methodology and Design

To follow a scientific investigation logically, research methods must follow four steps: identification of the research question, data collection, data analysis, and results interpretation (Anguera et al., 2018). This program of research identified several research questions, all with the overall goal of evaluating the development and implementation of an AHA role within an acute respiratory physiotherapy service. In particular, the role and scope of practice of the AHA, the impact of the AHA role on physiotherapy scope of practice and the overall impact on physiotherapy care delivery were evaluated. A pragmatic multiphase multi-method study design was chosen to attain the research goals.

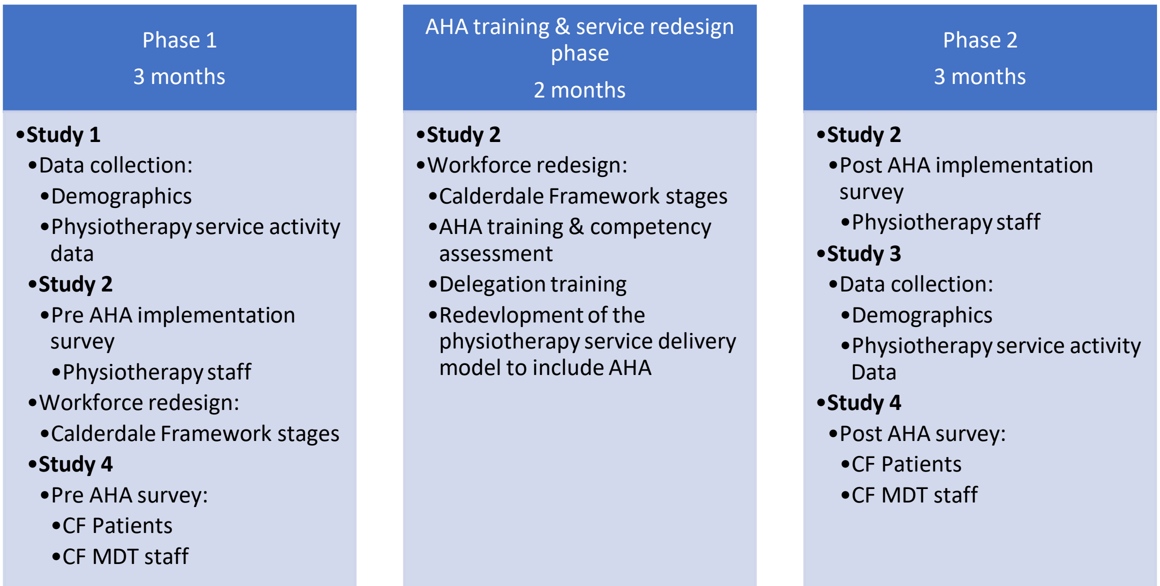
This chapter describes the overall research design and why a pragmatic multiphase multi-method design was chosen. The methodology of Studies 1, 3 and 4 are described in detail in this chapter. Studies 1 and 3 used quantitative methods. Study 1 used a prospective cross-sectional observational design, and Study 3 used a pre-post observational design to examine the delivery of physiotherapy care without and with the addition of an AHA. Similarly, quantitative methods (surveys) were used in Study 4 to examine patient and staff perceptions of, and satisfaction with, the physiotherapy care delivery across the same time periods without, and then with, the addition of an AHA. Study 2 was an observational study describing the process of using the workforce redesign system (the Calderdale Framework) to develop and implement the new AHA role. The perceptions of the staff regarding this process were investigated using surveys and semi-structured interviews. As Study 2 has not been published to date, the extended description of the methodology is presented in Chapter 5 (see section 5.3 Methods).

3.1 Overview of Research Design

3.1.1 Multiphase Research Design

The series of studies comprising this program of research were conducted involving all patients treated in The Prince Charles Hospital Adult Cystic Fibrosis Centre, staff involved in physiotherapy care delivery and the multidisciplinary team in the same centre. This program of research was designed across three phases and used a pragmatic approach with a multi-methods research design. The sequencing of the studies across the three phases is shown in Figure 3.1. Two phases focused on data collection, interspersed with a training and service redesign phase. Phase 1 comprised data collection to quantify the current physiotherapy care delivery for inpatient and outpatient adults with CF undergoing treatment within this centre (Study 1). The training and service redesign phase comprised AHA skill training and competency development, and then a new model of physiotherapy care delivery was established that included the new AHA role (Study 2). In Phase 2, quantitative data collection occurred to evaluate the new physiotherapy care delivery, and comparisons were made with pre-AHA data (Study 3). Finally, surveys were undertaken pre- and post- the implementation of the new AHA role to explore patient and staff perceptions of the physiotherapy care occurring during Phases 1 and 2 (i.e., examining the same time period as the quantitative data was being collected for Studies 1 and 3) (Study 4). The reasons for choosing a pragmatic multi-methods approach will now be discussed, followed by further comprehensive details of the methods used in Studies 1, 2 and 4.

Figure 3.1: Diagram for Multiphase Study Design.



AHA = allied health assistant; CF = cystic fibrosis; MDT = multidisciplinary team

3.1.2 Pragmatic Research Approach

This program of research adopted a pragmatic approach across the phases. A pragmatic approach to research and data collection and analysis is, in essence, researching to answer a clinical question through inquiry in a real-world setting (Biesta et al., 2003; Feilzer, 2010, Lipman et al., 2017). As this program of research examined changes in the delivery of a health service associated with the development and implementation of an AHA role within a CF physiotherapy service, a pragmatic approach was warranted. In essence, pragmatic research should provide the opportunity to examine if a change or intervention within a clinical setting works or not (Bell et al., 2014). Pragmatic research examines real-world practice changes that might occur using the participants at hand in a service. Advantages of pragmatic research include allowance for participant recruitment with minimal or no selection bias, with no emphasis on controlling for variables, placebos or blinding (Zwarenstein et al., 2008, Rockhold et al., 2020). Pragmatic research in health settings prioritises the validity, applicability (Bell et al., 2014) and speed of translation of outcomes into routine clinical practice (Rockhold et al., 2020). The overall design of this program of research collected quantitative data about clinical care delivery (Studies 1 and 3) alongside patient and staff perceptions of the care delivery (Study 4) and reflected the pragmatic and inclusive approach to real-world clinical research.

There are known disadvantages to pragmatic research, such as limitations in the reliability and accuracy of data collection (Rockhold et al., 2020). Additionally, the cost of conducting pragmatic research can be prohibitive due to the prioritisation of support for clinical care over research funding as part of public health funding (Almufleh et al., 2021). This program of research was supported by a Queensland Health Allied Health Research Scheme Grant, which allowed for a one-day-a-week backfill during Phase 1 and Phase 2 for the candidate to support the development of the studies, oversee all procedures and timely data collection and data fidelity checks, which addressed these disadvantages.

Pragmatic research also aims to engage with patients and other key stakeholders, to gain their perspectives on healthcare delivery systems (Allemang et al., 2022). Measuring patient and stakeholder perspectives is acknowledged as 'enhancing the real-world nature of data collection within the clinical trial' (Davies et al., 2021). Surveys were used to gain the perceptions of physiotherapists working in the CF service on the use of the Calderdale framework (Study 2) and those of patients and staff regarding the physiotherapy service delivery (Study 4). Specific details of each study and how data were captured and analysed will be expanded in this chapter under each study methodology.

3.1.3 Multi-methods Research Design

Pragmatic research encompasses multiple research methods, as this is considered most appropriate for health services research (O'Cathain et al., 2009; Shaw et al., 2010). Several authors have defined this approach as multi-methods (Anguera et al., 2018; Hunter & Brewer, 2015; Plano Clarke & Ivankova, 2016), where a combination of several quantitative research methods, such as quantitative experimental research, observational research and surveys are used (Hunter & Brewer, 2015; Plano Clarke & Ivankova, 2016). The basic premise of multi-methods research is that different research methods offer different perspectives on the research outcomes (Brewer & Hunter, 2006, Creswell, 2015); however, the different methods selected overall offer answers to a common research goal (Anguera et al., 2018). Multiple quantitative research methods were intentionally selected for this program of research to develop a comprehensive understanding of the physiotherapy care delivery for adults with CF and any changes associated with the development and implementation of an AHA role within the service.

The combination of evaluating interventions with a quasi-experimental design (observational cross-sectional design in Study 1 and observational pre-post design in Study 3), alongside determining patient and staff perspectives through surveys (Study 2 and 4), allowed for quantitative data to be collected for both the delivery of the care, alongside the perspectives of stakeholders. Such an approach is considered necessary to comprehensively explore health issues (O'Cathain et al., 2009) as the multi-methods study design involves real-world interaction with the delivery of health services, the health service environment, and the complex nature of health service delivery (O'Cathain et al., 2009). The next section of this methods chapter will discuss the methodological details of the studies.

3.2 Methodology for Study 1 and Study 3

Research aims, questions and methodology for Study 1 and 3 were similar and are presented together.

3.2.1 Research Aims and Questions

3.2.1.1 Research Aims and Questions for Study 1

Study 1 aimed to describe the current physiotherapy care delivery within a tertiary adult CF service in terms of service provision, scope of practice (clinical and non-clinical activity) and skill mix. Additionally, Study 1 aimed to investigate differences in physiotherapy care delivery provided by junior and senior physiotherapists at the participating facility.

For this program of research, a model to describe physiotherapy care delivery was proposed that included all activity and staffing that contributed to physiotherapy in CF. This model considered three aspects to describe physiotherapy care delivery:

- Physiotherapy service provision
- Physiotherapy scope of practice
- Physiotherapy mix of staffing and levels (skill mix).

These three aspects overlap at times and are discussed in the context of the current literature. A full description of the model and its inclusions is included in section 2.4.1.

The specific research questions for Study 1 were:

- What comprises CF physiotherapy care delivery in terms of staff numbers, work hours and skill mix (junior/senior)?
- How often and where do physiotherapists deliver direct clinical care activity to inpatients and outpatients?
- What clinical (direct and non-direct) and non-clinical physiotherapy care activity are delivered to patients with CF by physiotherapists?
- Is there a difference in the clinical and non-clinical provided by junior and senior (skill mix) physiotherapists in terms of type, number and/or duration of the care activity?

3.2.1.2 Research Aims and Questions for Study 3

The aim of Study 3 was to investigate the impact of establishing a new clinical AHA role as part of CF physiotherapy care delivery in an adult CF service. Quantitative outcomes were collected, including service provision, scope of practice and skill mix for AHAs and physiotherapists. Changes to physiotherapy care delivery were determined after introducing an AHA role in an acute care service.

The specific research questions for Study 3 were:

- What comprises CF physiotherapy care delivery in terms of staff numbers, work hours and levels (AHA/junior/senior) in the new delivery model?
- How often and where do physiotherapists and AHAs deliver direct clinical care activity to patients with CF?
- What is the impact of a new care delivery model on clinical and non-clinical care activity delivered by junior and senior physiotherapists and AHA (skill mix);
- Are there any safety implications for care delivery because of the new care delivery model?

3.2.2 Design

For Study 1, a cross-sectional observational study was conducted to examine physiotherapy care delivery to adults with CF admitted to and/or attending outpatient clinics over a three-month period. Cystic fibrosis physiotherapy care delivery was examined in terms of service provision, scope of practice and skill mix of staff. Following the establishment of the AHA role, prospective data collection examining this new physiotherapy care delivery to adults with CF admitted to and/or attending outpatient clinics occurred for a second three-month period occurred. This new care delivery was examined in terms of service provision, scope of practice and skill mix of staff. Compared to Study 1 findings, any changes to care delivery were also examined, forming Study 3 (pre-post design).

3.2.3 Study Setting

The study was conducted in the Adult Cystic Fibrosis Centre (ACFC) at The Prince Charles Hospital, Queensland, Australia (TPCH). The Prince Charles Hospital is a tertiary general and cardiothoracic hospital in Australia that employs over 3200 staff who deliver specialised care for over 420,000 people annually. The hospital is considered a premier teaching and clinical cardiothoracic hospital, providing care to patients living across Queensland and northern New South Wales. The hospital comprises several specialised services, including the state heart and lung transplant service, adult cystic fibrosis service, adult congenital heart disease, and complex cardiac and thoracic medicine care services. The Queensland Indigenous Cardiac and Respiratory Outreach programs are also based at the hospital.

The hospital is regularly involved in national and international research trials and is considered a centre of excellence for clinical and translational research programs in cardiothoracic medicine and surgery, critical care, and orthopaedics. The hospital strongly focuses on education and innovation and has partnerships with The University of Queensland, Queensland University of Technology and Australian Catholic University.

The physiotherapy department at the Prince Charles Hospital has a staff of over 80. This includes multiple senior staff delivering expert physiotherapy services to both inpatients and outpatients in the medical and surgical specialities. There is a strong culture of education and upskilling of junior staff. As a teaching centre, physiotherapy students from all physiotherapy schools across the state attend placements at the hospital, supervised by the hospital physiotherapy staff.

The ACFC comprises a permanent multidisciplinary team of specialised respiratory physicians, nurses, and allied health members (physiotherapists, dietitians, social workers, psychologists, and research staff). Care is provided for more than 350 adults with CF living throughout the state of Queensland, northern New South Wales, and the Northern Territory. The ACFC includes a dedicated ward with 14 single rooms, with additional patients managed on thoracic medical wards within the hospital. Five multidisciplinary outpatient clinics are conducted each week, one being a telehealth clinic. Patient allocation to the wards and clinics is based on microbiology.

3.2.4 Participants

In Study 1 and Study 3, activity data for the staff involved in the delivery of physiotherapy care during normal business hours on weekdays (referred to hereafter as weekdays) to the CF service was collected. For Study 1, this was physiotherapy staff. For Study 3, this was physiotherapy staff and AHA. All data for all staff involved in providing weekday care to the CF unit during each study were included. Data from physiotherapists delivering physiotherapy care to patients with CF outside of normal business hours, including evenings and weekends, were excluded. This was a pragmatic decision for several reasons. Weekend and evening staffing is variable, based on the availability of staffing, service needs, patient volume and acuity, and often involves casual staff and other hospital staff unfamiliar with the CF service procedures. Additionally, staff are time-poor on weekends, providing only emergent and urgent services throughout the entire facility. For these reasons, the accuracy of the activity data collection could not be ensured and was excluded.

In Study 1, allocated physiotherapy staffing for the CF service comprised two senior physiotherapists (2.0 full-time equivalent, [FTE]) and one junior rotational physiotherapist [1.0 FTE] for two months and then two junior rotational physiotherapists (2.0 FTE) in the last month. In Study 3, allocated physiotherapy staffing for the CF service comprised two senior physiotherapists (2.0 FTE), two junior rotational physiotherapists (2.0FTE) and an AHA (1.0 FTE).

After the completion of Study 1, the additional 1.0 FTE junior rotational physiotherapist added to the staffing in the last month of Study 1 was formally allocated to the CF service. This resulted from information gathered in Study 1 that highlighted the unmet need within the physiotherapy service to the CF service. Study 1 demonstrated a high number of physiotherapy staff from other acute services were working in the CF service, plus overtime occurring daily, amounting to 5.5 hours per week, was used to meet CF care delivery needs. Hospital management permanently increased the allocated CF physiotherapy staff into the service to cover the workload more sustainably after Study 1.

3.2.5 Procedures

The procedures for collecting demographic data of the patients within the CF service and collecting the activity data by the physiotherapy staff will now be discussed.

3.2.5.1. Patient Demographic Data

Patient demographic data collected included age and gender of patients, hospital length of stay (if inpatient), best body mass index and lung function recorded during the 12-month period prior to and during admissions/outpatient visits. The total number of admissions and the number of people with CF attending outpatient clinics were recorded over each of the three-month periods in Phase 1 and Phase 2.

The medical team produced a list of all patients with CF admitted to the hospital daily as part of their clinical handover process. Similarly, the nursing staff generated a list of patients who attended the CF multidisciplinary team outpatient clinics daily. All lists were made available to the candidate during Phase 1 and Phase 2. These lists were cross-checked with the hospital electronic booking system (HIBSCUS) and patient summary record information (The Viewer) to ensure that all patients who attended the CF service as either an inpatient and/or outpatients during Phase 1 or Phase 2 were accounted for. This information was collated into a single master list of patients' data set (purpose-designed excel data sheet). All demographic data were extracted for each patient from hospital records and entered into the master list of the participants' data set. The candidate conducted all steps in this process weekly during Phase 1 and Phase 2.

3.2.5.2 Measurement of Activity Data

For Study 1, activity data from physiotherapists working weekdays within the adult CF service were collected prospectively over a consecutive three-month period between September and November 2015. For Study 3, activity data from physiotherapists and AHA staff working weekdays within the adult CF service were collected prospectively over the consecutive three-month period between April and June 2016.

Identifying two data collection periods that represented similar patient activity within the CF service was necessary. Three months was deemed sufficient to gain a comprehensive overview of all patient activity. Using the same three-month period, 12 months apart was considered. However, this would have meant a lag between training and implementing the AHA role. Additionally, grant funding for this research had a 12-month limit. Therefore, the two three-month periods were selected to ensure similarity in patient demand and complexity between Study 1 and Study 3. Winter months (July to August) typically have higher patient admissions and outpatient activity, while summer months (December to February) typically have lower patient admissions and outpatient activity, so these periods were avoided as data collection periods.

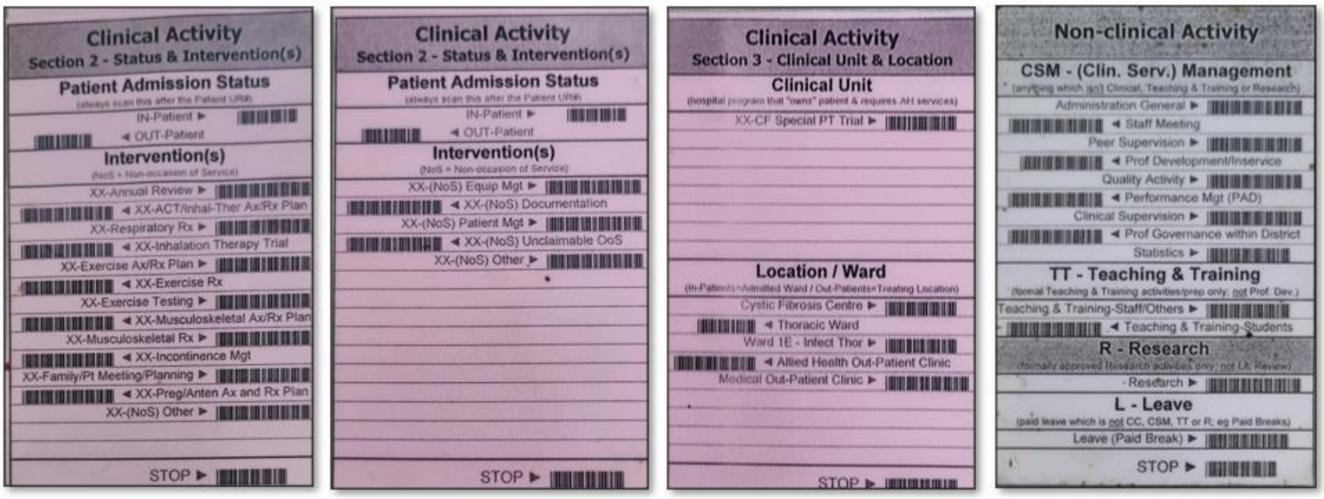
Workload data were collected contemporaneously by physiotherapists and AHA as patients were treated. These data were collected using the hospital Activity Bar Code (ABC) scanning system. The ABC uses a low-cost, battery-operated, portable barcode scanner (size of a matchbox) which can record up to 5000 codes and includes a timestamp that allows convenient collection of all activity. The software system analyses the barcodes to assemble an activity profile for each physiotherapist and AHA and can track all activity. Physiotherapists and AHAs at the hospital were familiar with this procedure, as the barcode scanners are routinely used to record all daily activity.

Figure 3.2: Activity Bar Code (ABC) Codes and Scanner used by AHAs and Physiotherapists.

Physiotherapy and AHA staff used the ABC scanner to scan relevant barcodes associated with the activity being undertaken in real-time as they worked through the day. The list of bar codes used in this program of research is shown on the left in Figure 3.2 and in full in Figure 3.3. Barcodes were specifically created for this research project. The barcodes included additional coding (shown as XX – ‘intervention’ in Figure 3.3) to distinguish data from physiotherapy activity not attributable to the CF service. Scan cards were coloured pink so staff could quickly identify which codes should be scanned when doing any activity attributable to the CF service.

For each clinical activity during the day, physiotherapists and AHA scanned relevant barcode/s recording if the patient was an inpatient or outpatient (patient admission status), what activity was undertaken (intervention/s), the location where the activity occurred (inpatient ward, outpatient clinic) and that the patient and activity was attributable to the CF service (Clinical unit: XX-CF special physiotherapy trial). If the activity was non-clinical, this barcode was scanned and attributed to the CF special physiotherapy trial. The time taken for each activity is automatically recorded from when physiotherapists start a barcode scan at the beginning, and scans stop at the end of the activity. Data from the scanners were uploaded daily into a computer software system by each physiotherapist or AHA to generate an exportable excel database of all recorded activity.

Figure 3.3: Activity Bar Code (ABC) Code Templates Used in this Program of Research.



3.2.5.3 Fidelity Checking Procedure for Activity Data

An excel file that included all activity undertaken by physiotherapists (and AHA in Phase 2) working weekdays in either the CF physiotherapy service and/or the Thoracic medicine service was generated and downloaded weekly (ABC data set). Data were sorted by patient name and cross-referenced with the master list of patients/participants to ensure all patients who were either inpatients or attended clinics were accounted for in the ABC data set.

Prior to analysis, all data were deidentified. Data for patients who had been scanned to an incorrect cost centre (i.e., not the XX-CF PT special trial [see Figure 3.3]) but were eligible for inclusion were identified and included in the study data set. Similarly, the ABC data set was sorted by the Intervention(s) code (see Figure 3.3) to ensure all interventions attributable to the CF service were included in the study data set. Finally, the ABC data set was sorted by day and time so that any activity data entered by physiotherapists working evenings and weekends were excluded. These procedures were undertaken to ensure all possible activity attributable to the CF service were included.

3.2.5.4 Categorisation of Activity Data

Physiotherapy activity data were categorised as either direct or non-direct clinical care or non-clinical care activities. Activity codes were grouped based on Health Activity Hierarchy developed by the Australian National Allied Health Casemix Committee (2001), and these data were routinely collected for all physiotherapy activity in the participating hospital. Clinical care activity is defined as activities affecting health outcomes of patients (either individual, group or community). Non-clinical care refers to management, teaching and training and research activity. Clinical care activity is further categorised as direct clinical care (face-to-face direct clinical care affecting health outcome/s of the patient) or non-direct clinical care (activities related to patient care affecting a patient's health outcomes but not involving the patient at the time).

For this program of research, the activities categorised as direct and non-direct clinical care activity were expanded from the list used routinely by the physiotherapists in the hospital. Direct clinical activity routinely used by staff included assessment, respiratory treatment, rehabilitation treatment, musculoskeletal treatment, and other codes. Non-direct clinical activity codes routinely used were patient documentation and patient other. Expanded codes developed for both direct and non-direct clinical care aimed to capture specific details of the physiotherapy care delivery in the CF service. Participating staff were orientated to and trained in the new codes prior to data collection, as discussed (Table 3.1). Complete definitions and inclusions for each activity code used in this research are described in Table 3.1.

Table 3.1: Description of Customised Clinical Care Activities (Direct and Non-direct) and Non-clinical Care Activities.

Activity code	Description
Clinical Care	Activities affecting health outcomes of patients (either individual, group or community)
Direct clinical care	Face-to-face direct clinical care affecting health outcome/s of the patient
Reviews	Physiotherapy annual review assessment and/or detailed reviews of airway clearance, inhalation therapies, exercise, musculoskeletal routines and management plans; trials of new inhalation therapy as per hospital guidelines; attendance at meetings to plan clinical care for specific patients
Respiratory treatment	Airway clearance assessment and treatment
Exercise treatment	Exercise assessment and treatment
Exercise testing	Six minute walk test or Incremental shuttle walk test
Other	Musculoskeletal treatment; incontinence assessment and management plans; other clinical care activity not covered above
Non-direct clinical	Activities related to patient care affecting health outcomes of patient but not involving the patient at the time
Equipment management	Time taken to manage (supply / setup / clean / order) patients respiratory / oxygen therapy equipment
Patient documentation /management	Documentation of clinical care related to patients and all other clinical documentation related to patient care administration
Other non-occasion of service	Other patient-related clinical activities not covered above
Non-clinical care	
Teaching and Training	Activities which formally impart (not receive) knowledge to staff and students
Research	Activities involved with formal research (requires formal ethics approval)
Leave	Paid leave break per day, e.g., morning tea
Management	Professional and/or management activities which support and are essential to providing physiotherapy care. May include general administrative tasks; attending staff meetings, professional development, meetings related to governance of care delivery for people with cystic fibrosis

3.2.6 Outcome Measures

Physiotherapy care delivery was defined in section 2.4 as the physiotherapy staff (Study 1) and physiotherapy and AHA staff (Study 3) working across the CF service and the activity undertaken by these staff during the data collection periods. Outcomes were categorised under physiotherapy service provision, physiotherapy scope of practice and skill mix. Safety outcomes were also recorded in both Study 1 and Study 3.

3.2.6.1 Service Provision

Service provision was quantified for Study 1 and Study 3 as follows:

- Number of inpatients admitted, and number seen by physiotherapists during admissions
- Number of outpatient attendances at multidisciplinary clinics and number seen by physiotherapists during their clinic attendance.

In Study 1, additional service provision outcome measures were quantified:

- Number of physiotherapists delivering clinical and non-clinical care activity
- Physiotherapy time spent on activities per day as percentage of full-time equivalent staff allocation
- Frequency of direct clinical care activities per day per patient
- Location of clinical activities – inpatient wards, outpatient clinics.

3.2.6.2 Scope of Practice

Scope of practice was quantified for Study 1 and Study 3 as follows:

- Direct and non-direct clinical activities – activity type, number, duration
- Non-clinical care activities – activity type, number, duration.

3.2.6.3 Skill Mix

All outcome measures above were further quantified according to staff level. In Study 1, staff level was defined as junior and senior. A junior physiotherapist was defined as a rotational physiotherapist with less than eight years of experience. A senior physiotherapist was defined as a physiotherapist with more than eight years of experience who had developed specialist skills specific to the CF clinical area. In Study 3, staff level was defined as junior, senior and AHA.

3.2.6.4 Safety Outcomes

Number and details of any documented clinical incidents or adverse events associated with physiotherapy or AHA patient intervention were recorded using the hospital incident recording system across Phase 1 (Study 1) and Phase 2 (Study 3).

An adverse event recording system, titled PRIME Clinical Incidents system (Queensland Government, 2017), is available throughout all Queensland Health facilities (Queensland Health, 2011, Queensland Government, 2014) and was used in this program of research. All Queensland Health staff are required to follow clinical incident management guidelines. Any clinical incident that could potentially or has led to unintended and/or unnecessary mental or physical harm to a patient must be reported through PRIME. Examples of clinical incidents included medical emergency team calls or patient fall or injury during a physiotherapy management session (AHA or Physiotherapist delivered).

3.2.7 Data Analysis

The following describes the statistical analysis used for each study. Where applicable, statistical tests undertaken, their purpose and the outcome measure they were used to assess are also discussed.

3.2.7.1 Study 1

Physiotherapy care provision was reported descriptively as number of staff, time spent on overall service delivery, staff levels (junior/senior), and location (ward, outpatient clinic). Physiotherapy care provision was presented as either frequency count and percentage or mean and standard deviation.

Total time (minutes) spent on physiotherapy activities delivered to the CF service per day was calculated and converted to a percentage of the allocated time for individual staff FTE day. This conversion accounted for differences in staff time allocation. For example, some staff worked 8.1 hours per day (as they accrue days off [ADOs]), and some allocated staff worked 7.36 hours per day (non-accruing ADOs). Scope of practice (clinical and non-clinical care), activity type (intervention), number, and duration (minutes) of activities were presented for physiotherapists delivering care to patients with CF within the study period.

To determine differences in physiotherapy care provided by junior and senior physiotherapists (skill mix), Pearson Chi-square tests were conducted to compare the overall number of activities completed and the number of each activity type completed. Pearson Chi-square tests were used to determine if there was a statistically significant difference between the expected and observed frequencies in the activities for the different skill mix levels. The Pearson Chi-square test is non-parametric and accounts for the uneven distribution of data relating to the number and type of activities between junior and senior physiotherapists (McHugh, 2013).

Independent t-tests were conducted to compare the duration of clinical and non-clinical care activities provided by junior and senior physiotherapists. Independent t-tests were used to assess the difference between the mean activity time of the junior and senior physiotherapists.

3.2.7.2 Study 3

Fisher's exact test was used to compare the proportions (number [%]) across Phase 1 and Phase 2. Some data cells had small numbers, and this test was determined as the preferred method (Heiman, 2013). Specifically, the number (percent total activity) of clinical and non-clinical care activities provided by all staff (physiotherapists and AHA) undertaken during each phase were calculated. Fisher's exact test was used to determine if there was a significant difference between the two proportions. Comparisons using Fisher's exact test were also made between phases for the number (percent total activity) of clinical and non-clinical care activity undertaken by the physiotherapists.

Independent t-tests were conducted to compare the number of activities per day and duration of activity type on the days these activities occurred between phases for all staff and between junior and senior staff.

Safety outcomes were described in terms of type and number of reported adverse events as reported in the critical incident management system (PRIME) across both studies. After Phase 1 and Phase 2, the manager of the Thoracic physiotherapy team accessed PRIME data to determine if any adverse events had been recorded for the CF service during the phases.

3.3 Methodology for Study 2

3.3.1 Research Aims and Questions Study 2

The aim of Study 2 was to examine the real-world application of the Calderdale Framework as a workforce redesign system to develop and implement an AHA role within an adult CF physiotherapy service.

The specific research questions for Study 2 were:

- Can the Calderdale Framework be used to implement an AHA role in an acute respiratory physiotherapy service?
- Can specific clinical tasks be delegated to an AHA in an acute respiratory physiotherapy service?
- What competencies and training systems need to be developed to implement an AHA role in an acute respiratory physiotherapy service?
- What are the perceptions of the physiotherapy staff of the physiotherapy care, workforce profile (scope of practice, roles, responsibilities) and the serviceability of implementing an AHA role in an acute respiratory physiotherapy service using the Calderdale Framework?
- What are the perceptions of the staff of the delegation training being undertaken?
- What are the barriers and facilitators to pragmatically implementing the Calderdale Framework?

3.3.2 Study Design

An observational study was undertaken to describe the Calderdale Framework stages used to implement a new AHA role in an acute respiratory physiotherapy service. Outputs associated with implementing each stage were documented. Purposively designed surveys and semi-structured interviews examined the perceptions of physiotherapy and AHA staff at the beginning and the end of the implementation of the AHA role using the framework. This study has not been published, and the expanded details of the methodology for this study have been included within Chapter 5 (Section 5.3) for ease of reading.

3.4 Methodology for Study 4

3.4.1 Research Aims and Questions

Study 4 examined patient and staff perceptions of, and satisfaction with, physiotherapy care delivery pre-implementation of the AHA role and any perceived change to care delivery post-implementation of a new AHA role.

The specific research questions for Study 4 were:

- What are patients' perceptions of the quality, effectiveness, access, and collaborative approach to physiotherapy care delivery in an acute respiratory physiotherapy service?
- How satisfied are patients with the physiotherapy care delivery in an acute respiratory service?
- What are the CF multidisciplinary team's perceptions regarding benefits, access, team engagement and collaborative approach to physiotherapy care delivery in an acute respiratory physiotherapy service?
- If an AHA is involved in care delivery, what are the patient's perceptions of their care delivery?
- What are the CF multidisciplinary team's perceptions of change associated with implementing the AHA role in an acute respiratory physiotherapy service?

3.4.2 Study Design

A pre-post design study was conducted in the CF service using purposely designed surveys. All CF patients (inpatients and outpatients) who received physiotherapy care and the CF multidisciplinary team staff were asked to complete anonymous surveys rating their satisfaction with the physiotherapy care delivery using Likert-scaled responses and open-ended questions. The two phases of care delivery examined were: care delivery without AHA (Phase 1) and including the AHA role (Phase 2). Surveys were sent out at the completion of Phase 1 (December 2015) to examine care delivery during Phase 1 and Phase 3 (July 2016) to examine care delivery during Phase 2.

3.4.3 Participants

Two participant groups were recruited for this study; patients and staff.

All patients admitted to the hospital and/or attended outpatient services under the CF service during the two three-month periods before and after the implementation of the AHA role were invited to participate. There were no specific exclusion criteria.

Permanent members of the CF multidisciplinary team (medical, nursing, dietetics, social work, pharmacy, and physiotherapy) were invited to complete the surveys. Cystic fibrosis physiotherapists involved in the study design were excluded. All permanent CF ward nursing staff involved in clinical services during the activity data collection phases (Study 1 and 3) were also invited to complete the surveys.

3.4.4 Procedure

All eligible inpatients and outpatients were contacted by mail in the month following each three-month period (P1 and P2) and invited to participate in Study 4. Participants could complete the survey in a paper format or electronically using a Survey Monkey link included in the letter. Both paper and electronic surveys were completed anonymously. Completed paper surveys were returned to the Quality and Safety officer at The Prince Charles Hospital in a prepaid envelope. Anonymous survey responses from paper-based surveys were manually added to the Survey Monkey platform by the candidate with no changes. Follow-up reminders were sent via mail (or email if an email address was known) twice over a four-week period. Patients within this centre were acquainted with paper and electronic satisfaction surveys used frequently within the service. Demographic information, including gender, age, and inpatient and/or outpatient status, was collected from patient participants.

Staff were sent a link to an electronic version of the survey on the Survey Monkey platform via their workplace email address. All staff received two follow-up emails regarding completion of the online survey over a four-week period. The candidate sent all notification emails. All surveys were completed anonymously. Discipline information but no other demographic information was collected from staff participants.

3.4.5 Survey Development

No previously validated or standardised survey was identified to investigate patient or staff perceptions of CF physiotherapy care delivery. Therefore, purposively designed surveys were developed for this program of research. Patients in Queensland Health hospitals are regularly surveyed by Queensland Health Quality and Safety units to determine their experience and perceptions of their inpatient and/or outpatient hospital care (M. Humpheries, personal communication, May 5, 2015). The purposively designed surveys used in Study 4 were developed using methodology created by the Picker Institute (M. Humpheries, personal communication, May 5, 2015). Surveys developed by the Picker Institute examine the experiences of healthcare by both patients and staff to facilitate quality improvement and are validated and reliable survey tools (Jenkinson et al., 2003).

Questions developed for the patient and staff surveys explored the eight principles of person-centred care, known as the Picker principles (Gerteis et al., 2002; Jenkinson et al., 2002; Picker Institute Europe, 2020). The questions in the surveys explored patient experiences of:

- access to reliable health;
- effective treatment by trusted professionals;
- participation in decisions and respect for preferences;
- clear, comprehensive information and support for self-care;
- attention to physical and environmental needs;
- emotional support, empathy and respect;
- involvement of and support for family and carers; and
- continuity of care and smooth transitions (Gerteis et al., 2002; Jenkinson et al., 2002; Picker Institute Europe., 2020).

Similar surveys have previously been created for CF services use with both adult and paediatric populations internationally (Homa et al., 2013,2015; Stern et al., 2014). Questions were included related to experiences with the health care team: access to care; straightforward explanations given by team; spent enough time with patients; team were informed and up to date; team answered questions/concerns; patients were involved with care decisions, and overall rating of quality of care received (Homa et al., 2013, 2015).

Additionally, the adult CF service had undergone an Australian CF peer review process, and outcomes from this review were made available at the time of the commencement of this program of research. The peer review process involves representatives from a CF multidisciplinary team and patient consumers reviewing the current processes, clinical practices and patient engagement, and outcomes of a CF service (Cystic Fibrosis Trust UK., 2016; Cystic Fibrosis Australia., 2020). This process included the CF service patients and the CF multidisciplinary team completing surveys that explored experiences of care delivery, with the questions purposively developed to examine person-centred care based on the Picker principles of person-centred care (Bell, 2015; Greville et al., 2012).

Therefore, both patients and staff within the ACFC at TPCH were familiar with surveys exploring person-centred care. The surveys purposely designed for Study 4 included questions that examined patient and staff experiences of care based on exploring the Picker principles of person-centred care. Surveys comprised closed and open-ended questions and were specific for each participant group. Patient and staff surveys included locally developed questions relevant to CF physiotherapy care delivery for adults with CF. Therefore, the surveys were pragmatically developed, emphasising local context, and questions were based on the Picker principles of person-centred care (Glasgow, 2013; Glasgow & Riley, 2013). Questions were designed to be brief, easily interpreted and easily understood by stakeholders per the principles of good survey measurement (Duncan & Murray, 2012; Glasgow, 2013).

All surveys were pilot-tested prior to implementation. The patient survey was pilot tested with three patients, one of whom was explicitly recruited due to expertise in patient-centred Queensland Health survey development and contribution to patient advisory committees within a tertiary hospital. The staff survey was pilot tested with one junior and one senior multidisciplinary team member. Modifications to the surveys were made following feedback for the pilot surveys.

3.4.6 Outcome Measures

Patient and staff surveys were conducted pre-implementation and post-implementation of the AHA role.

3.4.6.1 Patient Surveys

Pre-implementation patient surveys comprised 38 questions, and post-implementation patient surveys comprised 40 questions. The surveys comprised a number of categorical questions, Likert-scaled (five-point) questions and open-ended questions. Phrasing for the five points differed according to the sentence structure of the questions, e.g., Always to Never, Strongly Agree to Strongly Disagree or Excellent to Very poor. Questions were organised under four sections: patient demographics, inpatient experience of care, outpatient experience, and overall experience of care.

Section one comprised three categorical questions that gained demographic information about the participants.

Section two examined inpatients’ perceptions of CF physiotherapy care delivery. There were five categorical questions and 13 Likert-scaled questions. Seven of the questions also included an open-ended response option. Questions included:

- patients' access to inpatient physiotherapy care;
- patient participation in decision-making (responsiveness of care);
- confidence and trust in staff delivery of inpatient care;
- if there was any variation in inpatient care delivery with different staff members;
- effectiveness of inpatient physiotherapy care (reliability of care);
- overall quality of the inpatient physiotherapy care.

Section three examined outpatients’ perceptions of the CF physiotherapy care delivery. There were three categorical questions and 10 Likert-scaled questions. Three of the questions also included an open-ended response option. Questions included:

- patients' access to outpatient physiotherapy care;
- completion of outpatient physiotherapy tests;
- confidence and trust in staff delivery of outpatient care;
- effectiveness of outpatient physiotherapy care (reliability of care);
- overall quality of the outpatient physiotherapy care delivery;

Section four comprised five questions examining <u>overall</u> perceptions of the CF physiotherapy care delivery. Questions were Likert-scaled (five-point) questions. Three open-ended questions sought further feedback regarding patients' perceptions of what was particularly good/liked about physiotherapy care, suggestions for improvements and any other general comments regarding the service. Questions included:

- perceptions of care delivered with respect and dignity by members of the physiotherapy team;
- satisfaction with the care received from staff delivering physiotherapy care.

In the post-implementation survey, an additional two questions were included in section two (inpatient care):

- if an AHA supervised treatment (categorical question);
- if there were variations in care if an AHA was involved in the care (categorial with open-ended response option).

Patient surveys are included in Appendix 2.1 and 2.2.

3.4.6.2 Cystic Fibrosis Multidisciplinary Team Staff Surveys

Pre-implementation staff survey comprised 11 questions, and the post-implementation multidisciplinary team survey comprised 15 questions. Surveys comprised a number of categorical, five-point Likert-scaled, and open-ended questions. Phrasing for the five-point Likert scaled questions was Always to Never. However, the option for non-applicable was also included. This option allowed multidisciplinary team members to opt out of answering any question that may not have applied to them or they felt they did not have enough knowledge to respond appropriately.

The pre-implementation staff survey examined CF multidisciplinary team perceptions about the CF physiotherapy care delivery. Seven Likert-scaled questions were included. Three questions were open-ended. Information regarding professional discipline of the person completing the survey was collected.

In the post-implementation staff survey, four additional questions were included that examined the implementation of the AHA role as part of the CF physiotherapy service. These additional categorical questions included:

- multidisciplinary staff awareness of the AHA working in the service;
- professional contact and/or awareness of care delivered by an AHA; and
- any variations in overall care delivery with implementation of AHA.

An additional open-ended question sought comments on any changes observed to the physiotherapy care since the AHA role had been implemented.

Staff surveys are included in Appendix 2.3 and 2.4.

3.4.7 Data Analysis

All data were downloaded from Survey Monkey into an excel spreadsheet, checked for accuracy and then transferred to Statistical Package for the Social Sciences (SPSS) for analysis. All quantitative statistical analysis was performed using SPSS (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp).

Descriptive statistics for all demographic characteristics were performed. Prior to analysis, data were checked for normality. Independent T-tests or non-parametrical equivalent Pearson's Chi-Square test of independence was used to determine any baseline differences for respondents to the pre-and post-implementation survey for both patient and staff groups for age, gender, inpatient and outpatient numbers.

Descriptive analysis of quantitative questions was performed. All Likert-scaled responses were analysed using frequencies and percentages. Data were checked for normality prior to analysis. A non-parametric test, the Mann-Whitney U test (Karadimitriou et al., 2018), was used to examine mean rank comparisons of patient and staff perceptions pre-and post-implementation of the AHA role. The Mann-Whitney U test was used due to the small sample size of the participant groups. Significance level was set to $p < 0.05$.

Open-ended responses were exported to an excel spreadsheet and collated. Using a summative approach (Hsieh & Shannon, 2005), the text content was quantified, and a frequency count was performed. Additionally, a word cloud tool, WordCloud Generator (https://monkeylearn.com/word-cloud/), was used to generate a visual representation of frequencies of the most common responses for Question 22. This tool is acknowledged as a basic supplemental numerical tool to quantify the responses and display these visually to support the quantitative data analysis (McNaught & Lam, 2010). Specific responses were also reported as text to describe the qualitative data. This analysis was performed by the candidate in consultation with a statistician and reviewed by the supervisory team.

3.5 Grant Funding and Timing of Studies

The candidate was awarded a Queensland Health Allied Health Research Scheme Grant to support this research project from mid 2015 – end 2016. The associated grant funding was strictly time controlled. Therefore, the studies that informed this research ran concomitantly to allow for all data collection within the funded timeframes. Study 1 was conducted between August to October 2015. Study 2 commenced in late August 2015 and was completed in June 2016. Study 3 was conducted between April to June 2016, and Study 4 had two data collection phases: November 2015 and July 2016.

3.6 Ethics

3.6.1 Ethics Approval

Ethics approval was initially sought from The Prince Charles Hospital Human Research Ethics Committee, Metro North Hospital and Health Service with a complete National Ethics Application form (NEAF) submission. The committee confirmed that the project met the National Statement definition of a project that was exempt from full ethical review on the basis that it was an audit/quality assurance project (HREC/25/QPCH/68 Approval 18/3/2015).

Ethical approval was sought from Australian Catholic University's Human Research Ethics Committee, and an exemption from ethics full review was granted as the research met the definition of an audit/quality assurance project (2017-51N Ethics Review Exemption: De-identified data Approval 20/3/2017). Please refer to Appendix 3: Ethics Approval and Amendments for correspondence from both ethics committees.

As both the Prince Charles Hospital and Australian Catholic University Human Research Ethics confirmed that this research met the National Statement definition of a project that was exempt from full ethical review on the basis that it was an audit/quality assurance project, there were no requirements for individual consent to be sought from either patients or staff to be sought within this program of research for any data collection. However, further considerations relating to ethics addressed in this research are discussed below.

3.6.1.1 Participation and Confidentiality

All patient and ABC data were collected as part of routine clinical care. Included data belonged to the patients with CF already attending the CF service and physiotherapists working in the CF service. Therefore, participation was not coerced. These data were initially identifiable to enable all applicable data to be collected. Once data sets were finalised, all data were converted to non-identifiable data prior to analysis. Any presentation or publication of data was in a collated, non-identifiable format.

3.6.1.2 Informed Consent

Ethics committees from both institutions, the participating health facility, and the university under which this program of research was conducted did not require individual participant consent for any data collection included in this research, including patient and staff surveys and interviews. However, as part of these procedures, consent was sought. All surveys included a cover sheet detailing survey content, purpose, and planned use of results. Participants (patients and staff) were informed that survey responses would be anonymous and that participation was voluntary. Choosing to participate indicated consent. Staff who participated in the semi-structured interviews were asked for verbal consent prior to the interview. Presentation or publication of data was in a collated, non-identifiable format.

3.6.1.3 Data Storage and Ownership

Electronic data: All electronic data collection files (demographic data for all studies (excel files), ABC activity data sets, and all online electronic survey responses (excel files) were stored in a password-protected folder on the CF physiotherapy computer in a locked office area in the CF centre at the participating facility during the data collection phases. Once data collection was finalised, this data storage folder was transferred to an ACU and exported to CloudStor, a secure data storage option for ACU researchers' storage and analysis. This single storage site for the data is password protected and only accessible by the investigative team.

Paper surveys used for Study 4 were securely stored in a locked cupboard within the research office of the CF service at the participating facility. Only members of the research team can access this paperwork upon request made to the CF senior research officer. Compliance with Queensland Health regulations requires that all records be kept for seven years.

All data were de-identified for analysis.

The following chapters (Chapters 4 to 7) present each study comprising this thesis.

Chapter 4 - Study 1

Current service provision, scope of practice and skill mix for physiotherapists in CF care delivery for adults with Cystic Fibrosis

This chapter has been published.

Hall, K., Maxwell, L., Cobb, R., Chambers, R., Roll, M., Bell, S. C., & Kuys, S. (2020). Benchmarking service provision, scope of practice, and skill mix for physiotherapists in adult cystic fibrosis care delivery. *Physiotherapy Theory and Practice*, 1-7.
https://doi.org/10.1080/09593985.2020.1777606

4.1 Abstract

Background/Aims:

Increasing age, numbers, and complexity of clinical care are potentially impacting physiotherapy care delivery for adults with CF. This study aimed to describe physiotherapy service provision, scope of practice, and skill mix in a large tertiary adult CF service and determine if services met clinical practice recommendations.

Methods: A cross-sectional observational study examined inpatient and outpatient physiotherapy care delivery in a tertiary adult CF centre over a three-month period. Physiotherapy care delivery was described by number and skill level of physiotherapists, total hours of activity, and number, type, and duration of each physiotherapy activity.

Results: Twenty-two physiotherapists provided care delivery. Respiratory (n = 1058, 38%), and exercise treatments (n = 338, 12%) were the most frequent. Exercise testing (n = 20, 1%), and detailed treatment reviews (n = 79, 3%) occurred infrequently. Time for research was limited. Junior physiotherapists undertook more exercise treatments per day ($p < 0.001$), with senior physiotherapists attending outpatient clinics ($p < 0.001$).

Conclusion: A large number of physiotherapists were involved in the delivery of care. Recommended respiratory and exercise treatments were frequently provided; however, other recommended activities occurred infrequently. The impact of increasing age, number of patients, and complexity of clinical care may be contributing to demand exceeding supply for physiotherapy care. Future studies are required to determine innovative approaches to address the gaps in clinical practice recommendations.

4.2 Introduction

Cystic Fibrosis is a life-limiting autosomal recessive genetic disorder (Elborn, 2016) and the most prevalent heritable condition in Australia (Cystic Fibrosis Queensland, 2016). Physiotherapy management for adults with CF is integral to care delivery, including daily treatments of inhaled medications, airway clearance techniques and exercise (Button et al., 2016). Physiotherapists are involved in collaborative and consultative processes with adults with CF to optimise these treatments (Rand et al., 2013). Adults with CF see physiotherapists at outpatient department (OPD) clinics and while hospitalised (Bell et al., 2008), with improvements across a range of outcomes demonstrated with physiotherapy (Button et al., 2016; Rand et al., 2013).

Currently, median survival for adults with CF is in the mid-late fifties (Cystic Fibrosis Australia, 2020). Improved medications, treatments and access to multidisciplinary care and expertise provided in specialist CF services have resulted in an exponential rise in survival age and a corresponding increase in numbers of patients, particularly in adult CF services (Bell et al., 2011; Conway et al., 2014; Cystic Fibrosis Australia, 2016; Elborn et al., 2016; Parkins et al., 2011). Complexity of CF care delivery, morbidity and number of complications are increasing concomitantly with survival in adults with CF (Elborn et al., 2016). Further specialised treatments from all members of a multidisciplinary team, including physiotherapy, are required to manage this complexity (Button et al., 2016; Conway et al., 2014; Kerem et al., 2005; Morrison & Parrott, 2020), resulting in an exponential increase in the number and type of physiotherapy clinical care activities, at times, the complexity of delivery of this care (Button et al., 2016; Conway et al., 2014; Rand et al., 2013).

Considerable evidence exists to support physiotherapy management of adults with CF. However, there are documented variation in practice across CF services worldwide as treatment options, and complexity grows (Button et al., 2016; Morrison & Parrott, 2020). Physiotherapy discipline-specific CF guidelines have been developed as comprehensive reference documents to standardise and optimise physiotherapy management (Button et al., 2016; Morrison & Parrott, 2020). These clinical practice guidelines integrate systematic reviews of current evidence with clinical expertise from physiotherapists who regularly deliver survives for people with CF in recognised centres (Button et al., 2016; Morrison & Parrott, 2020). The guidelines make recommendations about clinical practice based on the quality, quantity, and level of the evidence, the consistency of the evidence, the likely clinical impact, and applicability to physiotherapy practice (Button et al., 2016).

The guidelines provide detailed physiotherapy care delivery, including service provision and clinical care activity recommendations for people with CF. Service provision recommendations include the number and mix of junior and senior staff based on CF patient numbers (Morrison & Parrott, 2020) along with recommended frequency of physiotherapy clinical care activity for both outpatients and inpatients (Button et al., 2016; Morrison & Parrott, 2020). Senior physiotherapists are considered to have expert knowledge and skills to lead CF physiotherapy care and deliver expert clinical opinion on CF physiotherapy assessment and treatment. Their roles contribute to service–wide quality improvements, research, patient data registries, supervision of junior staff, education and training for staff and students within the CF service and externally and offer specific clinical advice and leadership on CF physiotherapy care delivery at local, state and national levels (Conway et al., 2014; Kerem et al., 2005). Junior physiotherapists' skills may possibly involve more routine CF assessments and treatments in line with their level of experience. Complex clinical decision-making and problem-solving occur under the supervision of senior CF physiotherapists (Morrison & Parrott, 2020).

The guidelines also make recommendations for the key areas of physiotherapy clinical care activity, including airway clearance therapy, inhalation therapy, exercise training and testing, musculoskeletal management, and annual reviews of the key physiotherapy treatment interventions (Button et al., 2016; Morrison & Parrott, 2020). Where evidence is unavailable or limited, consensus from expert clinicians has resulted in clinical practice points, which recommend areas of expert practice relevant to clinicians (Morrison & Parrott, 2020). Consequently, these documents comprehensively describe the recommended scope of practice for physiotherapists working with adults with CF.

In Australia, a national CF patient registry has been established to collect information on disease diagnosis, treatments, and outcomes for people with CF (Cystic Fibrosis Australia, 2016). Data from this registry are not inclusive of specific physiotherapy treatment information. Thus, current physiotherapy care delivery in adult CF services in Australia has not been quantified nor benchmarked against recommended guidelines. A benchmarking process would be a starting point for future planning, as the exponential increase in adults with CF numbers and complexity of clinical care poses a challenge for current and future sustainability of this care delivery (Burgel et al., 2015). Defining physiotherapy care delivery in terms of service provision, scope of practice, and skill mix within an adult CF service provides an important contribution to the evidence.

4.3 Methods

A summary of the methods for this study is presented below. Full details are presented in section 3.2.

4.3.1 Design

A cross-sectional observational study examined inpatient and outpatient physiotherapy care delivery to adults with CF admitted to and/or attending outpatient clinics across a three-month period in a tertiary adult CF centre. Physiotherapy care delivery was described by number and skill level of physiotherapists, total hours of activity, and number, type, and duration of each physiotherapy activity. Further detailed information about study design is included in sections 3.2.2 and 3.2.3.

4.3.2 Participants, Physiotherapists, CF Service

Workload activity data for physiotherapists working weekdays delivering physiotherapy care to adults with CF as either inpatients or when attending outpatient clinics during a three-month period from September to November 2015 were collected. Workload activity data from CF physiotherapists working outside business hours, including evenings and weekends, were excluded. Usual physiotherapy staffing for the CF service comprised two senior physiotherapists (2.0 FTE) and one junior rotational physiotherapist (1.0 FTE). Further detailed information about participants is included in section 3.2.4.

4.3.3 Procedures

Prospective collection of all outcomes was undertaken for all inpatient admissions and outpatient attendance at clinics at the ACFC over the three-month period. Physiotherapy workload activity was collected via the hospital Activity Bar Code (ABC) scanning system. Allied health staff at the centre routinely use the ABC scanner to record all clinical and non-clinical care activity. Staff scanned codes daily from a predetermined list to record all direct and non-direct clinical care and non-clinical care activities associated with CF physiotherapy care delivery. Information collected included the date, time, activity type, number, and duration of each activity type, who performed the activity, their location, and their staffing level. A comprehensive list of the codes and their descriptors is included in Chapter 3, Table 3.1. For the purposes of this study, the activity codes for the direct and non-direct clinical care activity were expanded and customised to include subcategories relevant to CF physiotherapy care delivery. Staff were orientated to the new codes prior to data collection. Further detailed information about data collection using ABC and activity codes is included in section 3.2.5.2.

Demographic data were collected for all adults with CF inpatient admissions, including age, gender, and hospital length of stay. Best body mass index and lung function recorded during the 12-month period prior to admission were also recorded. The number of adults with CF attending outpatient clinics was recorded over the three-month period. Further detailed information about data collection using ABC and activity codes is included in section 3.2.5.1.

4.3.4 Outcome Measures

All activity and staffing that contributed to physiotherapy care delivery within a tertiary adult CF service were described in terms of service provision, scope of practice and skill mix. Details of further quantification of this data can be found in section 3.2.6.

4.3.5 Data Analysis

Descriptive statistics were used for patient demographic and ABC activity outcomes for the three-month period. ABC data software created an activity profile for physiotherapists working within the CF service, including inpatients and/or outpatients.

Physiotherapy care activity was reported descriptively (number, ratio, skill level, location). Scope of practice (clinical and non-clinical care) activity type, number, and duration are presented for all staff delivering care to adults with CF within the study period.

Pearson's Chi-square test of independence was used to determine differences in the proportions of provision between junior and senior physiotherapists. The overall number of activities and the number of each activity completed were compared. The duration for clinical and non-clinical activities provided by both junior and senior physiotherapists was also compared using independent t-tests. SPSS v25.0 was used for all analyses, and results were accepted as statistically significant at $p < 0.05$. For further details on data analysis for Study 1, please refer to section 3.2.7.

4.4 Results

Physiotherapy care delivery is described in terms of service provision, scope of practice and skill mix and results are presented under these headings.

4.4.1 Service Provision

4.4.1.1 Flow of Patients Through the CF Service

A total of 192 people with CF were provided physiotherapy care across inpatient wards and outpatient clinics during the three-month period. Of these, 87 (45%) received inpatient physiotherapy care, and the remainder received outpatient physiotherapy care (n=105, 55%). Fifty-two (27%) people received physiotherapy care as both inpatients and outpatients.

All inpatients (n = 87 admissions) received direct clinical care activity through the physiotherapy service. Demographic details for people with CF receiving inpatient physiotherapy care are presented in Table 4.1. Demographic details for people receiving outpatient care were not recorded.

Table 4.1: Demographic Details of CF Inpatients.

Participants, n (female)	87 (32)
Age, years, mean (SD)	31.7 (10.2)
Length of stay, days, mean (SD)	14.9 (8.3)
FEV_1% predicted*	50.6 (19)
BMI*	22.6 (4.8)

Note: BMI = body mass index

FEV_1% predicted = forced expiratory volume in one-second percent predicted

** denotes the best-recorded value in 12 months prior to admission*

4.4.1.2 Staffing

Staffing allocation across the three-month data collection period varied, with one additional junior FTE physiotherapist allocated to the service in the third month. During the three-month data collection period, 22 different physiotherapists contributed to the CF physiotherapy care delivery. This comprised two senior staff and thirteen junior staff rostered to the junior CF positions and/or covering the allocated CF staff as required. An additional seven junior physiotherapists delivered extra physiotherapy care, as required, into the service above the allocation.

Total time (minutes) spent on physiotherapy care activities delivered to the CF care per day was calculated. On average, physiotherapists spent 13.6% (SD10.3, range -3 to 48%) above the FTE time allocation each day providing physiotherapy care across the three-month period. This equates to 66 minutes of additional care each day or 5.5 hours a week for CF physiotherapy service provision above the allocated time. Senior physiotherapists allocated to the service worked longer per day than junior physiotherapists, mean difference 8.7% (95%CI 5.7 to 11.8). Junior physiotherapists worked 101% (SD5) of their allocated time providing physiotherapy care, while senior physiotherapists worked 112% (SD10).

4.4.1.3 Location of Care Delivery

The location of the provision of clinical care activities overall and for junior and senior physiotherapists is shown in Table 4.3. Most clinical care activities occurred in the dedicated CF ward (n = 1815, 70.1%). Physiotherapy clinical care activities were also delivered in three thoracic medical wards in the hospital (n = 270, 10.4%). Location was not recorded for nearly 10% (n = 249) of clinical care activities (see Table 4.2).

Table 4.2: Location of Provision and Number (percent) of Clinical Care Activities (direct and non-direct) Delivered by Junior and Senior Physiotherapists.

	Number of clinical care activities		
	Total (n=2591)	**Junior physiotherapist** (n=1278, 49.3% of total)	**Senior physiotherapist** (n=1313, 50.7% of total)
Location	n (% of 2591)	n (% of 1278)	n (% of 1313)
Cystic Fibrosis ward	1815 (70.1)	919 (71.9)	896 (68.2)
Thoracic medical wards	270 (10.4)	190 (14.9)	80 (6.1)
Multidisciplinary clinic	215 (8.3)	15 (1.2)	200 (15.2)
Physiotherapy outpatient clinic	42 (1.6)	5 (0.4)	37 (2.8)
Location not recorded	249 (9.6)	149 (11.7)	100 (7.6)

Outpatient physiotherapy care was provided to CF patients attending multidisciplinary outpatient clinics and those presenting to the physiotherapy outpatient clinic. The total number of patient attendances at the multidisciplinary outpatient clinics was 385. Physiotherapists provided direct care activity for 56% (n =215) of these attendances. A small number of physiotherapy clinical care activities were delivered in physiotherapy outpatient clinics (n = 42, 1.6%) (see Table 4.2).

4.4.1.4 Delivery of Clinical Care to Patients per Day

Inpatient direct clinical care activities were further quantified according to the number delivered on average to each patient per day. A total of 1097 direct clinical care activities (treatments) were delivered to inpatients over the three months. The number of individual treatment sessions provided to inpatients ranged from one to four sessions daily, with a median of one session daily. Approximately 30% of patients received direct care sessions twice daily, and 4% received direct care sessions three to four times a day (see Table 4.3).

Table 4.3: Frequency (percent) of Direct Clinical Care Activity per Inpatient per Day over Three-months for junior, senior and all physiotherapists.

Frequency of direct clinical care activity per day	Junior physiotherapists	Senior physiotherapists	All physiotherapists
One	470 (71.5)	284 (64.5)	754 (68.7)
Two	176 (26.8)	122 (27.7)	298 (27.2)
Three	9 (1.4)	28 (6.4)	37 (3.4)
Four	2 (0.3)	6 (1.4)	8 (0.7)

4.4.2 Scope of Practice

Scope of practice for physiotherapists delivering care to adults with CF was defined as direct and non-direct clinical care activities and non-clinical care activities as described in Chapter 3 (Table 3.1). The type and number of the activity and the mean time spent in activity have been described.

4.4.2.1 Type and Number of Physiotherapy Care Activities: All Staff

Physiotherapists undertook a total of 3177 care activities over the three-months: 1740 (54.8%) direct clinical care activities, 851 (26.8%) non-direct clinical care activities, and 586 (18.4%) non-clinical care activities (Table 4.4). The most common direct clinical care activities undertaken were respiratory treatments (n = 1059, 33.3%), exercise treatments (n = 338, 10.6%) and outpatient reviews within the multidisciplinary clinic (n = 215, 6.8%). Infrequent direct clinical care activities included exercise testing (n = 20, 0.6%) and annual reviews (n = 79, 2.5%). Non-direct clinical care comprised primarily of patient-related documentation of clinical care and related administrative tasks (n = 501, 15.8%) and other activities associated with patient care not specified in the intervention list (n = 248, 7.8%). Most non-clinical care activity centered on management activities (n = 326, 10.3%).

4.4.2.2 Time Spent in Physiotherapy Care Activities: All Staff

Duration of time spent in individual activities across the three-months is shown in Table 4.4. Overall, the mean (SD) duration of time spent in any clinical care activity was 29.6 (SD 20) minutes and time spent engaged in any non-clinical care activity was 41.7 (SD 45.8) minutes (see Table 4.4).

Table 4.4: Total Number (Percent) and Mean (SD) Duration of Clinical and Non-clinical Care Activities over Three-month Period for All Physiotherapists.

Activity	**Number** of activities	**Time** spent in activity (minutes)
	n (%) (n = 3177)	Mean (SD) (minutes)
Clinical Care		
Direct clinical care		
Respiratory treatment	1059 (33.3)	30.6 (17.4)
Exercise treatment	338 (10.6)	39.4 (11.9)
Outpatient review in MDT clinic	215 (6.8)	45.2 (30.5)
Reviews	79 (2.5)	41.6 (13.8)
Exercise testing	20 (0.6)	32 (9.1)
Other treatment	29 (0.9)	25 (7.9)
Total direct clinical care	*1740 (54.8)*	*29 (19.5)*
Non-direct clinical care		
Patient documentation/ management	501 (15.8)	10.5 (9.3)
Equipment management	102 (3.2)	24.9 (15)
Unspecified intervention	248 (7.8)	35.7 (22.3)
Total non-direct clinical care	*851 (26.8)*	*35.71 (22.3)*
Total clinical care	**2591 (81.6)**	**29.6 (20.3)**
Non-Clinical care		
Management	326 (10.3)	47.4 (57.1)
Teaching and training	128 (4)	47.5 (25.8)
Leave	128 (4)	20.8 (7)
Research	4 (0.1)	65 (17.3)
Total non-clinical care	**586 (18.4)**	**41.7 (45.8)**

Note: MDT = multidisciplinary team

4.4.3 Differences between Junior and Senior Physiotherapists' Activity

Comparisons between junior and senior activity were made as the number of activity over the three months and the duration of time (minutes) spent in activity over the three months.

4.4.3.1 Type and Number of Activities: Staff Level

Junior physiotherapists completed 1527 care activities over the three-month period, 1278 (83.7%) clinical care and 249 (16.3%) non-clinical care activities (Table 4.5). Junior staff most frequently conducted respiratory treatments (n = 529, 34.6%) and exercise treatments (n = 279, 18%). The largest contributor to non-clinical care activity was management (n = 160, 10.5%).

Senior physiotherapists completed 1650 activities over the three-month period, 1313 (79.6%) clinical care and 337 (20.4%) non-clinical care activities. Senior staff most frequently conducted respiratory treatments (n = 530, 34.6%), patient reviews in outpatient clinics (n = 200, 12.1%) and completed 271 (16.4%) patient documentation activities. Non-clinical care activities included management (n = 166, 10%), teaching and training (n = 128, 8%) and on four occasions, research.

A chi-square test of independence found a significant difference between the total number of activities undertaken by the junior and senior staff ($X^2 = 545.2$, $p < 0.001$) across the three-months. Significant differences were found in the number of exercise treatments, reviews, reviews in multidisciplinary clinics and equipment management completed by junior and senior staff (Table 4.5). Only senior staff undertook teaching and training, and research activities.

Table 4.5: Comparison of Junior and Senior Physiotherapists' Clinical and Non-clinical Care Activities [number (%)] over Three-months.

Activity	**Number** of activities		X^2		
	Junior physio (n = 1527)	Senior physio (n = 1650)	df	Value	p
Clinical Care					
Direct clinical care, n (%)					
Respiratory treatment	529 (34.6)	530 (32.1)	24	26.6	p = 0.322
Exercise treatment	279 (18.3)	59 (3.6)	8	70.4	p = 0.000**
Outpatient review in MDT clinic	15 (1.0)	200 (12.1)	11	61.9	p = 0.000**
Reviews	15 (1.0)	64 (3.9)	5	21.6	p = 0.001**
Exercise testing	14 (0.9)	6 (0.4)	3	6.0	p = 0.112
Other treatment	25 (1.6)	4 (0.2)	3	6.0	p = 0.113
Total direct clinical care	*877 (57.4)*	*863(52.3)*			
Non-direct clinical care, n (%)					
Patient documentation/ management	230 (15.1)	271 (16.4)	21	23.1	p = 0.34
Equipment management	22 (1.4)	80 (4.8)	7	14.2	p = 0.047*
Unspecified intervention	149 (9.8)	99 (6.0)	4	26.0	p = 0.000**
Total non-direct clinical care	*401 (26.2)*	*450 (27.2)*			
Total clinical care	**1278 (83.7)**	**1313 (79.6)**			
Non-Clinical care, n (%)					
Management	160 (10.5)	166 (10.0)	9	10.1	p = 0.342
Teaching and training	0	128 (8.0)	6	93.5	p = 0.000**
Leave	89 (5.8)	39 (2.4)	4	26.0	p = 0.000**
Research	0	4 (0.2)	1	4.6	*p = 0.03
Total non-clinical care	**249 (16.3)**	**337 (20.4)**			

*Note: * = p < 0.05, ** = p < 0.001*

4.4.3.2 Duration of Time Spent in Activities: Staff Level

Independent sample t-tests were conducted to compare mean duration of time spent by junior and senior staff for all activities combined and individual activities (clinical and non-clinical). There was no difference in mean duration (SD) of time spent in all activities combined between junior and senior physiotherapists (t (3175) = -0.9, p = 0.37); junior staff spent 32.3 (17.7) minutes, and senior staff spent 31.4 (33.8) minutes.

Junior physiotherapists spent a significantly longer time than senior physiotherapists on respiratory treatments ($p < 0.001$), organising patient equipment ($p = 0.002$) and documentation/management activities directly related to patient care ($p < 0.001$). Junior physiotherapists spent less time on non-clinical care management activities, on average 40 (SD 22.5) minutes, compared to senior staff who spent 54.5 (SD 76.4) minutes ($p = 0.022$) (see Table 4.6).

Table 4.6: Comparison of Junior and Senior Physiotherapists for Mean (SD) Duration of Time Spent in Clinical and Non-clinical care Activities over Three-months.

Activity	**Time** spent in care activity (minutes)		
	Junior physio Mean (SD) (n = 1527)	Senior physio Mean (SD) (n = 1650)	Mean Difference (95% CI)
Clinical Care			
Direct clinical care			
Respiratory treatment	35.8 (14.6)	25.3 (18.4)	-10.5 (-12.5 to -8.5)
Exercise treatment	39.3 (11.9)	40.1 (12.2)	0.9 (-2.5 to 4.2)
Outpatient review in MDT clinic	46.6 (6.2)	45.1 (31.6)	-1.5 (-17.6 to 14.6)
Reviews	37.7 (10.8)	42.5 (14.3)	4.9 (-3 to 12.7)
Exercise testing	34.5 (9.4)	26 (4.9)	-8.5 (-17 to 0)
Other treatment	25.6 (8.1)	21.3 (6.3)	-4.4 (-13.2 to 4.4)
Non-direct clinical care			
Patient documentation/ management	13.1 (9.9)	8.4 (8.3)	-4.7 (-6.3 to -3.1)
Equipment management	33.4 (20.6)	22.6 (12.3)	-10.8 (-17.7 to -3.9)
Unspecified intervention	33.8 (22.1)	38.5 (22.4)	4.7 (-1 to 10.4)
Non-Clinical care			
Management	40 (22.5)	54.5 (76.4)	14.5 (2.1 to 26.8)
Teaching and training	0	47.5 (25.8)	Unable to be calculated
Leave	20.7 (7.5)	21.3 (5.9)	0.6 (-2.1 to 3.3)
Research	0	65 (17.3)	Unable to be calculated
Total of all activity	32.3 (17.7)	31.4 (33.8)	-0.9 (-2.8 to 1.0)

Note: MDT = multidisciplinary team

4.5 Discussion

This is the first paper to quantify service provision and scope of practice for CF physiotherapists in a large tertiary adult CF service. Service provision is described as number and level of physiotherapists, inpatient and outpatient treatment activity and total time spent on CF service provision. Twenty-two physiotherapists contributed care activities to the CF service across the three months to both inpatients and some outpatients. Physiotherapists contributed, on average, 5.5 hours of additional care delivery above the allocated time per week. Respiratory and exercise treatments, considered fundamental for care delivery, were identified as the most frequent clinical activities. Exercise testing and treatment reviews occurred infrequently, and limited time was spent on research activity. Junior physiotherapists undertook more exercise treatments, with senior physiotherapists providing most of the equipment management and all teaching and training activities in the centre over the three-months. Senior physiotherapists completed respiratory treatments and patient documentation in less time than junior physiotherapists.

Physiotherapy Service Provision

Staffing Numbers

The allocated number of physiotherapists for this CF service was below recommended levels in the practice guidelines. For a centre of this size, providing care to 300 people with CF, at least six full-time equivalent physiotherapists are recommended (Bell et al., 2008; Morrison & Parrott, 2020). The physiotherapists collectively worked, on average, 5.5 hours per week more than the allocated hours to the service. This additional physiotherapy care delivery above the allocated hours suggests that the current staffing level or allocation was insufficient to meet demand. The extra hours comprised unpaid overtime worked by the allocated CF physiotherapists and contributions to clinical care activity by an additional seven physiotherapists across the three-months. This additional care was likely required to meet prioritised treatment needs where increased inpatient numbers and/or very unwell people with CF were admitted with exacerbations. It is probable that the additional physiotherapists would have been rostered to other acute care clinical areas within the hospital, putting the treatment needs of the CF inpatients in competition with the needs of other patient cohorts across the acute care areas of the hospital.

The need for 22 different physiotherapists to provide the clinical care activity in this CF service is likewise of concern. This number did not include physiotherapists working evening or weekend shifts, so the total number of different physiotherapists providing CF patient care in this centre is likely to be even higher. Care delivered by different hospital staff across a range of patient groups has been shown to result in suboptimal communication, poor coordination of care, and adverse effects on health service costs, patient outcomes, and experiences with care (Bodenheimer, 2008) whilst increased continuity of clinical care for people with chronic disease results in improved patient satisfaction (Health Quality Ontario, 2013). Sveréus et al. (2017) suggest that continuity with the same care provider may be the most crucial component of continuity of care for people with chronic respiratory disease. It is possible that having such high numbers of physiotherapists delivering care in this centre may impact care delivery outcomes, including patients' perceptions and satisfaction with the physiotherapy care delivery.

The number of senior physiotherapists allocated to the service did not change over the three-month period. Thirteen different junior physiotherapists worked across the allocated positions over the three months. Several reasons might account for this number. Rostering practices in this facility include relief cover for a monthly accrued day for full-time physiotherapists and backfill cover for two days following monthly mandatory weekend shifts for junior physiotherapists. Additional physiotherapists would also have been required to work in the CF service to cover leave such as sick or recreational leave. Also, junior full-time physiotherapists rotate every three months, and one roster change occurred after the first month of data collection, contributing to the staff numbers. CF clinical practice guidelines identify concerns about the impact of rotational staffing on continuity of care, health outcomes, and patient satisfaction (; Morrison & Parrott, 2020).

A further consequence of the large number of different physiotherapists over the three months could be challenges for the senior physiotherapists. Guidelines suggest that complex clinical decision-making and problem-solving for people with CF occur with supervision and ongoing training in CF-specific physiotherapy care activities provided by senior CF physiotherapists (Daniels et al., 201; Morrison & Parrott, 2020). Senior physiotherapists in this CF service, as the consistent staff members, would likely be required to support the large number of junior physiotherapists involved in CF care delivery in terms of training requirements and providing care continuity for all patients (Morrison & Parrott, 2020). It is likely that having one rotational position (out of three FTE staff allocation) would contribute to the senior staff load. Guidelines suggest that no more than 10% of the total physiotherapy numbers be rotational positions (Morrison & Parrott, 2020).

Inpatient and Outpatient Treatments.

Inpatient treatments occurred across several wards, which is not unsurprising, given that patient segregation and ward allocation are based on microbiology. Physiotherapists saw inpatients at least once a day, meeting Australian recommendations (Button et al., 2016). Approximately one-third of patients received treatment two to four times a day, with guidelines suggesting such increased frequency is determined by the complexity and acuity of the patient's presentation (Bell et al., 2008; Button et al., 2016; Conway et al., 2014; Kerem et al., 2005). Quantitative evidence investigating more specific determinants for the frequency of inpatient care demonstrated in this study is yet to be determined.

Physiotherapists saw patients approximately half the time they attended the multidisciplinary outpatient CF clinics. Current recommendations suggest that people with CF should have access to physiotherapy at each multidisciplinary outpatient clinic visit (Bell et al., 2008; Button et al., 2016; Conway et al., 2014; Morrison & Parrott, 2020). Additionally, for a CF service of this size, it appears very few individuals attended dedicated physiotherapy specific outpatient department sessions, with guidelines recommending individualised appointments be available as required (Button et al., 2016; Morrison & Parrott, 2020). This centre's outpatient physiotherapy care delivery does not appear to meet these recommendations. This may be a consequence of staffing allocation, high inpatient acuity, and inpatient activity prioritised over outpatient activity.

Scope of Practice

Clinical and Non-clinical Care Activity

Physiotherapists undertook a range of clinical and non-clinical care activities over the three months, with the majority occurring as clinical care activity by both junior and senior physiotherapists. More than 80% of the physiotherapists' scope of practice was spent in direct patient care activity. This exceeds the expected standard for clinical to non-clinical activity ratio developed by the Australian National Health Round Table for hospital Allied Health staff (Mater Health Services, 2014).

Most of the clinical care activities were respiratory (33%) and exercise (11%) assessment/ treatments, which are considered essential to CF patient management (Button et al., 2016; Morrison & Parrott, 2020), and therefore expected. Infrequent clinical activities included exercise testing (0.6%) and detailed reviews (2.5%) of physiotherapy treatment plans. Exercise testing is recommended to monitor the impact of disease progression and informs targeted and individualised exercise prescription (Button et al., 2016; Morrison & Parrott, 2020). Exercise testing should occur annually (Hebestreit et al., 2015; Morrison & Parrott, 2020) and additionally at regular intervals to facilitate exercise prescription (Hebestreit et al., 2015) and to monitor the efficacy of admissions and treatment changes (Hebestreit et al., 2015, Morrison & Parrott, 2020). Similarly, regular detailed reviews of treatments are recommended to achieve effective, individualised, and optimised airway clearance, inhalation therapy and exercise training routines (Flume et al., 2009; Lannefors et al., 2004; Pryor et al., 2010; Rand et al., 2013). These reviews are recommended every three to six months (Morrison & Parrott, 2020). For adults with severe or complex disease, reviews should occur more frequently (Button et al., 2016). Both exercise testing and detailed treatment review activities do not appear to be undertaken regularly in this centre.

Physiotherapy scope of practice also includes non-clinical care activities such as educating other multidisciplinary team members, supervision, management, advocacy, and research (Button et al., 2016, Conway et al., 2014; Morrison & Parrott, 2020). For the CF physiotherapists in this study, less than 18% of their activity was non-clinical and centred on undertaking management activities (10%), with minimal teaching and training (4%) and research (0.6%) activity occurring. Reasons for this are unknown, but staff likely prioritised required attendance at staff and in-service meetings and completed daily statistic reports over other management activities.

To comprehensively describe physiotherapy scope of practice, the type and number of activities undertaken should be considered, and the time taken to complete that activity. Physiotherapists in this CF service spend, on average, 30 minutes (+/- 20 minutes) when undertaking any clinical care activities. When undertaking non-clinical care activity, the average time spent is longer at 46 minutes, with a greater variation of 46 minutes. Data describing the time spent in different physiotherapy care activities have not previously been reported, and guidelines do not indicate expected treatment times for these activities. These data may prove useful to inform future research, as determining changes to these time inputs may indicate changed efficiencies for treatment delivery alongside the mix of the activities.

Comparisons of Junior and Senior Physiotherapist Activity

The physiotherapists allocated to this service comprised two senior non-rotational positions and one junior rotational position, although this increased by a further junior position during the last month of the study period. This mix of physiotherapy staff levels supports guideline recommendations that, in a tertiary CF service, at least one or more of the physiotherapy positions are senior (Bell et al., 2011; Button et al., 2016; Conway et al., 2014;; Morrison & Parrott, 2020). Senior physiotherapists are expected to have skills and expertise in managing people with CF (Button et al., 2016; Morrison & Parrott, 2020), and any additional physiotherapists (usually junior physiotherapists) are likely to require supervision, teaching and training and support to manage people with CF (Button et al., 2016; Morrison & Parrott, 2020). Typically, this supervision and training are provided by senior physiotherapists. It would be expected, therefore, that both similarities and differences between the levels of the physiotherapists working in the centre, in terms of the type and number of activities undertaken and time spent engaged in these activities, would occur. This study is the first to quantify such outcomes, as discussed below.

Differences in Type and Number of Activity and Time Spent in Activities

No differences were demonstrated between junior and senior physiotherapists in the number of respiratory assessments, treatments, and exercise tests performed. Junior physiotherapists spent, on average, ten minutes more than senior physiotherapists on respiratory assessments and treatments. This is perhaps not unexpected, as senior physiotherapists would likely be more efficient at these activities. Other differences were demonstrated. Junior physiotherapists completed most exercise assessments and treatments, which may reflect a pragmatic approach to the division of clinical workloads and the level of expertise required to undertake exercise training for people with CF in the centre.

The expertise required for different clinical care activities also possibly accounts for differences between junior and senior physiotherapists. Senior physiotherapists, for example, undertook outpatient-related physiotherapy activity almost exclusively and most of the clinical care review activity. The recommended scope of practice for senior CF physiotherapists encompasses delivering expert clinical opinion on CF physiotherapy assessment and treatments, contributing to service–wide quality improvements, research, patient data registries, supervision of junior physiotherapists, education and training for physiotherapy staff and students, and multidisciplinary staff within the CF service and externally, and offer specific clinical advice and leadership on CF physiotherapy clinical care at local, state and national levels (Conway et al., 2014; Morrison & Parrott, 2020). Regardless of level however, the physiotherapists who did undertake exercise assessments and treatments and testing, detailed reviews and outpatient treatments spent a similar amount of time on the activity. It appears that on the few occasions junior physiotherapists performed activities considered aligned with more senior roles, they were equally efficient. It may be that these physiotherapists had more opportunities for training and experience in CF physiotherapy team; however, this could not be confirmed in the current findings. Addressing staffing stability and overall numbers of staff may facilitate the development of expertise for junior physiotherapists.

Significant differences between non-direct clinical care activity for junior and senior physiotherapists were also demonstrated. Senior physiotherapists completed more patient-related management and documentation activities and took less time to complete these activities than junior physiotherapists. These activities are likely to include letters and other communication associated with the continuity of patient care. As such, it is not unexpected these would sit with non-rotational senior staff more familiar with the patients and their care continuity. It is also not surprising the seniors demonstrated more efficiencies.

Senior physiotherapists undertook a higher number of activities in less time associated with organising equipment compared with junior physiotherapists. Such activities may include sourcing and setting up non-invasive ventilation and high-flow oxygen circuits before patient use and ordering, monitoring and supplying airway clearance devices, oxygen therapy, exercise, and other related equipment for both inpatients and outpatients. These equipment-related tasks require familiarity with the processes involved, which may account for the higher number undertaken and greater efficiencies in completing by senior physiotherapists. These are routine processes in this CF service, however. Allowing junior physiotherapists and/or AHAs exposure and training to develop these skills could potentially shift this routine activity away from senior staff. This may present an opportunity for senior physiotherapists to undertake infrequent activities aligned with their expertise, e.g., increased inpatient and outpatient detailed review activities.

It is perhaps not unexpected that senior physiotherapists undertook some specific activities more frequently than junior physiotherapists. Activities such as teaching, training, and research activity might be more likely completed by senior staff. Additionally, it is perhaps not surprising that senior staff spent more time engaged in management activities than junior staff. Despite no difference in the number of management activities undertaken between junior and senior physiotherapists, the time engaged in management activities was significantly greater for senior physiotherapists. It may be that although management activities were expected by all physiotherapists, the senior physiotherapists' management activities were more detailed.

Overall, the differences between junior and senior physiotherapists demonstrated in types of clinical activity undertaken reflect the responsibilities of and the concomitant level of expertise required by both the junior and senior physiotherapy positions in a CF service for many activities. Junior physiotherapists conducted most of the exercise treatments, for example. Undertaking the detailed reviews (for both inpatients and outpatients), teaching and training activities and conducting research were primarily undertaken by the senior CF physiotherapists in the centre. Some activity types, such as equipment organisation, may have the potential to be shared or moved across levels to allow the senior physiotherapists to address shortfalls in areas such as detailed reviews.

Limitations

There were limitations to this study. Not all the clinical care activities recommended for physiotherapy scope of practice in the clinical care guidelines, such as use of non-invasive ventilation and end-of-life care (Button et al., 2016; Morrison & Parrott, 2020), were included in the activity codes. Other activities, such as detailed inhalation therapy, respiratory and exercise reviews, musculoskeletal management, and incontinence management, were combined into a single activity code. The review category represented many activities as a pragmatic approach to developing the activity code list to ensure usability for the staff. As this level of detail was not captured, future research could include detailed and specific examination of the activities undertaken by the physiotherapists. A further limitation is that this study was conducted in one centre. Therefore, the findings may not be applicable to all CF physiotherapy services.

4.6 Conclusion

The findings presented describe for the first time the activities undertaken by physiotherapists in a large tertiary adult CF service in terms of service provision and scope of practice. Where possible, these findings were benchmarked against the current physiotherapy-specific clinical guideline documents available.

Physiotherapists in this centre worked above their allocated hours, and many different physiotherapists were involved in CF care delivery. The staffing allocation fell below recommended guidelines for a centre of this size. The physiotherapy service met the recommended guidelines for providing key aspects of CF physiotherapy treatment (respiratory and exercise treatments). However, there appears to be limited time for other aspects of care activity, such as exercise testing and detailed clinical care review. Research activity undertaken during allocated hours was minimal. Physiotherapists delivered treatments to inpatients at least daily but only saw approximately half of all outpatients attending multidisciplinary clinics.

Quantitative evidence of the scope of practice, including the type, number and time spent in physiotherapy activities for junior and senior physiotherapists, are presented for the first time. Significant differences were found, with senior physiotherapists undertaking more activities that require a higher level of expertise (such as clinical care reviews, teaching and training). Senior physiotherapists spent less time on average undertaking a respiratory treatment and more time on management tasks compared to junior physiotherapists. This quantifiable evidence may be used to determine potential changes in care delivery efficiencies over time.

The large number of physiotherapists contributing to physiotherapy care delivery over the three-month period is concerning. Whilst this number of staff may reflect the challenges faced in providing physiotherapy cover for leave, the number is high. Junior positions in this facility have weekend rostering commitments and rotate every three months. The impact, in terms of continuity of CF care and increased teaching demands associated with this many physiotherapists, is unknown. Future research could investigate these outcomes.

Additionally, as several clinical care recommendations are not being met within the current structure, future research is required to determine what can be changed in the care delivery model to address these demonstrated shortfalls in physiotherapy care provision.

Chapter 5 - Study 2

Using the Calderdale Framework workforce redesign system to develop an allied health assistant role in respiratory physiotherapy: reporting the practice and pragmatics of implementation.

Having quantified service provision and scope of practice of physiotherapists in a large tertiary adult CF service, it was evident that care delivery was not meeting clinical guideline recommendations. Recommended respiratory and exercise treatments were frequently provided; however, other recommended activities, including patient reviews, physiotherapists attending the multidisciplinary outpatient clinics, and exercise testing, occurred infrequently. Physiotherapy and hospital wide management sought an innovative approach to address the gaps in clinical practice recommendations and the physiotherapy care delivery in this centre. The proposal supported by management and grant funding included redesigning physiotherapy care to include a new AHA role to undertake clinical and non-clinical tasks within the service. To establish this role, a workforce redesign system was used. The Calderdale Framework workforce redesign system was proposed as the redesign tool as the tool was currently in use across Queensland Health sites, including The Prince Charles Hospital, and there was access to staff trained in the implementation of the Calderdale Framework who could support the research.

Study 2 examines the real-world application of the Calderdale Framework as a workforce redesign system to implement an allied health assistant (AHA) role within an acute respiratory physiotherapy service. Implementation includes role development and training for both the AHA and physiotherapy staff in skills and procedures to embed the AHA role seamlessly within the physiotherapy service.

5.1 Abstract

Background/Aims: To meet increased demand for physiotherapy care delivery in an acute respiratory service redesign, implementing a new allied health assistant role (AHA) using the Calderdale Framework as the workforce redesign system is described. Team perceptions were investigated alongside facilitators and barriers associated with implementing this new role.

Methods: A pragmatic approach to using the Calderdale Framework facilitated a structured implementation where physiotherapists and AHAs determined relevant tasks for delegation. Potential risks were reviewed, with training, delegation procedures, and supporting systems embedded into care delivery. Staff perceptions were collected at four time points during the implementation to assess the serviceability of the Framework.

Results: Six of the seven stages of the Calderdale Framework were completed. Clinical and non-clinical tasks specific to acute respiratory physiotherapy care activity were identified for delegation to an AHA. Allied health assistant competency training and training in delegation procedures for all staff, with an emphasis on risk mitigation, occurred. Six new comprehensive clinical task instructions, guidelines and other resources were developed to underpin training and safely implement this delegation model of care delivery. Response rates for surveys were 65% (n = 11) pre-implementation and 53% (n= 10) post-implementation. Staff perceived the Calderdale Framework implementation to be a positive experience. Staff reported a positive change in their perceptions of the value and role of an AHA and increased their confidence in understanding delegation procedures.

Conclusions: The Calderdale Framework was a useful system for implementing a clinical AHA role within this acute respiratory physiotherapy service. Both physiotherapists and AHAs need to participate in delegation training to optimise the AHA role and facilitate physiotherapists to potentially work to full scope. The pragmatic, and at times abridged, application of the Calderdale Framework in this research did not compromise outcomes but enabled whole team engagement.

5.2 Introduction

Allied health assistant roles are increasing in prevalence across rehabilitation and acute care settings (Snowdon et al., 2020). Whilst evidence supports an expansion of these roles, barriers to successfully developing roles have been identified (Snowdon et al., 2020; Somerville et al., 2015). To address barriers and minimise potential risks associated with AHA role development and implementation, the use of comprehensive workforce redesign systems has been recommended (Patterson et al., 2015).

The Calderdale Framework is recognised as a transformational system to support skill mix review and development of new roles (Allied Health Professions Office of Queensland, 2016b). The Calderdale Framework is patient-focused and engages clinicians, thus, aiding acceptance of role changes in practice (Smith & Duffy, 2010). There are seven stages in the Calderdale Framework: awareness raising, service analysis, task analysis, competency identification, establishing support systems, training, and sustaining (Chapter 2, Figure 2.1). The structure of the Calderdale Framework has been shown to reduce risk and improve patient safety and role consistency (Allied Health Professions Office of Queensland, 2016b; Smith & Duffy, 2010). Other reported benefits of using the Calderdale Framework include enhanced team dynamics, a deeper understanding of roles, increased service provision and improved resource usage (Patterson et al., 2015). To the candidate's knowledge, the use of the Calderdale Framework has not previously been reported to establish an AHA role in an acute respiratory clinical setting.

This study examines the real-world application of the Calderdale Framework as a workforce redesign system to develop and implement an AHA role within an adult CF physiotherapy service.

5.3 Methods

5.3.1 Study Design

An observational study was used to descriptively analyse the Calderdale Framework stages used in developing and implementing a new AHA role. Documentation of each Calderdale Framework stage and any associated outputs followed. Purposively designed surveys and semi-structured interviews were developed and used to examine the perceptions of physiotherapy and AHA staff at the start and the end of the implementation of the AHA role utilising the framework.

5.3.2 Procedure

5.3.2.1 Timeframes

Implementing an AHA role within the acute respiratory physiotherapy service in this adult CF service occurred over 11 months from August 2015 to June 2016 (Table 5.1).

Before establishing the AHA role, there were three full-time equivalent physiotherapists, and AHA support was available for small amounts of urgent non-clinical tasks within the service. Governance for the study was provided by a reference group comprised of physiotherapists and physiotherapy assistants.

Table 5.1: Timeframes and Study Activities.

Month / Year	Study activities undertaken
August 2015 - September 2015	Awareness raising (four sessions, 50 minutes each) • Physiotherapy Department ((All managers, physiotherapists and AHAs) • Physiotherapists and AHAs - Acute respiratory team • CF multidisciplinary team • Physiotherapy AHA staff Service analysis (three sessions, 50 minutes each) Task analysis (four sessions, 40 minutes each)
October 2015	Staff survey 1 – AHA Implementation using the Calderdale Framework: Pre-implementation survey
November 2015	Competency identification and development of training resources
January 2016	Staff interviews – AHA Implementation using the Calderdale Framework
February 2016	Physiotherapy assistant recruited Training commenced Supporting systems established
March 2016	Staff survey 2 – Pre-delegation procedure training survey Delegation training to physiotherapists and physiotherapy assistants Staff survey 3 – Post-delegation procedure training survey Training continued
April 2016	AHA role established Focus on sustaining
June 2016	Staff survey 4 – AHA Implementation using the Calderdale Framework: Post-implementation survey

Note: AHA, Allied Health Assistant

5.3.2.2 Calderdale Framework Procedure

The seven stages of the Calderdale Framework were used to inform the development and implementation of an AHA role in the CF physiotherapy service***.*** Two Calderdale Framework facilitators facilitated the stages of the Framework in this setting. Facilitators had undergone training and had the skills to support a team in implementing the Calderdale Framework (Allied Health Professions Office of Queensland, 2013). Facilitators had access to an extensive library of tools and resources available for use with the staff during each of the stages. Facilitators were the local workforce development officer and the candidate. The application of the stages of the Calderdale Framework for the purposes of this program of research is now described.

5.3.2.2.1 Awareness Raising Stage

The awareness raising stage introduced the Calderdale Framework and anticipated benefits to physiotherapy staff and CF team (Smith & Duffy, 2014). Clinical staff and management involved in the physiotherapy department and CF service were considered stakeholders. These groups were engaged in discussion and information sharing about developing and implementing the new AHA role. Four awareness raiding sessions were held. The first included the hospital's physiotherapy department, including physiotherapy managers and all physiotherapists and AHAs. The second session involved physiotherapists and AHAs working in the acute respiratory team, including the CF service. The third session included the CF multidisciplinary team management group, and the fourth session included physiotherapy department AHAs. Awareness raising sessions were tailored to meet the needs of each of these groups.

5.3.2.2.2 Service Analysis Stage

The service analysis stage engaged AHA and physiotherapy clinical staff to describe the current functions and tasks undertaken by the CF service and identify potential delegable tasks (Smith & Duffy, 2014). Several brainstorming sessions took place during which staff identified the functions and tasks provided by the CF physiotherapy service. Tasks were then grouped as clinical tasks of assessments, treatments, and non-clinical tasks subgroups. Brainstorming continued until all functions were included. Staff identified clinical tasks frequently completed and those not being undertaken consistently within the service.

Potentially delegable clinical tasks were then selected using a Calderdale Framework decision-making tool where task suitability, relevance and potential impact on physiotherapy delivery were determined (Table 5.2). Using a consensus process, a finalised list of clinical tasks was included in the next Calderdale stage, task analysis. An additional list of non-clinical tasks that could be suitable for the AHA to undertake was also selected from the non-clinical task subgroup list. These non-clinical tasks comprised general non-clinical tasks routinely undertaken by AHAs in the hospital and non-clinical tasks that were not routinely part of physiotherapy AHA roles in the department. The additional non-clinical tasks were specific to acute respiratory physiotherapy and included gathering and maintaining the equipment required for physiotherapists to set up non-invasive ventilation circuits on patients, maintaining high-flow oxygen equipment and other CF-specific equipment paperwork. Consensus on inclusions for all lists was achieved throughout the sessions.

Table 5.2: Decision Making: Identification of Task Suitability, Relevance, and Potential Impact as a Delegated Task.

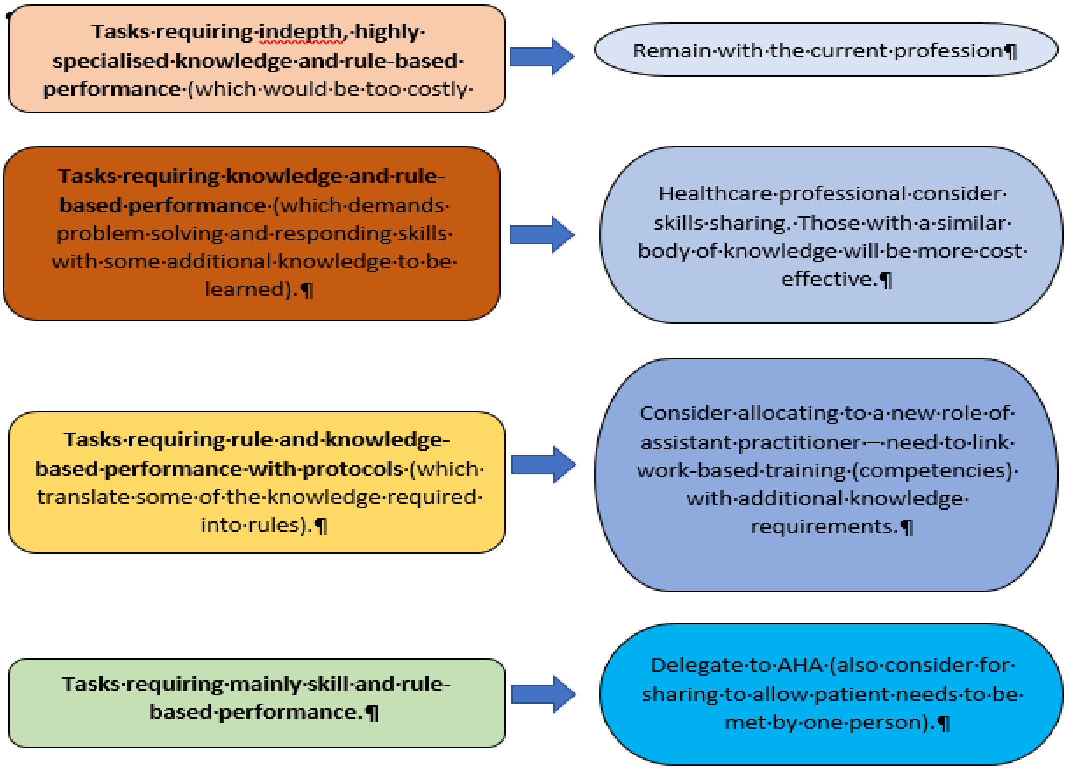
Quadrant 1 High impact/ high importance/ high relevance to delegation • Difficult and complex • High impact if delegatable but too complex to delegate	**Quadrant 2** High impact/ high importance/ high relevance to delegation • Easy/straightforward • High impact and appropriate to delegate
Quadrant 3 Low impact / difficult Unlikely to delegate	**Quadrant 4** Low impact / easy • May possibly delegate but low impact on workload of physiotherapist

Note: Adapted from 'Effective workforce program: Facilitators manual' by R. Smith & J. Duffy, 2014, Copyright 2014 by Effective workforce solutions.

5.3.2.2.3 Task Analysis Stage

This stage examined the potential for delegating the identified tasks to an AHA. This process included determining potential risks and potential strategies to minimise these risks. Using another Calderdale Framework decision-making tool (Figure 5.1), staff identified if the task was skill-based and could be potentially delegated if sufficient knowledge and protocols were developed or if the task required specialist knowledge. This skill/rule/knowledge framework (Rasmussen, 1983) specified the level of performance required for each task and risk, the potential sources of error and how risk could be managed through a nine-step process (Table 5.3). Staff consensus was achieved on the nine steps resulting in a final decision regarding the suitability of delegation for each task for delegation (Table 5.3). The list of potentially delegable clinical tasks was finalised at the end of the task analysis stage. This list formed the basis for training documentation developed for the AHA role during the competency identification stage.

Figure 5.1: Decision Making used during Task Analysis: A Calderdale Framework Tool to Guide Decision Making to Identify Potential Delegatable Tasks.



Note: Adapted from Effective workforce program: Facilitators manual by Smith & Duffy, 2014, Copyright 2014 by Effective workforce solutions.

Table 5.3: Calderdale Framework Decision-Making Table used to Undertake Risk Analysis for each Task.

<table>
<tr><th colspan="7"><u>DECISION-MAKING TABLE 1: TASK ANALYSIS</u></th></tr>
<tr><td colspan="2">Discipline:
TASK:</td><td>TEAM:</td><td>SETTING:</td><td colspan="2">Present at task analysis:</td><td>DATE:</td></tr>
<tr><td colspan="7">Task description:</td></tr>
<tr><td><u>FOR EACH TASK, DISCUSS AND GAIN CONSENSUS ON THE FOLLOWING STATEMENTS</u></td><td><u>A: GO</u></td><td><u>B: RISK IDENTIFIED #</u>
consider risk & how it can be managed</td><td colspan="2"><u>C: DESCRIBE THE RISK #</u></td><td colspan="2"><u>D: HOW CAN THIS BE MANAGED? #</u></td></tr>
<tr><td>Step 1. Is the task carried out frequently?
(Skill)</td><td>YES</td><td>NO</td><td colspan="4">Specify frequency: More than once a day / daily / 2-3 times a week / weekly / fortnightly / monthly / 2 monthly / 6 monthly</td></tr>
<tr><td>Step 2. Is the Task procedure complex? (multifaceted, how many strands, which bits most variable)
(Rule/Knowledge)</td><td>NO</td><td>YES</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Step 3. Does the task require skilled manual adjustment throughout?
(Skill/Rule/Knowledge)</td><td>NO</td><td>YES</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td rowspan="2">Step 4. a) If error occurs, is there an immediate negative consequence? (fall/blood flow – time for contingency)
b) Is this reversible?
(Rule/Knowledge)</td><td>NO</td><td>YES</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>YES</td><td>NO</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Step 5. Are ongoing assessment and clinical reasoning required throughout the task in order to adjust input? (dealing with changing situation)
(Knowledge/Rule/Skill)</td><td>NO</td><td>YES</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Step 6. Is information collection involved? (could info. Be collected with template?)
(Rule/Knowledge)</td><td>NO</td><td>YES</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Step 7. Is decision-making involved based on this information?
(Knowledge/Rule)</td><td>NO</td><td>YES</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Step 8. Are protocols available to follow or
Can they be written to support?
(Rule/Knowledge)</td><td>YES

YES</td><td>NO

NO</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Step 9. With all the above measures in place:
a) Is likelihood of error high (0-5)
b) Is consequence of error serious (0-5)</td><td>Score =
Score =</td><td></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td colspan="3">Step 10. Decision: Delegate / Skill Share / Uni-disciplinary   (circle as appropriate)</td><td colspan="4">Comments:</td></tr>
</table>

Note: Each group of tasks is considered using this decision-making tool. A series of questions (Steps 1 – 10) is worked through by the group to identify potential risk, how to mitigate the risk (if possible) and then come to a consensus on whether the task can be delegated (skill/rule-based task). The GO column indicates no or very low risk of error. Columns B to D highlight risk of error for each statement where staff identify the nature of the risk and error, how severe this is, and how and if it can be mitigated. Adapted from Effective workforce program: Facilitators manual by Smith & Duffy, 2014, Copyright 2014 by Effective workforce solutions.

Service and task analysis stages of the Calderdale Framework are usually delivered to staff via half and full-day workshops. All full-time, part-time, and casual physiotherapists and AHA staff working in the acute respiratory service, which included the CF service, were invited to attend service and task analysis sessions. However, for this program of research, a practical approach to delivering the Calderdale Framework content was adopted, where information was modified and summarised by the facilitators and sessions were integrated into scheduled team or departmental meetings.

5.3.2.2.4 Competency Identification Stage

This stage involved sourcing or developing training resources for tasks identified as appropriate for delegation. If training resources did not exist, then Calderdale specific Clinical Task Instructions (Smith & Duffy, 2014) or workplace instructions (Queensland Health., 2012) were developed. Clinical task instructions (CTIs) are comprehensive documents recommended in the Framework and include training, competency assessment and review, delegation, communication, collaborative practice and supervision mechanisms, and description of the responsibilities and accountabilities of employees and the organisation (Queensland Health., 2021; Smith & Duffy, 2014). Workplace instructions (WPI) are comprehensive documents that include descriptions of the task and instructions on how tasks are to be performed correctly and safely. These documents support training in delegation of tasks to AHAs. However, they are created and used only within a local work unit, e.g., a single hospital site. The WPI documents developed for this study were consistent with state-wide industry training standards set by the Allied Health Professions Office of Queensland (Queensland Health, 2012).

All training documents outlined competencies that needed to be met by the AHA to deliver the tasks. Both CTIs and WPIs developed were standardised using the Framework template for writing CTIs (Smith & Duffy, 2014), incorporated best practice and current evidence-based knowledge and included a procedure record and training documents. Documents were written by the CF physiotherapists who would be delegating that task and included content and editorial reviews by all physiotherapists and AHAs working in the acute respiratory service.

5.3.2.2.5 Supporting Systems Stage

This stage occurred through the development of governance and communication systems to support the practice of delegation. The new AHA and all delegating physiotherapists completed specific training in delegation practices (Queensland Health., 2013). Two 55-minute sessions that comprised PowerPoint presentations and short facilitated practical exercises occurred during team meetings. Queensland Health delegation guidelines were made available to all staff: Workplace Instructions sheets WPI 1: Guidelines for AHPs developing delegation skills (Queensland Health, 2015) and WPI 2: Guidelines for delegation to allied health assistants (Queensland Health, 2016) were also used support the procedure of delegating clinical tasks to AHAs.

Other supporting systems included documentation of AHA competency assessments once achieved, embedding supervision and patient allocation procedures, and developing and implementing a process for feeding back to delegating physiotherapists after task/s were completed. A template for documentation in patient records was implemented (Figure 5.2), and delegation practices were practised by staff following delegation training guidelines.

Figure 5.2: Delegation and Treatment Documentation Record Template.

Physio Assistant Delegation & Rx Record Delegation Date: ______

Name: UR Number: DOB:

Assistance Required: □ *Ind* □ *Cueing/Prompting* □ *Standby Assist* □ *Assist x1*

Walking Aid: __________ Distance:________***m*** O2:____ ***L/min Via***: ____

Ex Program/Specific Physio Instructions:

Physiotherapist: **Signature:**

PTA Comments/Details of Rx Provided:

Consent Obtained: □ *Obs Stable*: Yes □ No □

□ Feedback provided to physio and notified of any variations from treatment plan

Physiotherapy Assistant: **Signature:**

Note: PTA = physiotherapy assistant /allied health assistant

5.3.2.2.6 Training and Skill Development Stage

This stage included training of the clinical and non-clinical skills for the AHA and additional training for the AHA and physiotherapy staff members engaged in delegation. Training for the AHA was conducted by the senior physiotherapists working in the adult CF service. The Taught, Modelled, Competent methodology for work-based learning was used to train the AHA (Aggarwal et al., 2010; Smith & Duffy, 2010), and a training plan (Table 5.4) was used to record the training required and completed.

Table 5.4: AHA Training Plan.

AHA Name: ____

Date of training	Description of Training (Include if tutorial/ self-learning guide/ observation/practical)	Trainer Initials	Comments

5.3.2.2.7 Sustaining Stage

This stage focused on assessing overall outcomes as a result of the role development. The methodology, analysis and impacts associated with the first three months of the AHA role functioning within the CF physiotherapy service are discussed in Chapter 6. Further analysis of this stage associated with longer timeframes was not achievable as part of this research.

5.3.2.2.8 Delegation Training

Delegation training occurred within team meetings using a structured online delegation training package (Queensland Health, 2013). All resources for this program were provided and designed to be adapted for local use. For this program of research, the online delegation package was broken down into smaller components, more suited to the regular team meeting/training times. The order of presentations and activities was maintained. Training was facilitated by a senior in the CF physiotherapy team and presented over three team meetings.

The training consisted of the following:

- 'Starting out' activity
- 'Delegated practice: basic concepts' presentation plus activity
- 'Delegated practice: structural delegation' presentation plus activity
- 'Delegated practice: The five rights of delegation' presentation plus activity
- 'Delegated practice: teamwork' presentation plus activity
- 'Delegated practice: feedback' presentation plus activity
- 'Delegated practice: professional development presentation plus activity
- 'Finishing up' activity.

5.3.2.3 Survey Procedures

Four surveys were purposively designed using Survey Monkey to examine perceptions of the CF physiotherapy service, staff's roles and functions in the service, serviceability of implementation of an AHA role using the Calderdale Framework and delegation practices. Survey dissemination timelines are shown in Table 5.1. All surveys were developed by the candidate in collaboration with a senior member of the hospital's workforce redesign management team with expertise and experience in developing similar surveys as part of ongoing quality project evaluations conducted throughout the Allied Health divisions of a tertiary hospital. Two surveys focused on the CF AHA implementation using the Calderdale Framework specifically, and two surveys examined delegation practices, and these are now discussed.

5.3.2.3.1 AHA Implementation Using the Calderdale Framework: Pre-implementation and Post-implementation Surveys

Two customised surveys were developed to examine the perceptions of physiotherapy and AHA staff at the start and end of the AHA role development and implementation using the Calderdale Framework. Survey questions were adapted from a previously developed survey that used change readiness tools to evaluate Calderdale Framework projects (Greater Northern Australia Regional Training Network, 2013). The pre-and post-implementation surveys comprised 25 Likert-type scale questions (five points) grouped under three sections.

Section one comprised seven questions and examined staff perceptions of the CF physiotherapy care delivery, including patients' ease of access to physiotherapy care, effective and timely coordination and delivery of CF physiotherapy care, and any duplication of clinical tasks or unproductive time within the CF physiotherapy service.

Section two comprised nine questions focused on staff perceptions regarding general workforce profiles with respect to understanding the roles and functions of the various CF physiotherapy team members, including AHAs, and if staff were working at full scope of practice.

Section three comprised nine questions and examined the serviceability of implementing an AHA role using the Calderdale Framework. Questions explored staff perceptions of the value, perceived patient benefits and support for undertaking AHA role development and implementation. Additional questions comprised staff perceived benefit in using the Calderdale Framework stages and capacity to be involved in the stages Framework. One open-ended question was included for further feedback regarding the AHA role implementation using the Calderdale Framework. Surveys are included in Appendix 1. The survey was pilot tested with an AHA and a physiotherapist, with modifications made to the final survey before distribution.

The pre-implementation survey (AHA Implementation using the Calderdale Framework: Pre-implementation survey, see Appendix 1.1) was completed prior to the development, recruitment, training, and embedding of the new AHA role within the CF physiotherapy service. The post-implementation survey (AHA Implementation using the Calderdale Framework: Post-implementation survey, see Appendix 1.2) was completed at the end of the implementation of the new AHA role included within the CF physiotherapy service.

5.3.2.3.2 Pre- and post-Delegation Procedure Training Surveys

Two customised surveys were developed to examine staff understanding of delegation training and the practices used by physiotherapy and AHA staff.

The pre-and post-delegation procedure training surveys comprised 11 Likert-type scale questions (five points). Seven questions examined staff:

- understanding of the specific role and functions of the CF physiotherapy and AHA staff in the acute respiratory service
- understanding of the scope of practice for an AHA role in CF
- perceptions of current appropriateness/effectiveness of AHA delegation and
- if AHAs were working at full scope of practice

Four questions examined staff:

- confidence and understanding of responsibilities and roles associated with delegation procedures

- current delegation training status of physiotherapists and AHAs.

The delegation training package included ten additional questions as post-training evaluation questions, and these were further included in this study's post-delegation procedure survey (Queensland Health, 2013).

These survey questions explored staff:

- understanding of specific concepts associated with delegation, such as the accountability and responsibility associated with delegation practice
- clinical supervision practice
- overall usefulness of the training (see Appendix 1.3 and 1.4).

The survey was pilot-tested on two staff (one AHA and one physiotherapist), with modifications made to the final survey before distribution.

Delegation training surveys were conducted in the week before and immediately after the delegation training.

5.3.2.3.3 Survey Participants

All staff (physiotherapy and AHA) involved in the weekday acute respiratory service, including the CF service, were invited to complete the pre-implementation survey. Physiotherapy and AHA staff who continued to work across these services for the complete implementation of the role were invited to complete the post-implementation survey. New staff that joined the team during the implementation period who had not undergone the initial education about the Calderdale Framework were excluded. Staff (physiotherapy and AHA) who undertook the delegation training were invited to complete the delegation training surveys. Information on staff discipline (AHA or physiotherapist) and the number of years of experience were collected from staff participants.

For all surveys, staff were sent an electronic link via their workplace email address by the hospital's workforce redesign management team officer. All surveys were completed anonymously.

5.3.2.4 Interview Procedure - AHA Implementation using the Calderdale Framework

One-on-one interviews were conducted to explore in-depth staff perceptions of the planned implementation of a new AHA role using the Calderdale Framework (see Table 5.1 for timeline). All staff (physiotherapy and AHA) who participated in the awareness raising, service and task analysis stages of the Calderdale Framework were eligible for interview. Eligible staff were grouped based on years of work experience (<2 years; 2-10 years; >10 years). Staff names were entered into a ballot for each grouping, and two staff from each group were randomly selected and invited to interview. Participation was voluntary. Verbal consent was recorded at the start of each interview.

A purpose-designed semi-structured interview guide was developed comprising open-ended questions based on the content of the AHA Implementation using the Calderdale Framework: Preliminary Survey (see Appendix 1.5). The semi-structured one-on-one interviews were designed to explore further and deepen the understanding of AHA implementation using the Calderdale Framework. The use of a semi-structured interview guide and the use of open-ended questioning by the workforce development officer allowed for a focused and flexible examination of the staff's perceptions of the serviceability of the Calderdale Framework to implement the AHA role. Interviews were designed to be conducted pragmatically, in 10-15 minutes, and targeted at AHA implementation using the Calderdale Framework.

Interviews were conducted by the workforce redevelopment officer, who had experience in qualitative research and interviewing. To enhance confidentiality and minimise bias, the interviewer was not a physiotherapist nor involved in current physiotherapy care delivery. Interviews were conducted in a quiet room in a separate location from the ward.

5.3.3 Outcome Measures and Data Analysis

5.3.3.1 Observational Analysis – Implementation of the New AHA Role using the Calderdale Framework

Procedures and outputs from the seven stages of the Calderdale Framework were documented. Information regarding the number of stages completed, the number of sessions and time taken to deliver each stage, the type of staff engaged in the meetings, and outputs such as training documents applicable to each stage were recorded.

Adherence to expected inclusions for each stage of the Calderdale Framework was assessed using an adaptation of an analytical template previously used to describe the key inclusions for the seven stages of the Calderdale Framework (Nancarrow, Moran et al., 2012). Adherence to inclusions was scored using a 0 to 2 scale, where 0 refers to inclusions not met, 1 to inclusions partly met and 2 to inclusions being completely met**.** Each stage of the Calderdale Framework undertaken in this study was analysed against the template criteria.

5.3.3.2 Surveys and interviews

5.3.3.2.1 Surveys

Descriptive analyses were used to describe the characteristics of participants involved in each survey. Percentage responses to Likert-scaled questions (five points) were determined. Comparisons between pre- and post-surveys were not made due to the small sample size. Responses to open-ended questions were collated.

5.3.3.2.2 Interview

Interviews conducted by the workforce development officer sought further details regarding the AHA implementation using the Calderdale Framework. Answers to questions were clarified, summarised, and typed into a word document during the interview as statements by the workforce development officer. Summarised statements were then analysed using a reflexive thematic approach by the candidate (Braun & Clarke, 2006; Braun & Clarke, 2019), and themes were identified. Reflective thematic analysis is based on the researcher's active role in the analysis or knowledge production (Braun & Clark, 2019; Byrne, 2021). This method of thematic analysis is considered a reflection of the researcher’s informative analysis of the data that has been collected (Braun & Clark, 2019). In this analysis, there is no assumption that the same resultant themes would be reproduced if a second researcher was involved in this process. The legitimacy of this thematic analysis method is that there is ‘thoughtful and reflective engagement with their data and thoughtful engagement with the analytic process” (Braun & Clarke 2019, p. 594). The candidate reviewed the summarised statements from the interviews to determine major themes. This process was a ‘back and forth’ process, with themes emerging and developing further as the candidate continued to analyse the data available. The candidate sought to group emerging concepts and organised them under central themes. Reflective thematic analysis, as described by Braun & Clarke (2019), is a flexible analysis method that aims to achieve valuable interpretations from the data rather than to provide ‘correct answers’ (Braun & Clarke, 2013). Data analysis of the interviews in this study adopted this methodology.

5.4 Results

5.4.1 Observational Analysis – Implementation of the AHA Role Using the Calderdale Framework

Descriptive and narrative analysis of the procedures and outputs that occurred during implementation of the AHA role using the Calderdale Framework stages is considered under the individual stages.

5.4.1.1 Awareness Raising

Four awareness raising sessions were required to reach stakeholders. Seventy percent of all eligible staff attended the sessions.

5.4.1.2 Service analysis and Task analysis

Three service analysis and four task analysis sessions were undertaken with physiotherapy and AHA staff rostered to the Thoracic medicine and CF physiotherapy team. A total of twenty-three staff participated across the sessions. Physiotherapy experience of participants ranged from recent graduates (less than two years) to more than 15 years of experience. Average attendance at each session was 11 (SD1) staff.

One hundred and one tasks were identified during service analysis and grouped under subgroups of assessment tasks, treatment tasks and non-clinical tasks (see Appendix 1.6). A final list of 26 frequently performed, potentially delegable clinical tasks were determined under four headings of monitoring tasks, airway clearance tasks, exercise tasks and exercise tests (Table 5.5). Monitoring skills included understanding 'when to stop parameters' and taking pulse oximetry and heart rate measurements. Airway clearance tasks included using the active cycle of breathing techniques (ACBT), manual techniques for airway clearance, PEPand oscillating PEP devices. Exercise tasks included supervision of gym exercise programs for respiratory patients. Exercise tests included six minute and modified shuttle walk tests.

All clinical tasks were perceived to be non-complex and have high impact on the physiotherapy team if delegated to the AHA role. Tasks that shared similarities in terms of practical application were further grouped. This resulted in nine clusters (see Table 5.5 - Cluster A to I) that were then considered for risk analysis. For example, all tasks that involved positive expiratory pressure devices were considered together for risk analysis to streamline this procedure (see Table 5.5 – Cluster F).

Risk assessment occurred through consensus to confirm if the groups of clustered tasks were delegable, and the steps required to mitigate identified risks were discussed and developed. An example of the decision-making tool used for risk assessment for PEP and oscillating PEP devices are included (see Appendix 1.7).

Table 5.5: Finalised Task Analysis List: Delegatable Tasks to Include in AHA Role Training.

Monitoring tasks:	**Delegated supervision of airway clearance**	**Delegated supervision of exercise**	**Delegated exercise tests**
Cluster A: 1. When to stop criteria	**Cluster D:** 4. Airway clearance – Manual techniques for airway clearance 5. Positioning to improve ventilation +/- modified gravity assisted drainage 6. Manual techniques- percussion 7. Manual techniques - vibrations	**Cluster G:** Supervision of a gym exercise program for respiratory patients 20. Gym exercise program – HIIT 21. Gym exercise program - strength training 22. Gym exercise program - endurance training 23. Gym exercise program - Yoga/Core 24. Gym exercise program - Other	**Cluster H:** 25. Six minute walk test
Cluster B: 2. Pulse oximetry	**Cluster E:** *Airway Clearance – Active cycle of breathing technique (ACBT)* 8. thoracic expansion exercise 9. breathing control 10. Forced expiration technique/huffing 11. effective cough		**Cluster I:** 26. Modified shuttle walk test
Cluster C: 3. Heart rate monitoring	**Cluster F:** *Airway clearance – PEP and Oscillating PEP devices* *PEP* 12. Pari-PEP 13. Pari PEP combined with inhalation therapy Oscillating PEP devices 14. Flutter 1 15. Turboforte 16.PariOPEP 17. Acapella 18. Aerobika 19. Aerobika combined with inhalation therapy		

Note: Clinical tasks are displayed under four headings of monitoring tasks, airway clearance skills/tasks, exercise skills/tasks and exercise tests. Tasks that share similarity in terms of their practical application were grouped into a cluster – resulting in nine clusters described as Cluster A to I. PEP = positive expiratory pressure: OPEP = oscillating positive expiratory pressure.

5.4.1.3 Competency identification

The tasks to be incorporated into the new AHA role (Table 5.5) were mapped to existing documents describing the knowledge, skills and steps to perform the tasks. Training resources existed for three tasks: When to stop, Pulse oximetry recordings, and Heart rate monitoring. The remaining tasks with no existing training resources were considered in clustered groups (again because of the similarities in the clinical application of the tasks), and six new documents were created for training the AHA. Three CTIs (Administer six minute walk test, Airway clearance – Active cycle of breathing technique (ACBT), Airway clearance – Manual techniques for airway clearance) and three workplace instructions (Airway clearance – PEP and Oscillating PEP devices, Administer Modified shuttle walk test, Supervision of a gym exercise program) were developed for the tasks (Table 5.6). Clinical task instructions and workplace instructions developed for competency training for the AHA are included in Appendix 1.8.

Table 5.6: Identification and Development of Training Resources.

Clusters	*Existing* documented training resource (CTI, WPI or none available)	*New* training resource developed (CTI or WPI
When to stop	CTI	Not required
Pulse oximetry recordings	CTI	Not required
Heart rate measuring	CTI	Not required
Administer six minute walk test	None available	CTI
Airway clearance – Active cycle of breathing technique (ACBT)	None available	CTI
Airway clearance – Manual techniques for airway clearance	None available	CTI
Airway clearance – PEP and Oscillating PEP devices	None available	WPI
Administer Modified shuttle walk test	None available	WPI
Supervision of a gym exercise program	None available	WPI

Note: Abbreviations: ACBT- active cycle of breathing techniques, CTI – clinical task instruction, PEP- positive expiratory pressure; WPI – workplace instructions

5.4.1.4 Training

The AHA underwent training and was signed off as competent in all tasks over a two-month period. Early training included self-directed learning using resources in the CTIs and WPIs and shadowing a physiotherapist prior to independent patient treatment. Once formal training was completed, ongoing training mirrored that provided for new graduate physiotherapists to minimise training duplication. This included targeted discussions conducted as required, at daily handover time and/or when the AHA reported back to the delegating therapist at task completion. The AHA also attended CF physiotherapy team professional development opportunities, including tutorials delivered to final-year physiotherapy students.

In addition to the new clinical tasks, training was developed for the new non-clinical tasks not previously part of the AHA role, including maintaining and setting up non-invasive ventilation circuits, high-flow nasal prongs, and specific paperwork for CF patient equipment orders. A complete list of all clinical and non-clinical task requirements for the AHA is included in Table 5.7.

Table 5.7: AHA Clinical and Non-Clinical Task Requirements.

1 COMMUNICATION

- Inform physiotherapist when arrive/leave ward
- Alert physiotherapist to any changes to normal routine (e.g. relief)
- Ensure patient confidentiality

2 SAFETY/KNOWLEDGE

- Location of emergency buzzers & trolleys, fire exits, fire extinguishers and fire break glass/alarms.
- Awareness of emergency procedures for area and alert tones
- Awareness, understanding and competent check of clinical task instructions
    - When to stop
    - Pulse oximetry
    - Heat rate monitoring
    - Blood pressure monitoring
- Awareness and management of signs of fainting, seizures, hypoglycaemia (low blood sugar levels), oxygen desaturation and severe breathlessness
- Awareness of infection control procedures
- Emergency alarm checks performed monthly
- Semiautomatic external defibrillator equipment checked daily
- Cleaning procedure for respiratory and exercise equipment

3 EQUIPMENT

- Familiarity with and understanding of the following equipment:
    - Oxygen saturation monitor (oximetry)
    - Oxygen cylinders and delivery methods
    - Nasal high-flow oxygen device (Airvo)
    - Non-invasive ventilation devices
    - Airway clearance devices
    - Exercise equipment (bikes, treadmills, weights)
    - Demonstrated ability to assemble/set up:
        - Nasal high-flow oxygen device (Airvo)
        - Non-invasive ventilation circuit
        - Airway clearance devices (e.g. PariPEP, Flutter, Aerobika)
- Demonstrated handling and safety associated with the following equipment:
    - Walking aids (Elbow support frame, walking belts, sticks, crutches, 4 Wheel walkers)
    - Attachments: Drips and drains (oxygen cylinder, IV* pole, lines, drains, catheter, shoes, clothing, chair)
    - Weights
    - Treadmill
    - Exercise bike
    - Multi-station gym equipment (CF gym)
- Responsible for equipment safety, inventory checks, cleaning and maintenance checks
- Responsible for stock ordering.
- Delivery/ retrieval of respiratory equipment from central sterilising unit
- Environment considerations
    - Bed positioning, brakes on, clear path, equipment positioning
    - Appropriate positioning of self with respect to patient and physiotherapist (under guidance of PT)

4 INTERVENTIONS/MANUAL HANDLING:
The tasks set out below are to be undertaken with the physiotherapist or at direction of the physiotherapist (delegation).
• Mobilising
  ◦ Able to assist in standing and mobilising patients using appropriate mobility aids and appropriate weight-bearing status (NWB*, PWB*, TWB*, FWB*)
  ◦ Able to assist in appropriate positioning of patient (high sitting, side lying, prone etc.)
• Airway clearance
  ◦ Supervision of airway clearance for inpatients as delegated per local work unit guidelines including:
    ▪ Positioning and manual techniques (percussion and vibrations)
    ▪ Active cycle of breathing technique
    ▪ PEP and OPEP devices
• Exercise
  ◦ Supervision of exercise programs for inpatients as delegated per local work unit guidelines
• Exercise tests
  ◦ Undertake delegated exercise test as per local work unit guidelines
    ▪ Six minute walk test
    ▪ Modified shuttle walk test

5 ORGANISATIONAL SKILLS • Data entry • Generation of patient reports • Statistics • Photocopying • Research assistant • Office administrative tasks • Management of medical aids subsidiary scheme and cystic fibrosis Qld equipment forms • Management of loan stock from the above agencies, including a three-monthly audit • Engineering and Biomedical technology servicing administration as required

Note: *Abbreviations: FWB - full weight bearing, IV – intravenous, NWB - non-weight bearing, PWB - partial weight bearing, TWB - touch/toe weight bearing,*

5.4.1.5 Supporting systems

All staff involved in delegation (delivering and receiving) underwent training, and delegation practices were implemented as planned (Queensland Health, 2013). The AHA was allocated a clinical and non-clinical workload each morning as part of the team’s work allocations. The physiotherapist responsible for each patient assessed the patient’s suitability and clinical stability for treatment to be delegated. The AHA performed the delegated clinical tasks, documented them in the patient medical record using a purpose-designed sticker template (Figure 5.3) and reported back to the delegating therapist. Any questions were addressed, and ongoing training regarding individual cases and task performance was identified. Weekly supervision was undertaken between the AHA and the senior physiotherapist to evaluate AHA role development and address concerns about workload or delegation. These supervision meetings occurred throughout training and sustaining periods of the implementation. Finally, the AHA had a performance and development plan that was revised on a six-monthly basis with physiotherapy management staff according to local policies.

5.4.1.6 Sustaining

Outcomes are discussed in Chapter 6.

5.4.1.7 Stage Inclusions and Completion Summary Analysis

Adherence to the key inclusions for each stage was analysed against the level of completion, i.e. were key inclusions undertaken (Table 5.8). All inclusions for each of the stages were adhered to within this study for stages 1 to 6. The time frames for data collection did not allow ongoing assessment of longer-term outcomes, including aspects of the sustaining phase of the implementation. Therefore, not all inclusions for stage 7 occurred.

Table 5.8: Stages of the Calderdale Framework including Key Inclusions per Stage and Completion Analysis.

Calderdale Framework	AHA role implementation
1. Awareness raising → staff engagement	
1.1 Managers and clinical staff engaged with the stages	2
1.2 Whole team/service aware of and educated in the implementation process	2
1.3 A clear leader/clear leadership ("champion") with skills to lead and facilitate the implementation and "project manage."	2
1.4 Leader is supported by a project lead and others undertaking similar workforce change projects	2
2. Service analysis → potential to change	
2.1 Frontline clinical staff identify and clarify the purpose of their service and all the functions that are carried out in order to deliver this service	2
2.2 Functions are broken into tasks, and these are matched to patient needs	2
3. Task analysis → risk management	
3.1 Open discussion with clinicians regarding suitability of tasks for delegation, identifying what and where risks will occur if delegating a given task (using the Calderdale Framework decision table and risk rating scale), and also how much training would be needed for each task	2
4. Competency generation → quality	

Calderdale Framework	AHA role implementation
4.1 Tasks accepted as suitable to delegate are written into a “competency” format, which sets out the performance criteria of the task	2
4.2 Clinicians agree on how task is to be performed, embedding best practice	2
5. Supporting systems → governance (is the workplace able to manage the new roles?)	
5.1 Ensuring clinical supervision processes are in place	2
5.2 Ensuring reflective practice is encouraged for all staff (including assistants)	2
5.3 Ensuring personal development review processes are in place	2
5.4 Ensuring communication channels are clear and robust	2
6. Training → staff development	
6.1 Training developed for both qualified and support staff	2
6.2 Support staff trained in competencies, each comprising a knowledge-based element and a practical element	2
6.3 Support staff also trained so they understood what feedback to give, when and how to give it, and when a task should be halted	2
6.4 Competence assessed prior to performing on a patient	2
6.5 Training in core competencies first. Once competent, then more specific competencies are introduced	2
6.6 Qualified staff were trained, so all understood how the competencies were derived and what the support staff were competent to perform	2
7. Sustaining → embedding and monitoring	
7.1 Resulting “framework” embedded into local induction and personal development review for new members of staff	0
7.2 Audit plan developed to monitor outcomes and use of competencies	1

Notes: 0, criterion was not met at all; 1, criterion was only partly met (where only part of the stage/process has been completed. For example, only a selection of staff were consulted with and engaged in the implementation process for the AHA role, champions were not identified, and project planning was not formally deployed); 2, criterion was fully met.

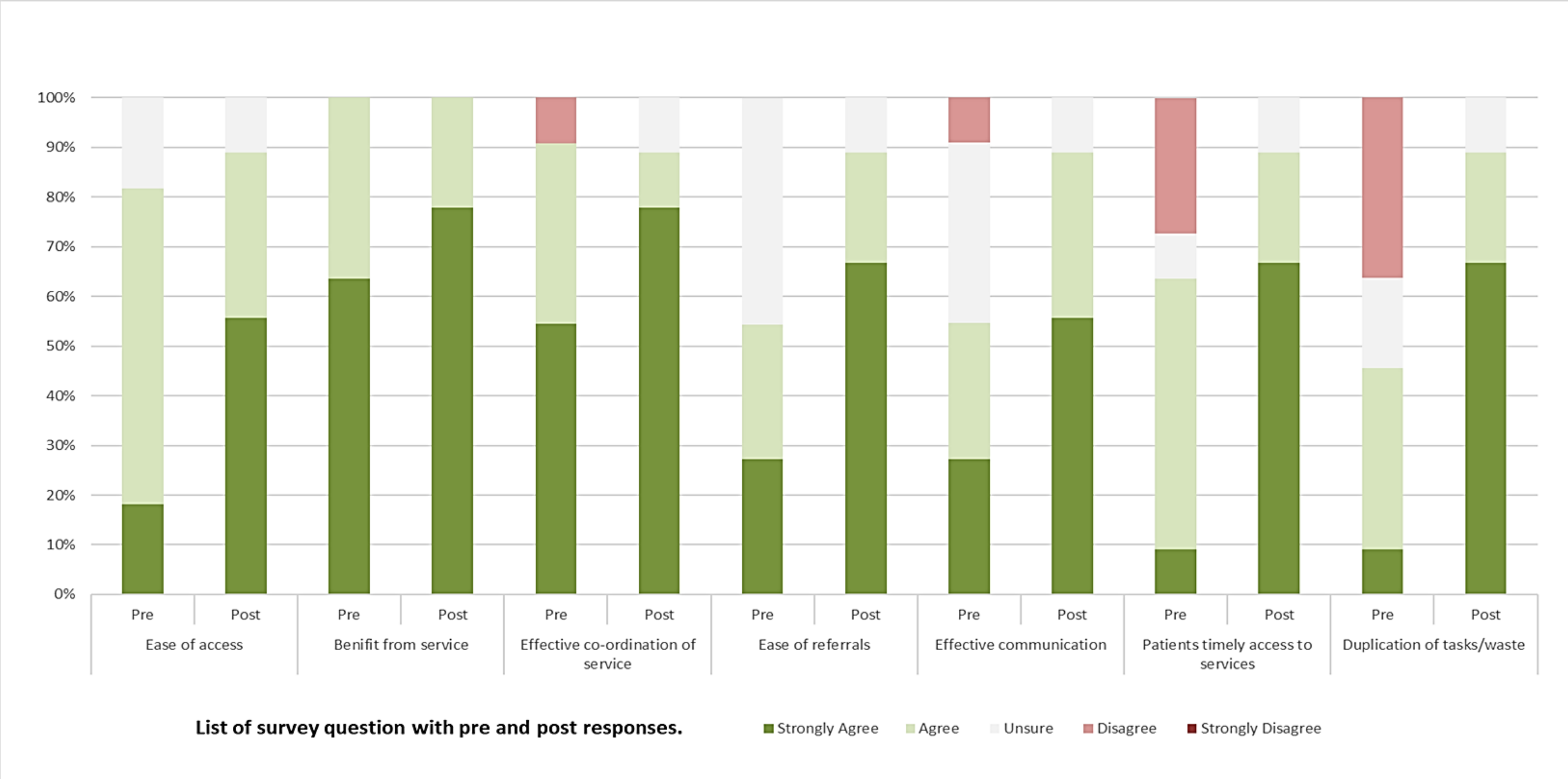
Table adapted from “Assessing the implementation process and outcomes of newly introduced assistant roles: a qualitative study to examine the utility of the Calderdale Framework as an appraisal tool” by S. Nancarrow, A. Moran, L. Wiseman, A.C. Pighills and K. Murphy, Journal of Multidisciplinary Healthcare, p.310, (DOI: 10.2147/JMDH.S35493) Copyright 2012 by Dove Medical Press Ltd.

5.4.2 Surveys

Seventeen staff were emailed the pre-implementation survey with a response rate of 65% (n = 11). Eight respondents were physiotherapists (73%), and three were AHAs (27%). Seventeen staff were emailed the post-implementation survey at the completion of the AHA role implementation, with a response rate of nine (53%), eight physiotherapists (89%) and one AHA (11%).

Overall, respondents were more positive in the post-implementation survey compared to pre-implementation for all questions (Figure 5.3). Prior to implementing the AHA role, approximately 50% of respondents agreed or strongly agreed with most questions (six out of seven questions). In the post-implementation survey, approximately 90% of staff agreed or strongly agreed that there was ease of access and referrals to physiotherapy services, physiotherapy services were effective and timely, and there was effective communication. The greatest change in agreement was noted for duplication of tasks occurring in the physiotherapy service, increasing from approximately 45 % to 89%.

Figure 5.3: Staff Perceptions of CF physiotherapy Care Delivery Pre- and Post-Implementation of an AHA Role using the Calderdale Framework.

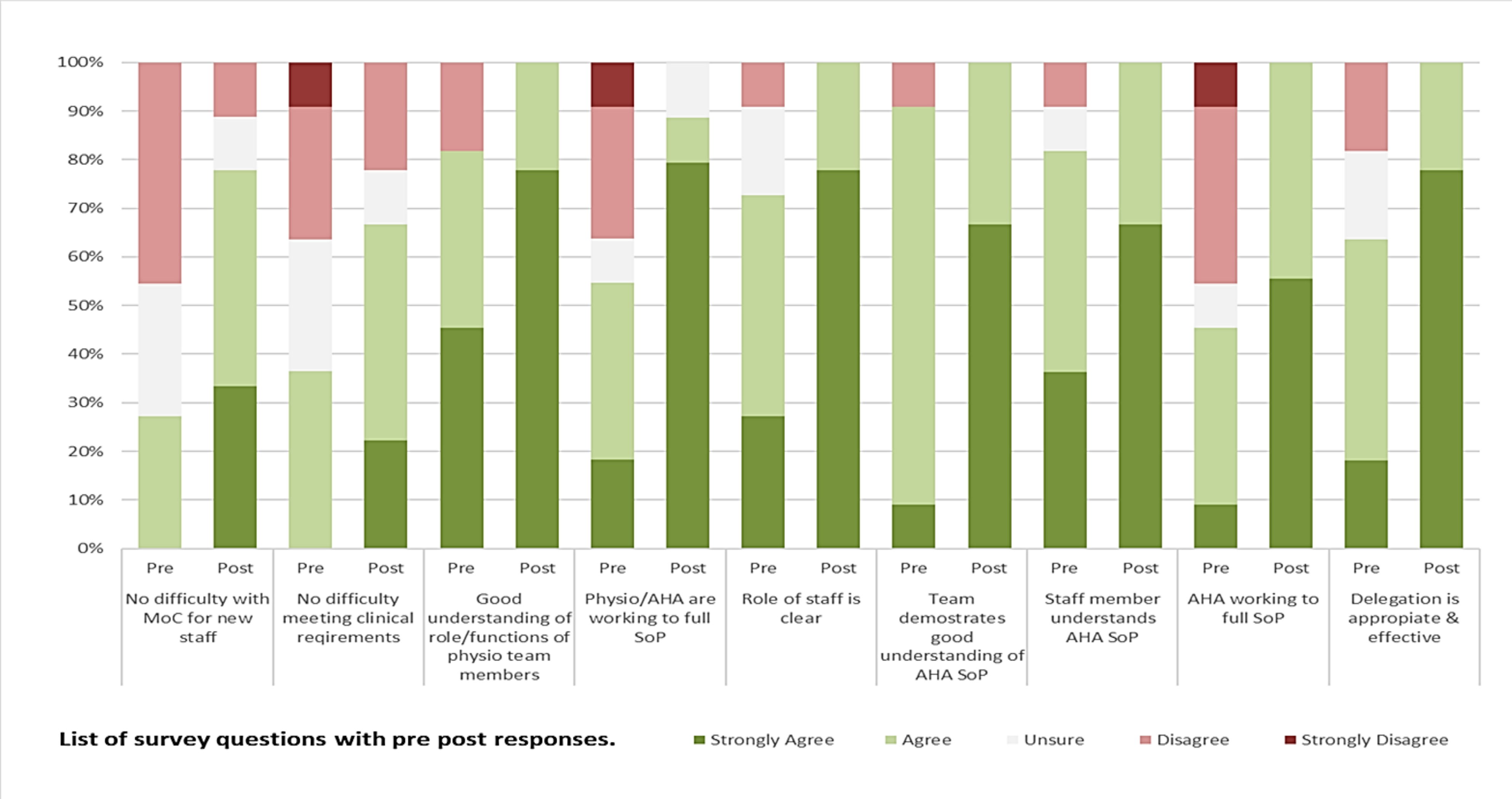


Staff perceptions regarding the roles and functions of the various CF physiotherapy team members, including AHAs, are presented in Figure 5.4. Approximately 25% to 50% of respondents prior to the implementation of the AHA role strongly disagreed, disagreed or were unsure that CF staff were meeting expected clinical requirements and working at full scope of practice. In the post-implementation survey, 100% of respondents agreed or strongly agreed that they had a good understanding of staff roles and functions, AHA scope of practice and perceptions of appropriate and effective delegation. Despite the positive shifts, approximately 45% of respondents remained unsure or disagreed that the clinical service requirements were being met by adding the new AHA role (Figure 5.4).

The pre-and post-implementation survey responses regarding the serviceability of the Calderdale Framework for facilitating implementation of the AHA role are reported in Table 5.9. Prior to implementation, approximately 40% of staff strongly agreed with most questions about the value, perceived patient benefits and support for the Calderdale Framework use. Post-implementation, approximately 80% of respondents strongly agreed with positive statements about using the framework.

In open-ended questions, respondents indicated positively that "*The study resulted in clear guidelines for appropriate allocation to an AHA in light of the training and competencies they had undergone*" (participant Y). The Calderdale Framework process and outputs gave physiotherapists '*confidence in delegating a range of tasks*' (participant X). Other comments reflected staff perception of a '*much-improved service provision in terms of clinical tasks, much-improved ability for senior staff to perform quality activities or research projects* (participant Z) and allowed increased '*focus on unwell patients by physiotherapists*' (participant W). Finally, staff identified the '*improved awareness of scope of practice for the AHA could be transferable into other physiotherapy areas*' (participant W).

Figure 5.4*:* Staff Perceptions of CF Physiotherapy Team Scope of Practice Pre- and Post- Implementation of an AHA Role using the Calderdale Framework (%).



Note: MoC= Model of Care= model of service delivery; SoP = Scope of practice

Table 5.9: Staff perceptions of the Serviceability of the Calderdale Framework to Implement an AHA Role at Pre- and Post-Implementation.

Questions	PRE n=10 POST n=9	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
				n (%)		
I feel there is value in undertaking this work on the delegation of tasks and optimising the role of the AHA	PRE	4 (36)	5 (45)	1 (9)	0 (0)	0 (0)
	POST	7 (78)	2 (22)	0 (0)	0 (0)	0 (0)
I feel that patients will benefit from this work reviewing the delegation of tasks and optimising the role of AHA	PRE	5 (45)	4 (36)	1 (9)	0 (0)	0 (0)
	POST	7 (78)	2 (22)	0 (0)	0 (0)	0 (0)
I support investigating greater opportunities for task delegation (to AHAs) within the team	PRE	6 (55)	4 (36)	0 (0)	0 (0)	0 (0)
	POST	8 (89)	1 (11)	0 (0)	0 (0)	0 (0)
The work is being driven from within the team	PRE	4 (36)	6 (55)	0 (0)	0 (0)	0 (0)
	POST	6 (67)	3 (33)	0 (0)	0 (0)	0 (0)
I feel I have the knowledge and skills to participate fully in this work	PRE	6 (55)	3 (27)	1 (9)	0 (0)	0 (0)
	POST	8 (89)	1 (11)	0 (0)	0 (0)	0 (0)
I feel my team will benefit from working on our delegation practices	PRE	6 (55)	4 (36)	0 (0)	0 (0)	0 (0)
	POST	7 (78)	2 (22)	0 (0)	0 (0)	0 (0)
I feel I have the time and capacity to participate in this work	PRE	0 (0)	6 (55)	3 (27)	0 (0)	1 (9)
	POST	7 (78)	2 (22)	0 (0)	0 (0)	0 (0)
Management supports this project reviewing the team's utilisation of AHAs	PRE	2 (18)	7 (64)	1 (9)	0 (0)	0 (0)
	POST	5 (56)	4 (44)	0 (0)	0 (0)	0 (0)
I feel the work will positively influence recruitment and retention of staff in the team	PRE	3 (27)	7 (64)	0 (0)	0 (0)	0 (0)
	POST	7 (78)	1 (11)	1 (9)	0 (0)	0 (0)

5.4.3 Semi-structured Interviews

Six staff (four physiotherapists and two AHAs) involved in the service analysis and task analysis sessions were interviewed. Physiotherapists ranged in years of experience from 2 years post-graduation to more than ten years experience. AHAs experience was less than three years.

Following analysis, four themes emerged. The first centred on current care delivery challenges for the CF physiotherapy service. The second theme emerged as the potential benefits of a new AHA role, with the third theme raising the potential non-acceptance of an AHA role. The fourth theme included staff perceptions of the serviceability of Calderdale Framework to implement an AHA role.

Theme 1: Current Physiotherapy Care Delivery Challenges

All interviewed staff indicated that care delivery was restricted by large clinical caseloads where care delivery was impacted, with staff reporting being unable to keep up with referrals and spend adequate time with all patients. *"The balance of volume of patients to treating therapists is out. Physiotherapists are forced to prioritise the kind of care provided to patients as well as which patients are seen"* (P3).

Concerns were identified that current service provision was not meeting some clinical guideline recommendations and CF physiotherapists were not working at full scope of practice. This included limited outpatient care, research, and management activity. *"Patients that are not 'sick' do not get what they need according to guidelines, and these treatments would improve QOL or reduce complications down the track"* (P1). More experienced physiotherapists interviewed perceived less research, quality assurance projects and training being undertaken to move care delivery forward. "*Being able to train newer staff can be a challenge during busy times*" (P5) and *"poses succession planning issues"* (P5).

Theme 2: Potential Benefits Associated with a New AHA Role in the CF Physiotherapy Service

Most staff interviewed identified potential benefits associated with a new AHA role in the CF physiotherapy service. These included increased access to care and changes to the scope of practice for both the AHA and the physiotherapists. Staff identified workload allocation associated with delegation may enable patients to access more or longer treatment sessions, with potential improvements for longer-term outcomes. Increased treatments *"would reduce the frequency of admissions as physiotherapists could get patients 'healthier' before discharge"* (P4). Several staff suggested physiotherapists could consequently undertake more complex treatments. *"Physiotherapists could do more appropriate clinical work that is appropriate to (their) skills and expertise"* (P3). Physiotherapists' scope of practice may change and include *"more time to work within scope and meet clinical guidelines for management of patients with CF"* (P1).

Several staff identified the potential to develop the service through increased research and quality activities. Staff *"could do research which they are currently unable to do, plus more teaching and training for junior staff"* (P2) with resultant increased "*satisfaction in working with patients and (again) better outcomes for patients"* (P2). The new AHA role could allow for new skill and knowledge development in a specialised area for these staff. Several staff suggested this would be considered fulfilling and interesting for the AHA and *"broaden the AHA experience*" (P4) with an *"expanded knowledge base and skill set"* (P5).

Theme 3: Potential Barriers to a New AHA Role – Non-acceptance by Individuals with CF and Staff

A potential barrier identified to role implementation was non-acceptance of the role by individuals with CF and staff in the CF service. Staff perceived that people with CF have significant contact with dedicated CF physiotherapists and potentially have high expectations of ongoing care activity delivered by experienced physiotherapy staff. The strong rapport many individuals with CF have with their physiotherapists could represent a challenge to introducing a new (non-physiotherapist) role. *"Some patients may be reluctant to receive care from an AHA and may refuse to participate, and clinical outcomes may be worse*" (P3) as *"rapport with the patient also plays a part in treatment outcomes"* (P3). *"CF patients are a 'difficult group' - they trust certain providers and are wary of others"* (P1).

The potential lack of understanding and acceptance of a new AHA role within the CF multidisciplinary team was also raised. "*Allied health assistant roles not well understood by other members of the (CF) team or by patients"* (P1). Addressing these barriers with education was suggested by several staff. *"Education with patients will be required so that they understand the* *role of an AHA and accept care from them"* (P1). It would be *"important to consult with the whole multidisciplinary CF team and with patients to give them info on the role of the AHA"* (P3).

Theme 4: Serviceability of Calderdale Framework to Implement an AHA Role

Staff were asked about their current perceptions around the use of the Calderdale Framework to guide the implementation of the new AHA role. The importance of delegation procedures and the changing perceptions of the value and role of an AHA were identified. Additionally, staff were positive about how this study managed time allocation for the Calderdale Framework meetings.

Several staff perceived that delegation procedures were not well understood prior to the Calderdale Framework implementation commencing. They felt there was limited or no training and limited written procedures to guide their practice. This applied to work in the CF service. *"Delegation practices currently not clear or appropriate with no training to date in good delegation practice, no delegation guidelines* (P1). Some staff raised the inconsistency in delegation procedures used in other parts of the hospital. "*Delegation varies across physios where some physios would delegate more, and others would prefer to do things themselves*" (P5) and *"delegation practices are less structured for new physios or if in a hurry"* (P4). Staff acknowledged that the Framework stages supported appropriate task selection for delegation and that delegation training was occurring. *"Something could go wrong with patients as with all interactions, but mitigation strategies have been worked through to address these*" (P4).

Staff suggested the Framework meetings were having a positive influence on the development of a new AHA role. Several physiotherapists suggested that AHA roles were poorly understood. As the Calderdale Framework meetings progressed, this perception changed, reporting better clarification around the role and a greater value perceived for the role. "*The AHA role was initially perceived as low value, but (there is a) growing awareness of the value of AHA role in the team*" (P3). Another participant shared that "*the Calderdale process is helping a lot to clarify the AHA role - which helped us all get on the same page*" (P1).

Finally, positive benefits were associated with running the Calderdale Framework meetings within the already established team meetings. Participants felt adequate time was allowed to work through the stages and that there was a collegiate approach, including both physiotherapists and

AHAs. *"Time allocation to the project was reasonable and good to include in team meeting times. Another time unlikely to have worked"* (P2), and *"the time allocated was necessary and not onerous"* (P4). "*It was a good idea to invite everyone to get everyone's perspective and make everyone feel included*" (P5).

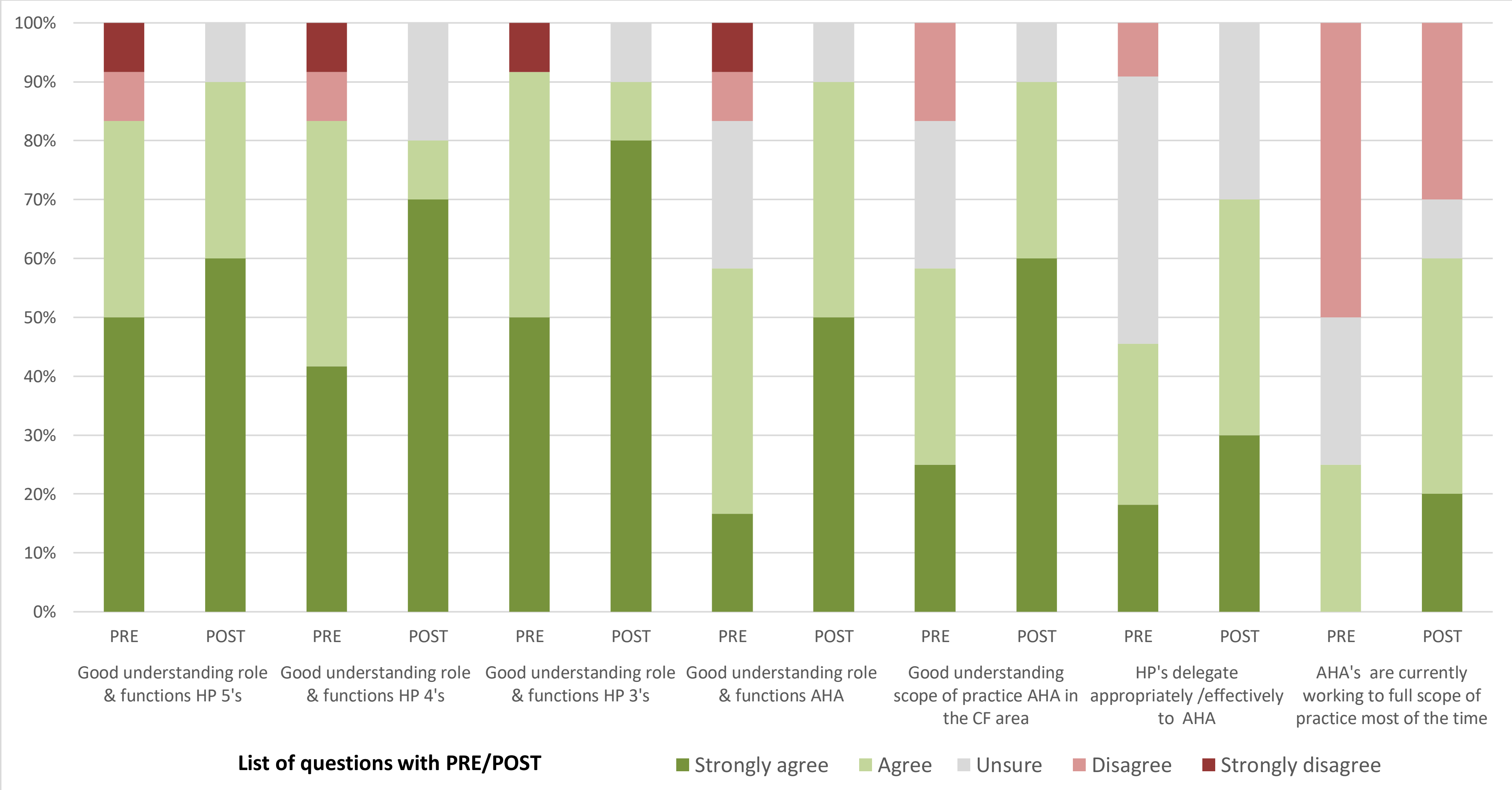
5.4.4 Pre- and Post-Delegation Procedure Surveys

Twelve staff completed the pre-delegation procedure training survey. Ten were physiotherapists (83%), and two were AHAs (17%). Four staff had between one to five years of clinical experience (34%), and eight had more than five years of experience (66%). Only one staff member had previously undergone delegation training (8%). Ten staff (83%) completed the post-delegation procedure training survey, eight physiotherapists (80%) and two AHAs (20%).

5.4.4.1 Roles and scope of practice for the AHA

Staff understanding of all roles and functions of the physiotherapy and AHA staff appeared to increase after undertaking training (Figure 5.5). Approximately 41% of respondents were unsure or disagreed/strongly disagreed that they understood the role, function, and scope of practice of an AHA in an acute respiratory area. Following delegation training, approximately 90% of respondents agreed or strongly agreed that they understood these concepts.

Figure 5.5*:* Perceptions of Physiotherapy and AHA Roles and Functions in the Acute Respiratory Service.



5.4.4.2 Staff confidence and understanding of responsibilities and roles associated with delegation procedures

After delegation training, respondents indicated increased confidence in their understanding of the competency requirements for delegation, delegation roles and responsibilities for both physiotherapy and AHA staff and the overall procedure for delegation, increasing from approximately 58 – 66% confidence to 90% after training (Figure 5.6). Notably, no respondents reported feeling unconfident in these areas after training, compared to between 17% and 25% before training (Figure 5.6).

After training, all respondents reported being able to identify patients appropriate for physiotherapists to delegate clinical care activities, increasing from 83% pre-training. Further, 100% of respondents understood the “when to stop” CTI, up from 33% at pre-training.

Staff also evaluated the delegation practices training to appraise their overall learning experience (Table 5.10). Most staff reported strongly agreeing or agreeing with statements about their understanding of delegation after training was undertaken. Free text responses suggested respondents appreciated the training process occurring within team meeting time (four responses). Respondents also suggested improvements to the training, such as less video content and more relevant and practical examples of delegation (four responses).

Figure 5.6: Confidence in Understanding Competency for and Roles and Responsibilities in Delegation Procedures.

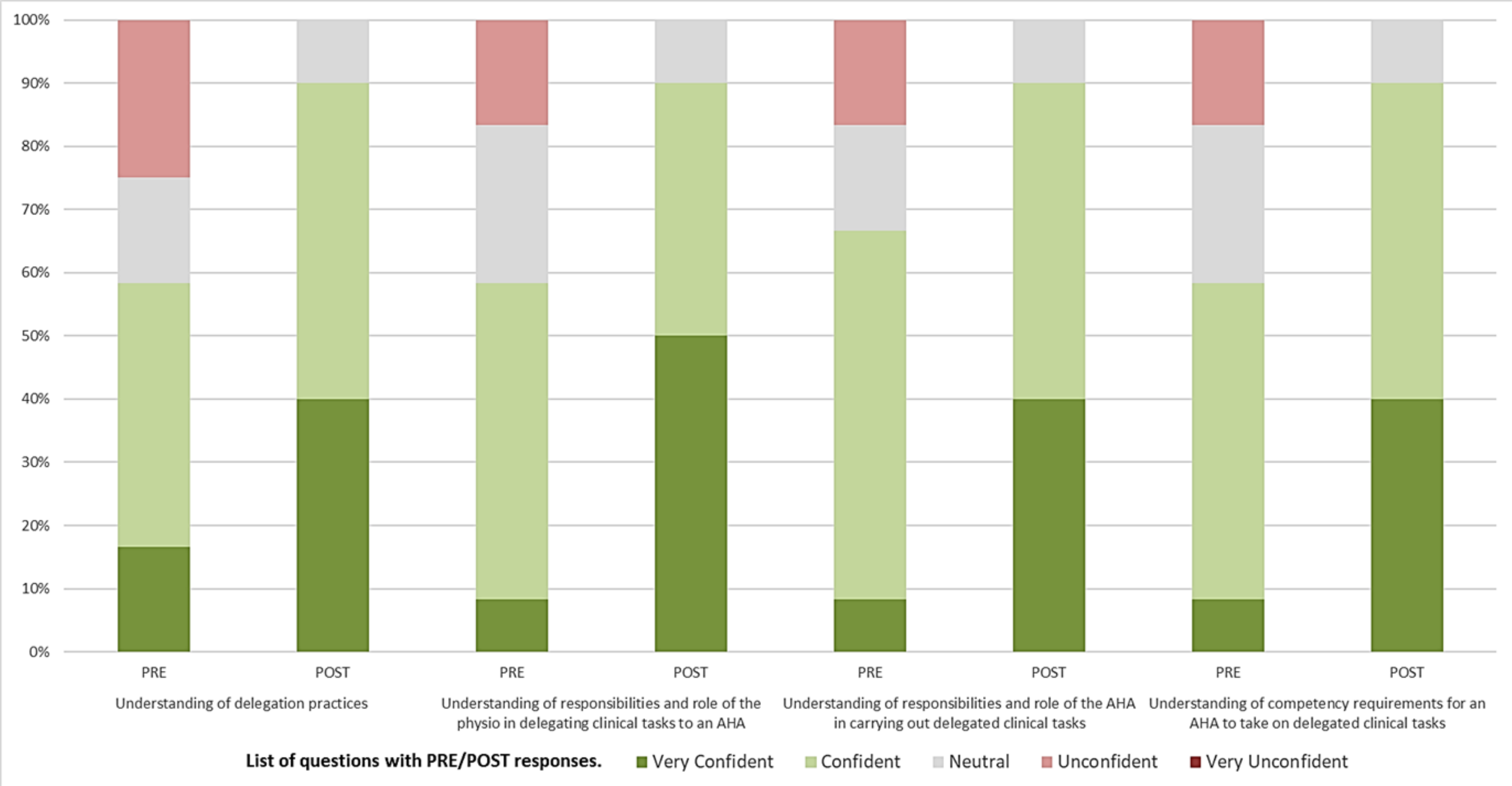


Table 5.10: Post-Delegation Procedure Training Evaluation Responses.

Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
			n (%)		
I understand delegated practice in the context of a model of care as opposed to the delegation of individual tasks	4 (40%)	5 (50%)	1 (10%)	0 (0%)	0 (0%)
I can describe the scope, roles and responsibilities of the allied health professional and the allied health assistant in a delegation relationship	2 (20%)	7 (70%)	1 (10%)	0 (0%)	0 (0%)
I understand the concept of structural delegation as it applies to clinical supervision within a delegation relationship	3 (30%)	6 (60%)	1 (10%)	0 (0%)	0 (0%)
I can discuss the concepts of responsibility and accountability as they apply to allied health professionals and allied health assistants	3 (30%)	6 (60%)	1 (10%)	0 (0%)	0 (0%)
I can apply systems to assist implementation of models of care incorporating allied health assistants	4 (40%)	5 (50%)	1 (10%)	0 (0%)	0 (0%)
I understand and apply the five rights of delegation	2 (20%)	6 (60%)	2 (20%)	0 (0%)	0 (0%)
I can describe the elements of effective teamwork as they apply in delegated practice	3 (30%)	6 (60%)	1 (10%)	0 (0%)	0 (0%)
I can provide effective performance feedback to team members	3 (30%)	6(60%)	1 (10%)	0 (0%)	0 (0%)
I understand the role and application of situational leadership to delegation practices and clinical supervision	3 (30%)	5 (50%)	2 (20%)	0 (0%)	0 (0%)
I found this workshop to be useful to my professional practice	2 (20%)	6 (60%)	2 (20%)	0 (0%)	0 (0%)

5.5 Discussion

This study examined the real-world application of the Calderdale Framework as a workforce redesign system to implement an AHA role within an acute respiratory physiotherapy service in the Adult CF service. It appears the Calderdale Framework was a useful workforce design system for implementing this new clinical AHA role. Through application of the stages of the Framework, the AHA role was developed. Clinical and non-clinical tasks were identified that could be delegated to an AHA in an adult CF physiotherapy service. Competency training for the AHA and training in delegation procedures for all staff, with an emphasis on risk mitigation, occurred. Where there were no existing training resources for the tasks, new comprehensive clinical task instructions, guidelines and other resources were developed to underpin training and safely implement this delegation model of care delivery. Staff perceived the Calderdale Framework implementation as a positive experience, resulting in a consensus-driven set of clinical and non-clinical tasks that could be delegated to the AHA. Staff reported a positive change in their perceptions of the value and role of an AHA in this acute respiratory setting and increased their confidence in understanding delegation procedures. The benefits associated with how this study efficiently managed time allocation for the Calderdale Framework meetings were considered necessary by staff. Overall, the Calderdale Framework stages facilitated a seamless embedding of the new AHA role into the physiotherapy service.

Health service workforce redesign by nature is complex, and workforce redesign systems are known to optimise success in the redesign process (Nolte et al., 2018; Workforce Strategy Branch Queensland Health., 2020). Therefore, a workforce planning system was deliberately included in the study design. The comprehensive completion and outputs from six of the seven stages of the Framework were reported in this chapter. The seventh stage involves the evaluation over time of the AHA role, including evaluating and embedding aspects of the role and competency training into local induction procedures. The seventh stage could not be completed in full for practical reasons as no additional funding was available for the continuation of the AHA role after the final three months of data collection. Partial or non-completion of Calderdale Framework stages in implementation studies have been described previously (Nancarrow, Moran et al., 2012) and could be considered a limitation to the success of the implementation processes and outcomes for AHA roles (Nancarrow, Moran et al., 2012). Stage seven was the only stage of the Calderdale Framework that was not completed entirely. The Calderdale Framework stages completed in this current study incorporated key inclusions considered critical to successful workforce redesign, such as clear communication strategies, executive support, governance structures, training, and involvement of the whole team (Barrett et al., 2015; Imison et al., 2016; Nolte et al., 2018). Additionally, the Framework implementation focused on local context and allowed sufficient time for the CF physiotherapy service to understand and embed the new role. These are also key factors that support successful implementation of new roles in health workforce redesign (Ovretveit, 2011).

Management support and dedicated staffing to drive the stages are identified as significant contributors to positive outcomes in health workforce redesigns (Nolte et al., 2018; Payne et al., 2011; Santos et al., 2020; Smith & Duffy, 2014; Tempfer & Nowak, 2011). Initial awareness raising sessions engaged all identified key stakeholder groups in the physiotherapy department and the CF service. Such broad and inclusive communication, which resulted in support from relevant stakeholders and managers, contributed to success of this research and has been identified as critical to successful workforce redesign (Hastings et al., 2014; Nancarrow, 2015; Nolte et al., 2018; Payne et al., 2011; Workforce Strategy Branch Queensland Health., 2020).

The Framework is known for its focus on developing positive, inclusive, consensus-driven staff culture and decision-making (Patterson et al., 2015; Smith & Duffy, 2010), with these characteristics known to support skill mix redesign (Buchan et al., 2016; Duckett & Breadon, 2014; Nolte et al., 2018). The physiotherapy and AHA staff working in the acute physiotherapy team, including the CF physiotherapy team, participated in the stages of service analysis, task analysis, competency identification and training. The service and task analysis stages were comprehensive, allowing the staff to objectively identify suitable tasks for delegation with consensus. The CF physiotherapy staff trained the AHA to undertake clinical and non-clinical skills. Importantly this training continued at daily handovers and/or when the AHA reported back to the delegating therapist after completing a delegated task. The AHA attended all physiotherapy new graduate training and in-services. The engagement with AHA and physiotherapy staff using the structured and systematic Framework stages resulted in less ambiguity and an increased understanding of the scope of practice for the new AHA role by all staff. This finding is not surprising as inclusive, consensus-driven processes that engage the local staff responsible for care delivery have been shown to result in positive and sustainable outcomes in AHA role development (Buchan et al., 2016; Dorning & Bardsley, 2014; Imison et al., 2016; Lizarondo et al., 2010).

Currently, there are no published data examining whether an AHA role can undertake delegated clinical tasks within an acute respiratory setting. The limited evidence for AHA roles in other acute care services focuses on delegation of exercise, primarily mobilisation and increasing activity in rehabilitation and surgical areas of hospitals (Boden, 2015; Snowdon et al., 2020). In this current study, AHA competency was gained in performing a range of delegated airway clearance tasks, field exercise tests, and supervising a range of delegated exercise programs that physiotherapists in acute respiratory services routinely perform. Additionally, the AHA undertook tasks associated with acute physiotherapy respiratory care activity, including managing airway clearance equipment, high-flow oxygen delivery and non-invasive ventilation equipment used by physiotherapists in direct patient care activity. Thus, this current study has established that an AHA can perform these routine clinical tasks competently with appropriate training. The next stage of this program of research will investigate the practical outputs associated with the new AHA role, i.e., what clinical tasks were undertaken by the AHA and whether these were performed safely. This is discussed in Chapter 6.

A benefit of the Calderdale Framework is the use of a risk management process in determining if tasks are suitable for delegation (Allied Health Professions Office of Queensland, 2016a; Queensland Health, 2016; Smith & Duffy, 2010). Risk-mitigating solutions were identified and implemented using the Calderdale Framework stages and specifically designed tools. These included developing CTIs and WPIs, undertaking a comprehensive AHA competency training program, formal training in delegation procedures for staff, daily patient allocation processes, use of a template to document in patient records, and feeding back to the delegating therapist after task completion and regular AHA supervision. These elements contributed to the successful establishment and embedding of this new AHA role (Moran et al., 2015; Moran, Nancarrow, Enderby et al., 2012; Moran, Nancarrow, Wiseman et al., 2012; Munn et al., 2013; Sarigiovannis et al., 2021). Importantly, these elements required consensus amongst staff to develop and deliver. Without the use of the risk management framework to identify solutions, risks may have been perceived as barriers, and the new AHA clinical tasks may have been deemed unsuitable for delegation. Both physiotherapists and AHAs raised these concerns in the interviews at the commencement of the study. A recent systematic review and meta-analysis examining delegation practices to AHAs (Snowdon et al., 2020) highlighted the paucity of evidence that described details of the tools, competency training, and supervision provided to AHAs within study designs.

Clinical task instructions are comprehensive training documents with all-inclusive guidelines available to support their development (Smith & Duffy, 2014). Due to the rigour of their development, the Framework suggests that CTIs be made available for broader distribution throughout organisations once endorsed by an appropriate governance body (Smith & Duffy, 2014). Within the context of this study, this would be the Allied Health Professions Office of Queensland (AHPOQ). It was envisaged that these comprehensive documents could become available for broader distribution within the state hospital system and therefore support the standardisation of AHA delegation training for specific clinical respiratory physiotherapy tasks. Unfortunately, this endorsement was not achieved when writing this thesis. Factors that may have contributed to the lack of progression included a potential lack of understanding that risk mitigation is intrinsic to the Calderdale Framework and that training and support systems underpin CTI development. Identifying key stakeholders at senior levels of management across the broader governance body and informing and educating them about the Framework, particularly the risk mitigation strategies, should be a consideration for future research using this methodology.

Staff reported high overall support for using the Calderdale Framework to develop and implement the AHA role. They perceived value in undertaking the stages to develop the new AHA tasks to optimise the AHA role. The awareness raising, service analysis and task analysis sessions were abridged to enable participation by clinicians in already scheduled team meetings. This was a pragmatic decision to minimise the time away from clinical tasks for staff and the potential to unnecessarily protract skill mix changes if full-day meetings were required, as suggested by the Framework (Smith & Duffy, 2014). Clinical staff appreciated this approach, reporting having time and capacity to participate in the stages. If the stages of the Framework had been undertaken as full-day offline sessions, it is possible that staff outcomes could have been different to those currently reported. This study has demonstrated, however, that the Calderdale Framework appears to have retained its benefits as a workforce redesign system, even when some elements (awareness raising, service analysis and task analysis) are abridged to suit the local context. Tailoring the workforce redesign system to meet local needs resulted in perceived value and reduced workload burdens for staff in this study, which are important factors consistently reported by others as underpinning successful workforce redesign (Hastings et al., 2014).

Importantly physiotherapy and AHA staff supported ongoing investigation of more opportunities for role development and task delegation to AHAs associated with using the Framework. This is important as previous studies have discussed that staff concerns relating to developing AHA roles can be a potential barrier to success, particularly where new skill development occurs (Hastings et al., 2014; Imison et al., 2016; Smith & Duffy, 2014). Uncertainty regarding AHA responsibilities, protectionism by physiotherapists regarding their roles and general staff non-acceptance of an AHA role are known barriers to AHA implementation (Imison et al., 2016; Lizarondo et al., 2010; Moran et al., 2015; Patterson et al., 2015; Sarigiovannis et al., 2021). Where the AHA role in this study was initially poorly understood by staff, working through the Framework stages improved understanding for all team members. In fact, staff reported an increased understanding of all the CF physiotherapy services' roles. The Framework stages appear to have addressed a barrier to staff non-acceptance of a new AHA role in this acute respiratory service.

One strategy in this study likely contributing to successful implementation was including an AHA group awareness raising meeting during the early stages of the study. This allowed AHAs to raise concerns about the new role independently of management and physiotherapy staff. Potential concerns included expectations that AHAs may have to undertake tasks that were more complex than they were trained for, possibly causing preemptive stress. Additionally, all staff had opportunities to raise concerns in small team meetings throughout the stages. Facilitators also ensured that consensus for decisions regarding inclusions for the new AHA occurred and were documented. Addressing such concerns and any potential impact on staff is considered vital during a redesign process (Barrett et al., 2015; Stanhope & Pearce, 2013) and contributed to the positive outcomes of this study.

Delegating clinical tasks to AHAs is a complex and multi-layered process (Moran, Nancarrow, Enderby, et al., 2012; Moran, Nancarrow, Wiseman, et al., 2012). Improved workforce capacity has been shown when physiotherapists demonstrate appropriate supervision and delegation skills required for delegation to AHAs (Allied Health Professions Office of Queensland, 2013; Somerville et al., 2015, 2018). Conversely, not delegating clinically appropriate tasks to AHAs limits the scope of practice for all staff (Somerville et al., 2018). Therefore, dedicated delegation training was included and undertaken for all clinical staff working in the CF and Thoracic medicine teams. Indeed, results from the pre-and post-delegation training surveys and interviews suggested that participating staff needed to improve skills in delegation, with most staff reporting no prior formal delegation training and raising concerns re current delegation practices in the hospital. The lack of training is a known barrier to effective AHA delegation and is consistent with previous studies (Kuipers et al., 2015; Somerville et al., 2015; Stanhope & Pearce, 2013; Stute et al., 2013).

All staff reported improved confidence in their understanding of delegation roles, responsibilities, competencies, and procedures after the training. Importantly, staff felt they could now identify patients appropriate for physiotherapists to delegate clinical care activity to the AHA. Of note is the lack of clarity about AHAs' scope of practice (Kuipers et al., 2015; Lizarondo et al., 2010; Stute et al., 2013) and an unwillingness to delegate clinical tasks due to a lack of education about roles and accountability and responsibility for tasks (Snowdon et al., 2020; Somerville et al., 2018; Stute et al., 2013, 2014) are known barriers to effective delegation practices. These barriers have been addressed with the Framework risk mitigation strategies and incorporating the delegation training. The formal delegation training contributed, therefore, to the AHA role implementation.

Limitations:

There are several limitations to this study. The study was supported by a grant that allowed for the appointment of a supernumerary AHA role during competency training and clinical data collection periods. Sourcing dedicated funding for new roles could be seen as a limitation of the generalisability of this study's outcomes. Sourcing trained Calderdale Framework facilitators to support the implementation may be another limiting factor. Facilitators were responsible for organising meetings and outputs from the stages. The Calderdale Framework suggests that staff within teams should ideally be identified in the early stages to be 'champions' and take responsibility for keeping the workforce redesign process moving forward and producing the outputs (Allied Health Professions Office of Queensland, 2016b; Smith & Duffy, 2014) to address this potential problem. The facilitators' role is therefore minimised and therefore could be used efficiently.

Whilst other workforce redesign systems may be implemented without the need for formally trained facilitator roles, key inclusions must be addressed. These include the involvement of leadership, management, and wider stakeholder groups to ensure advocacy and support; effective communication processes, ongoing monitoring, feedback, and evaluation of the redesign processes; and dedicated and continuing resources to enable these functions and processes to be developed and sustained (Hastings et al., 2014; Imison et al., 2016; Nolte et al., 2018; Workforce Strategy Branch Queensland Health., 2020). For successful AHA role development and implementation, dedicated team members and project management does need to occur.

There was an inherent limitation with the survey data. The eligible number of participants and response rates were low, so that no statistical analysis could be performed. The latter is typical of most qualitative research, however and not unexpected. Purposeful sampling accounts for the initial low eligibility numbers. Since small numbers of staff were involved in the study, anonymity was assured for all survey and interview invitees to increase both response rates and the integrity of responses. The number of participants interviewed was also small, reflecting a pragmatic decision around time constraints to carry out interviews. Interviews were not transcribed verbatim but clarified and summarised into statements at the time of the interview. Experience and expertise were sought to develop all surveys, with the content based on available validated tools. The aim was to gather meaningful and focused data from the small number of participants. However, surveys underwent pilot testing only using a small sample number. This was a pragmatic decision due to the study's time and staffing constraints.

In order to enhance health workforce redesign research, it is crucial to involve patients in the methodology (Duckett & Breadon, 2014; Nancarrow, Roots, Grace, et al., 2013; Rolfe et al., 2019). By doing so, numerous benefits can be achieved, such as meeting patients' needs, ensuring the delivery of quality and safe care, and sustaining or improving healthcare (Duckett & Breadon, 2014; Nancarrow, Roots, Grace, et al., 2013). Patient engagement in health research has been shown to increase feasibility, acceptability, and alignment of research outcomes with the real-world requirements of patients (Forsythe et al., 2019). Consequently, it is recommended to include patient engagement as an integral part of future workforce redesign processes. Although patients were involved to a limited extent in this research program, providing input into the development of patient surveys used in Study 4, there is a dearth of research exploring patients' perspectives on changes to care delivery resulting from the development of an AHA role (Nancarrow, Roots, Grace, et al., 2013). This program aimed to address gaps in the literature by incorporating Study 4, which focuses on patients' perspectives. However, it should be noted that patient engagement in other aspects of the research design did not occur. This was a consequence of the time frame associated with the grant finding which did not allow for this important aspect of research design. This is recognised as a potential weakness of the study design.

5.6 Conclusion

The Calderdale Framework proved useful for developing and implementing a clinical AHA role within this acute respiratory physiotherapy service. Staff perceived the Calderdale Framework implementation as a positive experience, resulting in a consensus-driven set of clinical and non-clinical tasks that could be delegated to the AHA. Staff reported a positive change in their perceptions of the value and role of an AHA in this acute respiratory setting. The outcomes highlight the need for both physiotherapists and AHAs to participate in delegation training to optimise the value of the AHA workforce and enable physiotherapists to work towards full scope. The pragmatic and, at times, abridged application of the Calderdale Framework in this research was appreciated by staff, appeared not to compromise outcomes, and enabled whole of team engagement.

Chapter 6 - Study 3

Physiotherapy service provision in a specialist adult cystic fibrosis service: a pre-post design study with the inclusion of an allied health assistant.

Once the AHA role had been established within the CF physiotherapy service using the workforce redesign system, the new CF care delivery was examined. Study 3 describes the changes to the physiotherapy care delivery within a tertiary adult CF service with the addition of an AHA into the CF physiotherapy service. This study describes changes to care delivery in terms of the service provision, scope of practice, skill mix and any safety implications for patients and staff due to the new care delivery model. Outcomes associated with a changed care delivery model using an AHA role as part of CF physiotherapy services have not previously been described.

This chapter has been published, and the content of this chapter comprises the content included in the paper.

Hall, K., Maxwell, L., Cobb, R., Steele, M., Chambers, R., Roll, M., Bell, S., & Kuys, S. (2021). Physiotherapy service provision in a specialist adult cystic fibrosis service: A pre-post design study with the inclusion of an allied health assistant. *Chronic Respiratory Disease*,*18*, https://doi.org/10.1177/14799731211017895

Please note that the term 'physiotherapy care delivery' used throughout this Thesis was replaced by the term 'physiotherapy service delivery' for publication purposes. The term implementation was changed to inclusion in the publication also.

6.1 Abstract

Background/Aims: Examination of physiotherapy care delivery in a large tertiary adult CF service established recommended clinical guidelines were not being met for several aspects of care delivery. An innovative service redesign was proposed to develop and implement an AHA role as part of CF physiotherapy services. This study aimed to establish the impact of including an AHA role in physiotherapy care delivery in an acute respiratory service.

Methods: A pragmatic pre-post design study examined physiotherapy care delivery across two three-month periods: current care delivery [P1] and current care delivery plus AHA role [P2]. Clinical and non-clinical activity quantified as number, type, and duration (per day) of all staff activity and categorised for skill level (AHA, junior, senior).

Results: Physiotherapy care delivery increased in P2 compared to P1 ($n = 4730$ vs $n = 3048$). Physiotherapists undertook fewer respiratory ($p < 0.001$) and exercise treatments ($p < 0.001$) but increased patient reviews for inpatients ($p < 0.001$) and at multidisciplinary clinics in P2 (56% vs 76%, $p < 0.01$). The AHA accounted for 20% of all service provision. Allied health assistant activity comprised mainly non-direct clinical care activity, including oversight of respiratory equipment use (e.g., supply, set-up, cleaning, loan audits) and other patient-related administrative tasks associated with delegation handovers, supervision, and clinical documentation (72%) and delegated supervision of established respiratory (5%) and exercise treatments (10%) and delegated exercise tests (3%). The AHA completed most of the exercise tests ($n = 25$). AHA non-direct clinical tasks included departmental management activities (11%). No adverse events were reported.

Conclusion: Implementing an AHA role in an acute respiratory care service changed physiotherapy care delivery. The AHA completed delegated routine clinical and non-clinical tasks. Physiotherapists increased clinic activity and annual reviews. Including an AHA role offers sustainable options for enhancing physiotherapy care provision in acute respiratory services.

6.2 Introduction

People with CF are living longer, thereby increasing both patient numbers and complexity of clinical care (Bell et al., 2020; Ruseckaite et al., 2019). Demand for care will likely increase, with forecasts suggesting that adults living with CF will increase by 75% between 2015 and 2025.(Burgel et al., 2015; Madge et al., 2017). Notably, these estimates do not incorporate predicted increases in survival associated with cystic fibrosis transmembrane conductance regulator modulator therapies (Bell et al., 2020). International guidelines recommend multidisciplinary and expert care for people with CF (Bell et al., 2008; Castellani et al., 2018). Study 1 demonstrated the effect of limited physiotherapy staffing numbers and skill mix in a large tertiary CF service, where current demand exceeded supply (Chapter 4). Key aspects of CF physiotherapy treatment (respiratory and exercise treatments) (Chapter 4) met the recommended guidelines (Morrison & Parrott, 2020). However, aspects of care delivery such as exercise testing and detailed clinical care review (Chapter 4) did not (Morrison & Parrott, 2020). Other adult CF services appear similarly under-resourced to deliver adult CF services (Madge et al., 2017) and likely face challenges in providing ongoing physiotherapy care delivery and future sustainability of services (Bell et al., 2020; Madge et al., 2017).

Innovative strategies to manage increased care demand, such as remodelling care delivery using AHAs, have been recommended but not for people with CF (Schwarz et al., 2019; Snowdon et al., 2020; Somerville et al., 2018). Allied health assistants are identified as potential cost-effective resources for health service delivery yet appear underutilised (Duckett & Breadon, 2014). AHAs are well received by patients and can perform both clinical and non-clinical tasks (Lizarondo et al., 2010; Munn et al., 2013), thereby enabling AHPs to spend more time performing clinical care activity or other duties (Nancarrow & Mackey, 2005; Stanhope & Pearce, 2013). Comprehensive information about establishing AHA roles and changes to physiotherapy practice associated with such roles in an acute respiratory clinical setting has not been reported (Sarigiovannis et al., 2021).

Study 3 aims to describe the changes to the physiotherapy care delivery within a tertiary adult CF service with the addition of an AHA role into CF physiotherapy. This will establish service provision, scope of practice, skill mix and any safety implications for patients and staff due to the new care delivery model.

6.3 Materials and Methods

6.3.1 Design

A pragmatic pre-post design study was conducted at an adult CF service to examine the delivery of physiotherapy care across two three-month periods: Phase 1 (P1) [September – November 2015] and Phase 2 (P2) [April – June 2016]. Physiotherapy staffing in both phases comprised two full-time equivalent permanent senior CF physiotherapists and two full-time equivalent junior rotational physiotherapists. A full-time equivalent AHA role was included in Phase 2 staffing. A workforce redesign system, the Calderdale Framework, was used to develop the AHA role (Allied Health Professions Office of Queensland, 2016b; Sarigiovannis et al., 2021). This Framework engages staff in a staged systematic approach to reviewing skill mix and developing new roles (Allied Health Professions Office of Queensland, 2016b; Smith & Duffy, 2010).

All CF physiotherapy staff and the AHA were trained in the principles and practices of delegation (Allied Health Professions Office of Queensland, 2016b). Physiotherapy staff delegated activities to an AHA who had been specifically trained to undertake the activities safely (Aggarwal et al., 2010; Allied Health Professions Office of Queensland, 2016b). Training covered direct and non-direct clinical tasks identified using the Calderdale Framework. Clinical tasks included six-minute walk tests and supervision of established inhalation therapy, airway clearance and routine exercise treatments for stable inpatients as delegated by the physiotherapy staff. Non-direct clinical tasks included oversight of respiratory equipment use (including supply, cleaning, and audit of loans) and general administrative duties. A complete list of these tasks can be found in Table 5.7 (Chapter 5). Further information can be found in Chapter 3: section 3.2.2.

6.3.2 Participants

Activity data from physiotherapists, including physiotherapists and AHA, working weekdays delivering physiotherapy care to adults with CF as inpatients or attending outpatient clinics during a three-month period were collected. Activity data from CF physiotherapists working outside business hours, including evenings and weekends, were excluded. Further information can be found in Chapter 3: section 3.2.4.

6.3.3 Procedures

All data collection procedures undertaken in Study 1 were repeated over a three-month period after implementing the AHA role into the CF physiotherapy service. Prospective collection of all outcomes was measured for all inpatient admissions and outpatient clinics at the adult CF service over three calendar months after implementing the AHA role. Demographic data were collected for all patients admitted under the CF service regardless of hospital ward, including age, gender, hospital length of stay, best body mass index and lung function recorded during the 12-month period prior to data collection. Number of people with CF attending outpatient clinics was also recorded over the three-month period.

Physiotherapy activities were collected via the hospital ABC scanning system. Staff scanned from a list of predetermined codes to record direct and non-direct clinical care and non-clinical care activities associated with CF physiotherapy care delivery. Information collected included date, time, activity type, number, and duration of each activity type, who performed the activity, location, and staffing level. Scanning cards and barcode scanner are shown in Figure 3.2. Further information can be found in Chapter 3: section 3.2.4

6.3.4 Outcome Measures

6.3.4.1 Service Provision, Scope of Practice and Skill Mix

All outcome measures collected in Study 1 (pre-AHA implementation: Phase 1) were repeated during Study 3 (post-AHA implementation: Phase 2). The primary outcome was clinical and non-clinical activity that contributed to the delivery of physiotherapy care. Physiotherapy care delivery was described under three categories: service provision, scope of practice and mix of staff (AHA/ junior/senior).

Service provision was quantified as the number of inpatient admissions and outpatient attendances at multidisciplinary clinics and corresponding number seen by physiotherapists as either inpatients or during outpatient clinic attendances. Scope of practice activity was quantified as number, type, and duration (per day) of all staff activity, further categorised for skill level (AHA, junior, senior). Further information can be found in Chapter 3: section 3.2.6.

6.3.4.2 Safety Outcome Measures

The PRIME Clinical Incidents system will record the number and details of any documented clinical incidents or adverse events associated with any physiotherapy or AHA patient intervention (Queensland Government, 2017). Further information about safety outcome measures has been discussed in 3.2.5.3 (Chapter 3). Additional information can be found in Chapter 3: section 3.2.6.4.

6.3.5 Data Analysis

Demographic, service provision, scope of practice and skill mix data were analysed descriptively. Fisher's exact tests were used to determine the differences in care delivery, staff numbers and types of activities across phases. Comparisons between the number of activities per day and duration of activity type on the days these activities occurred between phases for all staff and between junior and senior staff were made using Independent t-tests. Significance was defined as p-value < 0.05. All statistical analysis was performed using SPSS (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp).

6.4 Results

6.4.1 Service Provision

In P1, there were 113 inpatient admissions and 385 patient attendances at multidisciplinary outpatient clinics (henceforth called clinics). In P2, there were 111 inpatient admissions and 352 patient attendances at clinics. All inpatients across both phases received direct clinical care activity through the physiotherapy service. Physiotherapists saw a higher proportion of attendees at clinics in P2 (268 (76%) vs 215 (56%), absolute risk difference 20% (95% confidence interval 13 to 27).

6.4.2 Scope of Practice

Physiotherapy care activity (n, %) for all staff across the phases is described in Table 6.1. Overall, the physiotherapy service undertook more activity in P2 (n = 4730) compared to P1 (n = 3048).

Table 6.1: Number (percent total activity) of Clinical and Non-clinical Care Activities by All Staff (physiotherapists and AHA) across Phase 1 and 2. Comparisons between Phases for All Staff (number (%).

Activity	All Staff		
	Phase 1 n (%)	**Phase 2** n (%)	Fisher's exact test (p)
Direct clinical care			
Respiratory Treatment	1058 (35)	830 (18)	<0.001
Exercise Treatment	338 (11)	350 (7)	<0.001
Exercise Test	20 (1)	40 (1)	0.426
Multidisciplinary team clinics	215 (7)	268 (6)	0.01
Reviews	79 (3)	342 (7)	<0.001
Other Treatment##	29 (1)	20 (0)	<0.01
Total direct clinical care	*1739 (57)*	*1850 (39)*	
Non-direct clinical care			
Patient-related documentation, communication and management###	749 (25)	1796 (38)	<0.001
Equipment management####	102 (3)	273 (6)	<0.001
Total non-direct clinical care	*851 (28)*	*2069 (44)*	
Total clinical care	*2590 (85)*	*3919 (83)*	
Non-clinical care			
Management	326 (11)	587 (12)	0.037
Teaching & training	128 (4)	187 (4)	0.56
Research	4 (0)	37 (1)	<0.001
Total non-clinical care	*458 (15)*	*811 (17)*	
Total Activity	*3048*	*4730*	

Notes: Reviews include physiotherapy annual review assessment and/or detailed reviews of specific management; ##Other includes routine musculoskeletal and incontinence management and other clinical care activity not covered in other categories; ### Patient-related documentation and communication include documentation of clinical care related to patients and all other clinical documentation related to patient care administration and other patient-related clinical activities (handovers, weekly patient review meetings) not covered in other categories;####Equipment management includes time taken to manage (supply/setup clean/order) patients respiratory/oxygen therapy equipment. Please refer to Table 3.3 for a full description of activity code inclusions.

6.4.2.1 Physiotherapist Activity

Table 6.2 presents the activity undertaken by physiotherapists and AHA for both phases. Overall, the number and percentage of clinical care activities undertaken by physiotherapists across the two phases were similar (85 vs 81%), with some differences between phases for specific activities (Table 6.2). In P2, physiotherapists undertook fewer respiratory and exercise treatments, and patient reviews increased from 79 to 342. Patient-related clinical administrative tasks such as documentation, handovers, attendance at ward rounds and discussions within the multidisciplinary team increased from 25% in P1 to 36% in P2. Activity associated with managing patients' equipment needs by the physiotherapists reduced in P2. Non-clinical care activities of research and management increased from P1 to P2. Teaching and training remained unchanged (Table 6.2).

Table 6.2: Number (percent total activity) of Clinical and Non-clinical Care Activities Undertaken by Physiotherapists and AHA for each Phase.

Activity	Phase 1	Phase 2	
	Physiotherapists	Physiotherapists	AHA
	n (%)	n (%)	n (%)
Direct clinical care			
Respiratory Treatment	1058 (35)	778 (21) ***	52 (5)
Exercise Treatment	338 (11)	257 (7) ***	93 (10)
Exercise Test	20 (1)	15 (0)	25 (3)
Multidisciplinary team clinics	215 (7)	268 (7) **	0
Reviews	79 (3)	342 (9) ***	0
Other Treatment	29 (1)	19 (1) *	1 (0)
Total direct clinical care	*1739 (57)*	*1679 (45)*	*171 (18)*
Non-direct clinical care:			
Patient-related documentation, communication and management	749 (25)	1363 (36) ***	433 (45)
Equipment management	102 (3)	19 (1) ***	254 (26)
Total non-direct clinical care	*851 (28)*	*1382 (37)*	*687 (72)*
Total clinical care	*2590 (85)*	*3061 (81)*	*858 (90)*
Non-clinical care			
Management	326 (11)	485 (13) *	102 (11)
Teaching & training	128 (4)	187 (5)	0
Research	4 (0)	37 (1) ***	0
Total non-clinical care	*458 (15)*	*709 (19)*	102 (11)
Total Activity	*3048*	*3770*	*960*

*Note: * p<0.05; ** p=0.01; *** p<0.001, p values based on Fisher's exact test of the difference between phases*

6.4.2.2 AHA Activity

The AHA completed 960 activities in P2, representing 20% of all physiotherapy service provision (Table 6.2). The majority was non-direct clinical care activity (n = 687, 72%), however, delegated direct clinical activity, including respiratory (n = 52 (5%) and exercise treatments (n = 93, 10%)

occurred, contributing to the overall increase in numbers of exercise treatments undertaken by all staff in P2 (Table 6.2). The AHA completed 25 (3%) delegated exercise tests (Table 6.2).

6.4.2.3 Time Taken per Activity by Staff

The mean duration of each episode of activity per day for P1 and P2 for all staff is described in Table 6.3. Time spent on respiratory treatments increased by four minutes per episode in P2. Reduced time was spent on documentation, management, and communication activities per episode in P2 (Table 6.3). Time spent on remaining activity episodes did not change ($p > 0.05$).

Table 6.3: Duration in minutes (mean (SD)) of each episode of activity per day of clinical and non-clinical care activities by all staff for each phase. Mean difference (95% confidence interval (CI)) between the two phases.

Activity	**Duration of each episode of activity per day** (mins)		
	Phase 1 Mean (SD)	**Phase 2** Mean (SD)	Mean difference (95% CI) P2 minus P1
Direct clinical care			
Respiratory Treatment	34 (8)	38 (4)	4 (2 to 6)
Exercise Treatment	41 (7)	39 (6)	- 2 (-4 to 0)
Exercise Test	32 (9)	35 (7)	3 (-2 to 8)
Multidisciplinary team clinics	51 (29)	53 (31)	2 (-11 to 14)
Reviews	42 (10)	41 (11)	-1 (-5 to 4)
Other Treatment	24 (6)	32 (13)	8 (1 to 16)
Non-direct clinical care			
Patient-related documentation, communication and management	25 (14)	10 (5)	-15 (-18 to -11)
Equipment management	27 (12)	36 (15)	9 (3 to 14)
Non-clinical care			
Management	50 (37)	48 (12)	-2 (-12 to 8)
Teaching & training	49 (17)	40 (12)	-9 (-15 to -3)
Research	65 (17)	69 (65)	4 (-62 to 71)

6.4.3 Skill Mix

Overall junior physiotherapists undertook a similar number (Table 6.4) and duration (Table 6.5) of direct clinical care activities in both phases. Direct clinical care activity increased for the number of reviews, and junior physiotherapists commenced non-clinical teaching and training activity in P2. No research activity for junior physiotherapists occurred in either phase (Table 6.4).

Table 6.4: Number (mean (SD)) of clinical and non-clinical care activities per day undertaken by junior and senior physiotherapists across each phase.

Activity	Junior physiotherapists			Senior physiotherapists		
	Phase 1 Mean (SD)	Phase 2 Mean (SD)	Mean difference (95% CI) P2 minus P1	Phase 1 Mean (SD)	Phase 2 Mean (SD)	Mean difference (95% CI) P2 minus P1
Direct clinical care						
Respiratory treatment	8.3 (4.5)	9.5 (3.3)	1.3 (-0.1 to 2.7)	8.3 (8.5)	3.0 (2.8)	-5.3 (-7.5 to -3.0)
Exercise treatment	4.4 (2.1)	3.6 (2.0)	-0.8 (-1.5 to -0.1)	0.9 (1.2)	0.6 (0.7)	-0.3 (-0.7 to 0.0)
Exercise testing	0.2 (0.5)	0.2 (0.4)	0.0 (-0.2 to -0.1)	0.1 (0.4)	0.1 (0.2)	0.0 (-0.2 to 0.1)
Multidisciplinary team clinics	0.2 (0.9)	0.0 (0.1)	-0.2 (0.5 to -0.0)	3.1 (3.2)	4.3 (4.3)	1.2 (-0.2 to 2.5)
Reviews	0.2 (0.5)	1.9 (1.7)	1.6 (1.2 to 2.1)	1.0 (1.3)	3.7 (2.9)	2.8 (1.9 to 3.6)
Other treatment	0.4 (1.1)	0.3 (0.5)	-0.1 (-0.4 to -0.2)	0.1 (0.3)	0.0 (0.2)	0.0 (-0.1 to -0.1)
Non-direct clinical care						
Patient documentation /communication/ management	3.0 (3.7)	8.0 (4.5)	5.0 (3.8 to 6.2)	2.9 (5.5)	14.4 (10.1)	11.5 (8.7 to 14.3)
Equipment management	0.3 (0.6)	0.2 (0.5)	-0.2 (-0.4 to -0.0)	1.3 (2.7)	0.1 (0.4)	-1.1 (-1.8 to -0.4)
Non-clinical care						
Management	2.5 (2.0)	4.7 (1.7)	2.2 (1.5 to 2.8)	2.6 (2.1)	3.2 (1.7)	0.6 (-0.1 to 1.2)
Teaching and training	0*	1.1 (1.5)	1.1 (0.7 to 1.5)	2.0 (1.5)	1.9 (1.2)	-0.1 (-0.6 to -0.4)
Research	0*	0	[a]	0.1 (0.2)	0.6 (0.6)	0.5 (0.4 to 0.7)

Notes: [a]. *t cannot be computed because there were no data for at least one of the groups, * Represents nil activity*

Differences in most clinical care activities were observed for senior physiotherapists between phases (Table 6.4). In P2, senior physiotherapists completed fewer respiratory and exercise treatments but spent longer time per episode compared to P1 (Table 6.5). Senior physiotherapists completed the same number of exercise tests in P2 (Table 6.4), though approximately 16 minutes longer was spent completing each test (Table 6.5). Senior physiotherapists increased the number of inpatient reviews completed per day from 1.0 (SD1.3) in P1 to 3.7 (SD2.9) in P2 (Table 6.4). There was no difference in number or duration of non-clinical care activities for teaching and training, and management for senior physiotherapists. Senior physiotherapists undertook more research activity in P2 (Table 6.4).

6.4.4 Safety Outcomes

No clinical incidents or adverse events associated with physiotherapy or AHA patient intervention were reported to the investigators or through the hospital clinical incidents system (PRIME) (Queensland Health, 2017) across P1 or P2.

Table 6.5: Duration in minutes (mean (SD)) of each episode of activity per day by junior and senior physiotherapists for each phase. Mean difference (95% confidence interval (CI)) between the two phases for junior and senior physiotherapists.

Activity	Junior physiotherapists			Senior physiotherapists		
	Phase 1 Mean (SD)	Phase 2 Mean (SD)	Mean difference (95% CI) P2 minus P1	Phase 1 Mean (SD)	Phase 2 Mean (SD)	Mean difference (95% CI) P2 minus P1
Direct clinical care						
Respiratory treatment	37 (8)	37 (4)	-1 (-3 to 2)	32 (12)	42 (12)	9 (4 to 14)
Exercise treatment	40 (8)	38 (8)	-3 (-5 to 0)	40 (10)	44 (11)	4 (-2 to 9)
Exercise testing	34 (9)	39 (12)	5 (-5 to 14)	26 (5)	43 (3)	16 (9 to 23)
Multidisciplinary team clinics	47 (7)	30 (0)	-17 (-42 to 8)	51 (30)	53 (31)	1 (-11 to -14)
Reviews	38 (11)	39 (10)	1 (-6 to 7)	43 (12)	44 (15)	1 (-5 to 7)
Other treatment	25 (5)	32 (13)	7 (-1 to 16)	22 (8)	35 (9)	13 (-5 to 32)
Non-direct clinical care						
Patient documentation, communication, management	28 (15)	12 (7)	-15 (-19 to -12)	28 (17)	13 (12)	-15 (-20 to -10)
Equipment management	34 (21)	21 (7)	-14 (-25 to -2)	25 (10)	32 (13)	7 (-2 to 16)
Non-clinical care						
Management	43 (21)	41 (12)	-2 (-8 to 4)	63 (90)	52 (23)	-12 (-37 to 14)
Teaching and training	0*	29 (10)	[a]	49 (17)	45 (17)	-4 (-11 to 3)
Research	0*	0*	[a]	65 (17)	69 (65)	4 (-62 to 71)

Notes: [a.] t cannot be computed because there were no data for at least one of the groups, * Represents nil activity.

6.5 Discussion

This study describes the successful development and incorporation of an AHA role in an acute CF physiotherapy service. This redesign was an innovative approach to address care provision challenges associated with increasing age, numbers, and complexity of clinical care for adults with CF (Bell et al., 2020). Redesigning health service delivery, where change is directed towards skill mix reconfiguration and optimising healthcare team capabilities to increase workforce capacity and patient outcomes, is well recognised (Duckett & Breadon, 2014; Sarigiovannis et al., 2021; Snowdon et al., 2020; Somerville et al., 2015, 2018).

Overall, access to physiotherapy care improved according to the multidisciplinary team. Additionally, more patients reported that their care was effective in Phase 2 of the study. Physiotherapists' scope of practice incorporated more advanced skills such as patient reviews and research. In conjunction with delegating suitable tasks to the AHA, physiotherapy care delivery moved closer to benchmarking standards recommended in clinical practice guidelines (Morrison & Parrott, 2020). These findings describe a redesigned acute care respiratory physiotherapy service with increased capability, comprising a new skill mix of an AHA and junior and senior physiotherapists. Similar care delivery models have been shown to improve patient outcomes (Conti et al., 2007; Lizarondo et al., 2010; Munn et al., 2013).

The AHA contributed 20% of overall physiotherapy care delivery, with approximately 90% of their work providing direct and non-direct clinical care activity. Direct care activity included delegated respiratory and exercise treatments. In fact, most of the exercise tests in Phase 2 of the study were completed by the AHA. Previous reports of AHAs providing acute hospital ward-based physiotherapy care include delegated strengthening, and balance exercises and mobilisation occurring in rehabilitation, orthopaedic and general medical wards (Snowden et al., 2020; Stute et al., 2013, 2014) and mobilisation of patients post abdominal surgery (Boden, 2015). To our knowledge, this is the first time AHA workloads have been quantified for specific acute respiratory physiotherapy treatments.

As a likely consequence of the new AHA role, physiotherapists' scope of practice changed. Some exercise treatments and management of patients' equipment appeared to shift to the AHA. Senior physiotherapists completed more patient reviews and increased activity within the clinics and for research. Junior physiotherapists undertook more advanced roles, including teaching, training, and patient reviews. All physiotherapists increased their engagement in patient communication and management activity. Multidisciplinary team members felt the physiotherapy staff could contribute more to clinical care discussions. Clinical guidelines endorse the importance of physiotherapists contributing to multidisciplinary team clinics and inpatient case meetings, research, and education meetings (Bell et al., 2008; Castellani et al., 2018; Morrison & Parrott, 2020). Thus, an AHA role is a possible strategy to optimise this practice for physiotherapists.

Barriers to successfully implementing an AHA role were considered in service redesign planning, particularly safety aspects associated with delivering respiratory care activity. Well-documented barriers to successful AHA role development include pre-existing perceptions of both physiotherapists and AHAs about these roles (Munn et al., 2013; Nancarrow & Mackey, 2005; Sarigiovannis et al., 2021; Stanhope & Pearce, 2013). Other barriers include a lack of clarity regarding tasks being delegated, the need for preparation and training, and an understanding by all staff about accountability and responsibility levels for treatments undertaken by the AHA, requiring supervision and delegation training for all staff (Munn et al., 2013; Sarigiovannis et al., 2021; Snowden et al., 2020; Somerville et al., 2015; Stute et al., 2013). To address these issues, the Calderdale Framework was used to develop the AHA role, with a focus on supporting skill mix redesign and mitigating potential risk. This workforce redesign system has been successfully used in implementing AHA roles (Smith & Duffy, 2010), is patient-focused and engages both AHAs and physiotherapists in a seven-step facilitated process (Effective Workforce Solutions., 2021; Smith & Duffy, 2010).

Using these process tools and a trained facilitator (Allied Health Professions Office of Queensland, 2016a, 2016b; Smith & Duffy, 2014), AHAs and physiotherapists worked together to determine clinical and non-clinical tasks included in the new AHA role. Allied health assistant training was comprehensive, following a taught, modelled, competent methodology (Aggarwal et al., 2010). Competency assessment, clinical governance processes, and delegation documentation and communication procedures were developed. All staff completed a structured delegation training process (Queensland Health., 2013). Training outlined accountability and responsibility levels for physiotherapists and AHAs when supervising and handing over clinical tasks to AHAs (Queensland Health., 2013, 2016).

It is likely, therefore, that the positive implementation and practice outcomes reported can be attributed to the use of a comprehensive workforce development tool. All staff appeared to be engaged in activity at appropriate scope, which included new delegated practices for the AHA and physiotherapy staff undertaking more advanced scope of practice activities required to deliver care to this complex patient group (Sarigiovannis et al., 2021; Smith & Duffy, 2010; Snowdon et al., 2020).

An essential aim of using the redesign tool was to mitigate potential risks. This appears to have been achieved. The delegated clinical treatments undertaken by the AHA in this study appear safe, with no major adverse clinical events reported in the hospital's clinical incident documentation system. Previous safety outcomes in acute care settings are only available for patients delegated exercise and mobility treatments (Boden, 2015; Jones et al., 2006). A recent systematic review supports our findings, reporting no increased risk of harm to patients associated with a broad range of delegated AHA treatments occurring in hospital and community centres (Snowden et al., 2020). We could not collect more extensive safety data (e.g., intermittent desaturation with exercise), which should be included in future research.

Generalisability of our findings should be considered. Using the Calderdale Framework to inform the inclusion of the AHA role was a deliberate strategy to optimise outcomes for the new AHA role and overall care delivery. Other studies developing AHA roles have been less successful (Snowdon et al., 2020; Stute et al., 2013), and this may be due to insufficient planning and training for all team members. Findings from this study suggest that delegated clinical and non-clinical roles could be established in other centres with similar education and training strategies.

It is possible that some changes observed in physiotherapist activity for inpatients may have been attributed to variations in the complexity of patients admitted to the CF service across the two phases. There was no capacity to quantify patient complexity during each phase of the study. Variations in patient demand and complexity were minimised, with data collection periods deliberately chosen to avoid peak holidays (December to January) and clinical demand (July to August). Additionally, data collection over a three-month period may not have been long enough to fully account for changes to service provision and physiotherapists' scope of practice.

Finally, we acknowledge rapid changes to care provision for adults with CF with the development of modulator therapies (Bell et al., 2020). These changes were unlikely to impact workloads for physiotherapists at this centre during the study period. Modulator therapies are resulting in marked reductions in pulmonary exacerbations and consequent need for hospitalisation (Bessonova et al., 2018; Volkova et al., 2020). The incidence of obesity and metabolic syndrome is increasing (Litvin et al., 2019; 2020). This represents another role for delegated exercise testing and treatments. The COVID-19 pandemic has also affected care delivery models (Davies, 2020), with increased use of virtual platforms to deliver physiotherapy and other care (Compton et al., 2020). Care is being refocused on outpatient and virtual models (Davies, 2020; Litvin et al., 2020). Establishing an AHA role that can perform safely delegated clinical tasks and, potentially, many of the administrative tasks associated with virtual and face-to-face appointments suggests an even greater opportunity for this role to support current CF physiotherapy care provision.

6.6 Conclusions

This study describes the scope of practice undertaken by an AHA and the resultant changes to physiotherapy care delivery within an adult CF service. The AHA completed delegated clinical tasks such as respiratory and exercise treatments and most of the exercise tests. Allied health assistant's non-direct clinical care activity included managing equipment and patient-related administration activities. Physiotherapist activity and scope of practice changed, associated with the provision of increasingly complex clinical care activity, including increased activity in the clinics, and undertaking annual reviews. Physiotherapists also increased patient communication, management, and research activity. Notably, there were no safety issues reported. Critical to the successful establishment of the AHA role was the use of a workforce redesign tool to engage, develop, and train both the physiotherapists and the AHA in appropriate and safe delegation practices. There is potential for an AHA to enhance care delivery in other acute respiratory physiotherapy services.

Chapter 7 - Study 4

Patient and staff perceptions of the changed model of physiotherapy care delivery.

Research examining staff and patients' perceptions of and satisfaction with an AHA role in acute respiratory care settings is limited (Conti et al., 2007). Study 4 examined patient and staff perceptions of, and satisfaction with, the physiotherapy care delivery pre-implementation of the AHA role and assessed any perceived change to this care delivery post-implementation of a new AHA role. Outcomes from this study will offer original information about an AHA role in a large tertiary CF service and form Study 4 of this program of research.

7.1 Abstract

Background/Aims: As part of a physiotherapy service redesign in an acute respiratory service, CF patients' and multi-disciplinary team members' perceptions of the inclusion of a new AHA role in physiotherapy care delivery were sought.

Methods: A pragmatic pre-post design study was conducted at an adult CF service. Cystic fibrosis patients and multidisciplinary team staff completed anonymous surveys rating satisfaction with physiotherapy care using Likert scaled responses and open-ended questions during two phases of care delivery: care delivery without AHA [P1] and including the AHA role [P2]. Perceptions of safety and quality of care delivery by the physiotherapy service were sought.

Results: Response rates were similar for both phases: patients 35% (n = 63) vs 36% (n = 62), multidisciplinary team 51% (n = 18) vs 49% (n = 17) (P1 vs P2). Patients rated overall quality of physiotherapy care as good to excellent for both phases (P1-87%, P2-88%, p = 0.097), with approximately two-thirds reporting AHA involvement in their care in P2. Seventy-two percent of participants agreed/strongly agreed that physiotherapy care delivery was effective in P1, increasing to 87% in P2 (p = 0.024). In P1, the multidisciplinary team acknowledged the value of physiotherapy staff's knowledge, expertise, and holistic care delivery, despite 22% reporting access to physiotherapy happened only "half the time". The multidisciplinary team identified that adding the AHA improved physiotherapy care delivery, with senior physiotherapists more available for clinical discussion and research.

Conclusions: Patients perceived no changes to physiotherapy care quality with the inclusion of an AHA role, though the perceived effectiveness of physiotherapy care delivery to patients improved. Multidisciplinary team members reported positive outcomes, improvements in direct clinical care activities, increased availability of physiotherapists and involvement in research. An AHA role potentially offers sustainable options for enhancing physiotherapy care delivery that is acceptable to both CF patients and staff.

7.2 Introduction

Improvements in medications, treatments and access to multidisciplinary care and expertise provided in specialist adult CF centres have resulted in an exponential rise in survival age and a corresponding increase in numbers, treatment demands and complexity of care for adults with CF (Bell et al., 2020; Conway et al., 2014; Elborn, 2016; MacKenzie et al., 2014). This poses challenges to current and future sustainability of care delivery for Adults with CF (Bell et al., 2020; Burgel et al., 2015).

One strategy to manage this demand would be a service redesign that included an AHA to deliver clinical and non-clinical physiotherapy care activity within an adult CF physiotherapy service. Patient satisfaction associated with the quality of care delivery is considered an important outcome of service redesign (Anabila et al., 2019; Hincapie et al., 2016). Important aspects of patients' perspectives on quality of care delivery include communication associated with care delivery, access to care delivery, continuity of care and respect for patient's preferences (Hincapie et al., 2016). Patients are the end users of service redesign. However, their perspectives and suggestions for service redesign before implementation and feedback about changes post-implementation are often missing in service redesign research outcomes (European Observatory on Health Systems, 2018; Nolte, 2018; Nolte & Pitchforth, 2014). Staff perceptions are also critical to quality care delivery. Sarigiovannis et al. (2021) recent systematic review examining staff perceptions of care delivery and use of AHAs found no new evidence than that reported in systematic reviews published more than 15 years ago (Sarigiovannis et al., 2021). This suggests the need for current studies to seek both patient and staff perceptions of pre- and post-service redesign incorporating an AHA role.

Study 4 of this program of research sought CF patients' and multi-disciplinary team members' perceptions of, and satisfaction with, the physiotherapy care delivery and assessed any perceived change to this care delivery after implementing a new AHA role.

7.3 Methods

A summary of the methods for this study is presented below. Full details are presented in section 3.4.

Using surveys, a pragmatic pre-post design study was conducted at an adult CF service. Two purposively designed surveys examined patient and CF multidisciplinary team's perceptions of the current physiotherapy care before and after implementing a new AHA role within an adult CF physiotherapy service.

Participants were asked to examine the delivery of physiotherapy care that occurred across two three-month periods. The first three-month period was between September to November 2015, prior to the implementation of the AHA role in the CF physiotherapy service and is referred to as Phase 1 (P1). Pre-implementation surveys were undertaken in December 2015 and examined the care in Phase 1 (P1).

The second three-month period (Phase 2 (P2), refers to the period between April to June 2016, following the implementation of the AHA role. Post-implementation surveys were undertaken in July 2016 and examined the care in Phase 2 (P2). Surveys were developed in consultation with, and pilot tested on, adults with CF and staff prior to use. Questions focused on identifying individual perceptions of safety and quality of care delivery by the physiotherapy service. Patient and staff demographics (Patient: gender, age, inpatient and/or outpatient and Staff: staff discipline) were also collected as part of the surveys.

7.4 Results

7.4.1 Patient Survey

Sixty-three (35%) and 62 (36%) adults with CF receiving physiotherapy responded to the pre-and post-implementation surveys, respectively (Table 7.1). Patient characteristics are shown in Table 7.1. There were no significant differences between respondents to the pre-and post-implementation patient surveys for age and the number of inpatients and outpatients who responded, however, there were more male respondents to the pre-implementation survey.

Table 7.1: Characteristics of patient respondents.

Patients: Inpatient and Outpatient		Pre (P1)	Post (P2)	p
Invitees		181	171	
Respondents n (%)		63 (35)	62 (36)	
Gender, male n (%)		9 (62)	27 (44)	0.04
	18 – 25	16 (25)	20 (32)	
Age n (%)	*26 – 35*	20 (32)	21 (34)	0.55
	36 or older	27 (43)	21 (34)	
Inpatient admission n (%)		36 (57)	42 (68)	0.23
Outpatient review n (%)		51 (81)	48 (81)	0.95

7.4.1.1 Patients' Perceptions of the Inpatient CF Physiotherapy Care

Responses to pre- and post-implementation survey questions related to patients' perceptions of physiotherapy care for CF inpatients are presented in Table 7.2. Overall, the pre-and post-implementation surveys reported positive responses for most questions. Before the implementation of the AHA role, patient respondents perceived that access to physiotherapy was always/usually easy (89%). This perception increased, although it did not reach statistical significance following the implementation (97%, p = 0.091). Positive responses were received for access to physiotherapy equipment (94% vs 95%, p = 0.645) and patients' opportunity to participate in treatment decisions (84% vs 98%, p = 0.399). Seventy percent of patients perceived their access to supervised exercise sessions was always/usually easy before the implementation of the AHA role, improving to 89% following the implementation of the AHA role (p = 0.005). Patients reported increased use of home instructions before discharge by the physiotherapists (84% vs 88%, p = 0.016), and overall, their confidence and trust in the staff delivering care activities increased significantly (88% vs 92%, p = 0.017) (Table 7.2).

Table 7.2: Patient-reported perceptions of inpatient CF physiotherapy care delivery.

Questions examining inpatient experience	P1 n = 3 P2 n = 3	Always	Usually	Unsure	Occasionally	Never	Mean rank score	Mann-Whitney U	*p*
		n (%)							
Was it easy to access the physiotherapy service?	P1	15 (42)	17 (47)	2 (6)	2 (6)	0 (0)	42	560	0.091
	P2	23 (59)	15 (38)	0 (0)	1 (3)	0 (0)	34		
Was it easy to access supervised exercise sessions in the gym or your room?	P1	10 (28)	15 (42)	5 (14)	5 (14)	1 (3)	45	458*	0.005
	P2	22 (56)	13 (33)	2 (5)	2 (5)	0 (0)	32		
Overall, were your physiotherapy sessions long enough for you to feel your treatment was effective?	P1	15 (42)	12 (33)	4 (11)	4 (11)	1 (3)	41	605	0.267
	P2	20(51)	13 (33)	4 (10)	2 (5)	0 (0)	36		
Did you have access to the apparatus and equipment you needed for your physiotherapy care (as far as you could tell)?	P1	26 (72)	8 (22)	1 (3)	1 (3)	0 (0)	39	669	0.645
	P2	30 (77)	7 (18)	2 (5)	0 (0)	0 (0)	37		
As far as you could tell, did the members of the physiotherapy team delivering your care work well together?	P1	19 (53)	10 (28)	5 (14)	1 (3)	1 (3)	42	556	0.071
	P2	28 (72)	8 (21)	2 (5)	1 (3)	0 (0)	34		
Did you have opportunities to participate in the physiotherapy decisions that applied to your care?	P1	24 (67)	6 (17)	3 (8)	2 (6)	1 (3)	40	638	0.399
	P2	28 (72)	10 (26)	1 (3)	0 (0)	0 (0)	36		
Were you given detailed instructions regarding your home physiotherapy programs before discharge?	P1	11 (31)	19 (53)	0 (0)	6 (17)	0 (0)	44	493*	0.016
	P2	24 (62)	10 (26)	3 (8)	2 (5)	0 (0)	33		
Overall, did you have confidence and trust in the staff delivering your IP physiotherapy care?	P1	16 (44)	16 (44)	3 (8)	1 (3)	0 (0)	43	507*	0.017
	P2	29 (74)	7 (18)	0 (0)	3 (8)	0 (0)	33		
		Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree			

Questions examining inpatient experience	P1 n = 3 P2 n = 3	Always	Usually	Unsure	Occasionally	Never	Mean rank score	Mann-Whitney U	*p*
Overall, the staff delivering your IP physiotherapy care have a good understanding of cystic fibrosis.	P1	15 (42)	18 (50)	3 (8)	0 (0)	0 (0)	45	458*	0.003
	P2	29 (74)	10 (26)	0 (0)	0 (0)	0 (0)	32		
Overall, if you had any concerns about your IP physiotherapy management, these were addressed appropriately.	P1	13 (36)	19 (53)	3 (8)	1 (3)	0 (0)	42	544	0.06
	P2	23 (59)	13 (33)	3 (8)	0 (0)	0 (0)	34		
The physiotherapy care you received during your admission helped you to deal more effectively with your cystic fibrosis.	P1	12 (33)	17 (47)	7 (19)	0 (0)	0 (0)	42	560	0.102
	P2	22 (56)	11 (28)	4 (10)	1 (3)	1 (3)	34		

*Note: Non- parametric testing of the Likert scales examining mean rank used Mann-Whitney U test; *p < 0.05, IP = inpatient*

7.4.1.2 Patients' Perceptions of the Outpatient CF Physiotherapy Care

Responses to questions related to patients' perceptions of physiotherapy care for CF outpatients are presented in Table 7.3. Patient respondents had overall positive perceptions regarding physiotherapy outpatient care. Sixty-six percent of patient respondents perceived they always/usually had access to physiotherapy equipment required for their physiotherapy care before the implementation of the AHA role, increasing, but not statistically significantly, following the implementation of the AHA role (84%, $p = 0.136$) (Table 7.3). Patient respondents perceived opportunity to participate in treatment decisions increased significantly from 77% vs P2 93%, $p = 0.036$). Overall, respondents' confidence and trust in the physiotherapy staff delivering care increased significantly (94% vs 98%, $p = 0.02$) (Table 7.3). Fourteen percent of patient respondents felt they were unsure or only occasionally had access to physiotherapists in outpatients pre-AHA implementation. This reduced, but was not statistically significant, to 4% post-implementation ($p = 0.2$) (Table 7.3). The perception of the overall quality of outpatient physiotherapy care improved following the implementation of the AHA role ($U = 853$; $p = 0.006$) (Figure 7.1).

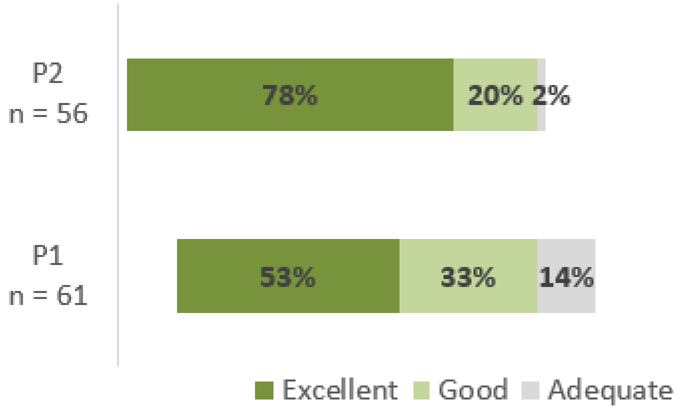
Table 7.3: Patient perceptions of outpatient CF physiotherapy care delivery.

Questions examining outpatient experience	P1 n = 51 P2 n = 46	Always	Sometimes	Unsure	Occasionally	Never	Mean rank score	Mann-Whitney U	*p*
		n (%)							
Do you find it easy to access physiotherapy care at the clinic?	P1	32 (63)	12 (24)	6 (12)	1 (2)	0 (0)	52	1022	0.2
	P2	38 (74)	9 (22)	3 (2)	1 (2)	0 (0)	46		
If you see a physiotherapist, do you have enough time to discuss your physiotherapy related health problems?	P1	34 (75)	10 (18)	1 (6)	0 (0)	0 (0)	50	1158	0.9
	P2	35 (76)	7 (15)	3 (7)	1 (2)	0 (0)	49		
		Always	**Usually**	**Unsure**	**Occasionally**	**Never**	Mean rank score	Mann-Whitney U	*p*
Could you access any physiotherapy equipment you needed for your physiotherapy care at home (as far as you could tell) through the outpatient physiotherapists?	P1	18 (35)	17 (31)	17 (33)	0 (0)	0 (0)	52.79	979.5	0.136
	P2	21 (46)	17 (37)	7 (15)	1 (2)	0 (0)	44.79		
Did you have opportunities to participate in the physiotherapy decisions that applied to your outpatient care?	P1	30 (59)	9 (18)	9 (18)	3 (6)	0 (0)	53.74	931.5*	0.036
	P2	35 (76)	8 (17)	3 (7)	0 (0)	0 (0)	43.75		
Were you given detailed instructions regarding your home physiotherapy programs if required?	P1	32 (63)	12 (24)	3 61)	4 (8)	0 (0)	52.18	1011	0.153
	P2	34(74)	11 (24)	0 (0)	1 (2)	0 (0)	45.48		
Overall, did you have confidence and trust in the staff delivering your physiotherapy care?	P1	34 (67)	14 (27)	1 (2)	2 (4)	0 (0)	53.67	935*	0.02
	P2	40 (87)	5 (11)	0 (0)	1 (2)	0 (0)	43.83		
		Strongly Agree	**Agree**	**Unsure**	**Disagree**	**Strongly Disagree**	Mean rank score	Mann-Whitney U	*p*
Overall, the staff delivering your OPD physiotherapy care have a good understanding of cystic fibrosis.	P1	41 (80)	8 (16)	2 (4)	0 (0)	0 (0)	50.15	458	0.522
	P2	39 (85)	7 (15)	0 (0)	0 (0)	0 (0)	47.73		

Questions examining outpatient experience	P1 n = 51 P2 n = 46	Always	Sometimes	Unsure	Occasionally	Never	Mean rank score	Mann-Whitney U	*p*
Overall, if you had any concerns about your OPD physiotherapy management, these were addressed appropriately.	P1	35 (69)	11 (22)	5 (10)	0 (0)	0 (0)	49.90	544	0.681
	P2	32 (70)	14 (30)	0 (0)	0 (0)	0 (0)	48.00		
The physiotherapy care you received during your outpatient consultation helped you to deal more effectively with your cystic fibrosis.	P1	26 (51)	18 (35)	7 (14)	0 (0)	0 (0)	51.04	560	0.4

*Note: Non-parametric testing of the Likert scales examining mean rank used Mann-Whitney U test; *p < 0.05, OPD = outpatient*

Figure 7.1: Patients Perceived Overall Quality of the Outpatient Physiotherapy Care Pre (P1)- and Post (P2)-Implementation of the AHA Role.

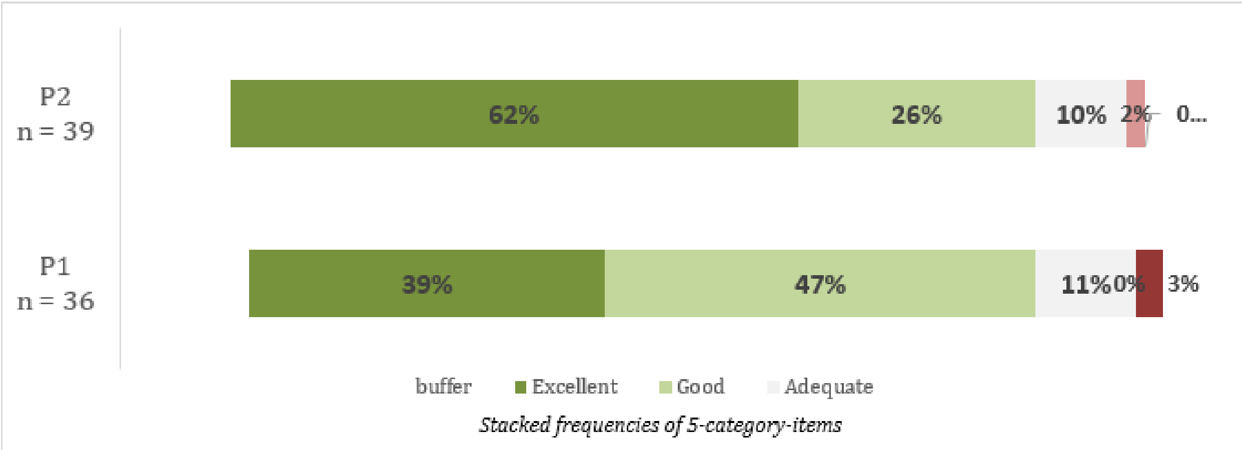


Note: Rated on a 5-category Likert-type scale. Mean ranks:55 for P1 and 42 for P2, Mann-Whitney U = 853, p = 0.006.

Inclusion of the AHA and physiotherapy care delivery

The AHA was involved in the care of approximately two-thirds (62%) of participants in P2, with 88% of respondents rating the overall quality of their inpatient physiotherapy care in P2 at good to excellent (p = 0.097, U = 560, mean rank score of 42 [P1] vs 34 [P2]) (Figure 7.2). When asked specifically if their care varied if an AHA was involved, 67% of participants reported no change to care (p = 0.092, U = 567; mean rank 34 [P1] vs 41[P2]). When asked to comment on the care received if treated by, or underwent exercise testing with, the AHA, participants indicated that the care was '*still a high standard*' (participant X), '*gym sessions remained the same'* (participant W), *'there appeared good communication with the other physiotherapy staff'* (participant U). The AHA was perceived as a '*good resource, interested and knowledgeable'* (participant Y). There were no negative comments associated with the AHA delivering provision of care.

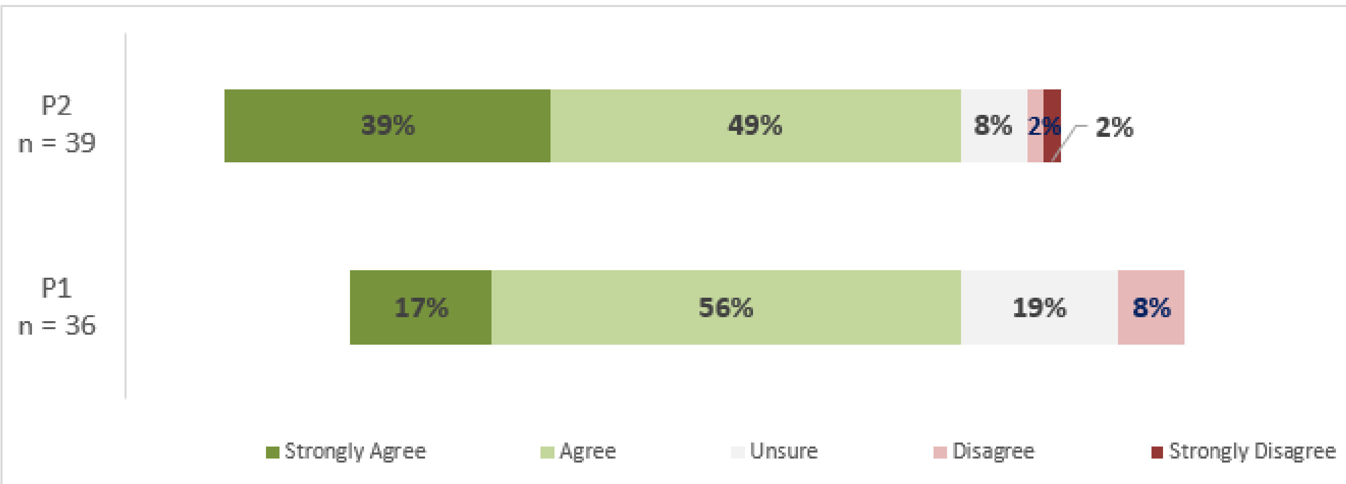
Figure 7.2: Patient Perceived Quality of the Inpatient Physiotherapy Care Pre- and Post-Implementation of the AHA Role.



Note: Rated on a 5-category Likert-type scale. Mean ranks: 42 for P1 and 34 for P2, Mann-Whitney U = 560, p = 0.097

Seventy-two percent of participants agreed / strongly agreed that inpatient physiotherapy care was effective in P1, even with different staff involved in care, which increased to 87% in P2 (p = 0.024, U = 508, Mean ranks: 43 for P1 and 33 for P2) (Figure 7.3).

Figure 7.3: Perceived Effectiveness of the Physiotherapy Care Delivery Pre (P1)- and Post (P2)-Implementation of the AHA Role.



Note: Rated on a 5-category Likert-type scale. Mean ranks: 43 for P1 and 33 for P2, Mann-Whitney U = 508, p = 0.024.

Finally, participants remained very satisfied/satisfied with physiotherapy care delivery (90% in P1 vs 98% in P2, U = 1488; p = 0.149, mean ranks P1 62.6 vs P2 55.1). Participants strongly agreed/agreed that they were treated with respect and dignity by members of the physiotherapy team delivering care across both phases (92% vs 97%, U = 1504; p = 0.153, Mean ranks P1 62 vs P2 55).

Participants were asked to respond to an open-ended question regarding what was good about the physiotherapy care delivery. Participant responses (P1, n = 44; P2, n= 42) are shown in the word clouds below, with the frequency of text shown in brackets (Figure 7.4). Responses were similar and positive across both phases, although increased use of the team's involvement, availability, and consultations (by physiotherapy staff) appeared in P2 responses.

Participants were asked what improvements could be made to the CF physiotherapy care delivery. In P1, 22 (65%) of the 34 respondents perceived a lack of staffing/asked for increased access to physiotherapy staff. These respondent's perceived:

- '*CF physio staff were unavailable at times and appeared understaffed all the time' (participant X)*
- *'There were not enough physios to treat all the patients' (participant F)*
- *'More physio staff to allow for more time with the patients / more appropriate physio staffing levels, especially for outpatients' (participant P)*
- *'More time with each patient to supervise exercise (participant B)*
- *'The physio team appears to be stretched thin and time-poor' (participant T)*
- *'The senior physio works best when the staffing levels are adequately boosted and maintained with the increasing number of patients at the hospital' (participant A)*

Eight (24%) respondents felt the care was 'good' in P1.

In P2, 26 responses were received, with participants requesting more reviews/personalised care with the CF physiotherapists and increased access to gyms and equipment (n = 14, 54%). Participants stated they wanted to see a *'bigger gym and more equipment'* (participant B), *'more staff in outpatients'* (participant K), *'and more time for specialised care'* (participant Y).

Figure 7.4: Patients' Responses Associated with What is Good about the CF Physiotherapy Care Delivery P1 and P2.

Note: Frequency of Text Response in Brackets. Developed using WordCloud Generator (https://monkeylearn.com/word-cloud/)

Participants requested access to specialised staff on evenings and weekends and regular education of sessional staff in these areas (n = 4, 15%). Eight (31%) respondents were positive about the care.

7.4.2 Cystic Fibrosis Multidisciplinary Team Staff Survey

Eighteen (51%) and 17 (49%) staff responded to surveys pre-implementation and post-implementation, respectively; 40% were allied health staff, 23% nursing and 29% medical staff. Pre-implementation, 22% of staff felt access to both inpatient and outpatient physiotherapists happened only *'half the time',* and an additional 11 % of staff felt outpatient access occurred rarely. Timely access to physiotherapy for inpatients was felt by 28% staff to occur half the time/rarely, while in outpatients, 39 % of staff perceived this timely access to be half the time/rarely (Table 7.4).

Pre-implementation, the multidisciplinary team acknowledged the physiotherapy team's knowledge, expertise, and excellent patient education. Physiotherapists were perceived to have innovative ideas, delivered holistic care, and were considered inclusive team members. The multidisciplinary team suggested that physiotherapy staff *'worked well beyond what is asked of them'* (participant J) and overall '*dedication to the patients despite the shortfall in manpower'* (participant K*)*. Physiotherapists were considered *'life savers in the acutely unwell patients'* (participant H).

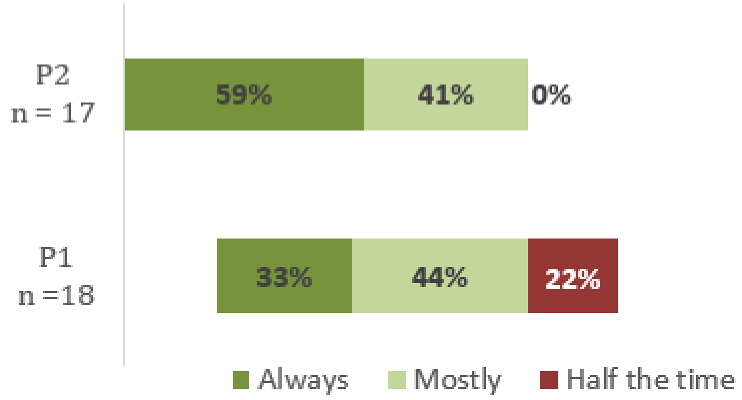
Staff (88%) were aware of the AHA working within the physiotherapy team post-implementation. Staff reported improved access to physiotherapy care for inpatients ($p = 0.05$) (Table 7.4, Figure 7.5) and greater ability of senior physiotherapy staff to engage in clinical care discussions (including education, assessing adherence/barriers to treatment) and clinical research. Members of the multidisciplinary team noted that *'more proactive and comprehensive clinical assessment and care has been available from the physiotherapy team'* (participant C) *and 'the senior physios have been more available for clinical discussion since a physiotherapy assistant has been working with us'* (participant D). Staff also noted *"6MWT and shuttles performed on inpatients, increased use of the gym, improved delivery of physio related equipment, and a tidier gym space"* (participant F) as benefits. Specifically, multidisciplinary members commented that the *'physiotherapy assistant able to facilitate extra patient contact sessions meaning better access to* *physio for patients'* (participant G) and '*allowed more attention to be given to quality activities within the physio group'* (participant H).

Table 7.4: Cystic Fibrosis multidisciplinary team staff perceptions of CF physiotherapy care pre-implementation [P1] and post-implementation [P2].

Questions examining physiotherapy services	*P1 n =18 P2 n = 17*	*Always*	*Mostly*	*Half the time*	*Rarely*	*Never*	*N/A*	*Mean rank score*	*Mann-Whitney U*	*p*
		n (%)								
As an inpatient, clients find it easy to access physiotherapy care.	P1	6 (33)	8 (44)	4 (22)	0 (0)	0 (0)	0 (0)	21	100	0.05
	P2	10 (59)	7 (41)	0 (0)	0 (0)	0 (0)	0 (0)	15		
As an inpatient, clients can access physiotherapy care in a timely way.	P1	6 (33)	8 (44)	4 (22)	3 (6)	0 (0)	0 (0)	20	114	0.15
	P2	8 (47)	9 (53)	0 (0)	0 (0)	0 (0)	0 (0)	16		
As an outpatient, clients find it easy to access physiotherapy care.	P1	2 (11)	8 (44)	4 (22)	4 (11)	0 (0)	2 (11)	20	120	0.23
	P2	3(18)	11 (65)	0 (0)	0 (0)	0 (0)	3 (18)	16		
As an outpatient, clients can access physiotherapy care in a timely way.	P1	0 (0)	9 (50)	5 (28)	2 (11)	0 (0)	2 (11)	20	112	0.13
	P2	2 (12)	11 (65)	1 (6)	0 (0)	0 (0)	3 (8)	16		
Clients receive benefits from physiotherapy care.	P1	12 (67)	3 (17)	2 (11)	0 (0)	0 (0)	1 (6)	20	117	0.11
	P2	15 (88)	2 (12)	0 (0)	0 (0)	0 (0)	0 (0)	16		
Referrers (e.g. doctors, other AHPs) can easily access the physiotherapy service.	P1	10 (56)	4 (22)	3 (17)	0 (0)	0 (0)	1 (6)	19	131	0.4
	P2	11 (65)	5 (29)	1 (6)	0 (0)	0 (0)	0 (0)	17		
Physiotherapists in the team work to their full scope of practice.	P1	13 (72)	2 (11)	2 (11)	0 (0)	0 (0)	1 (6)	19	129	0.26
	P2	15 (88)	1 (6)	0 (0)	0 (0)	0 (0)	1 (6)	17		

Note: AHP = allied health professionals.

Figure 7.5: Multidisciplinary Team Perceived Access to Inpatient Physiotherapy Care.



Note: Multidisciplinary team *rated the access to physiotherapy care delivery significantly increased in P2 compared to P1 (U = 100, p = 0.05, mean ranks P1 21 vs P2 15).*

7.5 Discussion

This study aimed to seek CF patients' and CF multidisciplinary team members' perceptions of, and satisfaction with, physiotherapy care delivery in this centre and assess any perceived change to care delivery after implementing an AHA role. Patients perceived the physiotherapy service to deliver high-quality care, with no changes associated with adding an AHA to the team. Patients also perceived an improvement in the effectiveness of physiotherapy care delivery with the AHA in the team. Approximately two-thirds of patients reported having the AHA involved in their care. Multidisciplinary team members observed improvements in direct clinical care and research activities undertaken by physiotherapists with the addition of the AHA. Despite the changes, there was still room for improvement.

Patient surveys

Respondents comprised both inpatients and outpatients receiving physiotherapy care. Inpatient responses were overall positive, both pre-and post-AHA implementation. This is in line with more extensive multicentre studies examining adult CF care, where positive characteristics of courtesy and respect were shown to patients, easily understood explanations were given, patients felt involved in the decision-making for their care, patient questions were answered, and members of the multidisciplinary team spent adequate time with patients (Homa et al., 2015).

Perceived access to physiotherapy, length of treatment time, and the opportunity for patients to participate in their treatment decisions as inpatients improved with the AHA implementation, although this did not reach statistical significance. Pleasingly, the positive responses demonstrated in this study matched those reported previously (Ellemunter et al., 2015; Homa et al., 2015). A known predictor of adults reporting the best overall experience of care is that they are facilitated to make informed care decisions associated with managing this complex disease resulting from access, time, and participation in care (Hibbard et al., 2010; Homa et al., 2015).

What did change was access to supervised exercise sessions and an increase in the use of home instructions for inpatients. This likely reflects the CF physiotherapy service members' overall ability to deliver these important aspects of care. Interestingly there was an increase in the patient's confidence and trust in the staff providing care in the post-implementation period. This finding has been demonstrated in previous studies where AHAs were introduced to speech and occupational therapy teams, increasing not just capacity but scope of practice for the therapists (Nancarrow, Moran et al., 2015; Russell & Kanny, 1998).

Responses from those attending outpatient clinics were again positive, although overall, the response percentage was lower than inpatients. Only 66% of respondents felt they had access to required equipment. This increased post-AHA implementation, but not significantly. Of concern was the number of patients who felt they did not have access to physiotherapists in the outpatient clinic. This number reduced with the AHA working in the team, although it was not a significant change. Clinical guidelines and consensus documents recommend physiotherapists attend clinics to enable regular contact and assessment of patients for evaluation of their maintenance treatment and acute care as required (Button et al., 2016; Conway et al., 2014; Morrison & Parrott, 2020). When patients saw physiotherapists in this study, they felt there was time to discuss and participate in treatment decisions. The addition of the AHA role may release physiotherapists from routine inpatient care, facilitating attendance in outpatient clinics.

Inclusion of the AHA

Specific information was sought from patients regarding the allied health assistant inclusion. It was pleasing that more than two-thirds of the participants reported that the AHA had been involved in their care. Patients reported that their physiotherapy care had not changed with AHA involvement. It has been postulated that patients may prefer qualified physiotherapy staff to deliver their care rather than AHAs (Charles et al., 2018; Russell & Kanny, 1998). In this study, patients perceived that treatment standards remained high and that the AHA was a good resource. These patient comments affirm the positive AHA contribution to physiotherapy care delivery. Notably, there were no negative comments associated with AHA delivering care. Previous studies have also demonstrated that patients are positive about AHA roles (Stanhope & Pearce, 2013; Wood et al., 2011), albeit these are associated with community settings and not in acute respiratory care, as this study has shown.

Concerns have been raised about a decrease in quality of care delivery associated with AHAs (Russell & Kanny, 1998). The perceived quality of care for both inpatients and outpatients remained high with the AHA inclusion in this study. Only one previous physiotherapy study has reported similar outcomes demonstrating no reported loss of quality with increased AHA involvement in a hospital musculoskeletal outpatient clinic (Saunders, 1998). Further studies are required to establish if perceived and/or objective measures of the quality of care delivery can be sustained or improved with AHA inclusion.

High overall satisfaction with care delivery remained unchanged with the AHA inclusion. In previous studies, patients have reported increased time with staff (Nancarrow & Mackey, 2005), increased intensity of care delivery (Lizarondo et al., 2010) and improved overall satisfaction with care delivery. Patients place a high value on this perception of satisfaction with care delivery (Walsh et al., 2015). Patients also perceived good communication among the entire physiotherapy team. This has been reported as necessary to facilitate successful delegation (Nancarrow, 2015; Nancarrow, Moran, et al., 2015).

Patients’ confidence and trust in the staff increased with the AHA involvement, potentially reflecting the physiotherapists’ ability to spend time with patients, listen to concerns, answer questions, and deliver treatments. Before the AHA involvement, open text responses from patients identified understaffing in the service, resulting in a perceived reduction in physiotherapist time available to communicate with and treat patients well. These concerns appeared to be addressed with the inclusion of the AHA. It is likely that the physiotherapy staff were more available for longer and more complex treatments, potentially meeting patient needs. Excellence in patients' experiences of CF healthcare is associated with high levels of communication, treatment with respect and dignity, and the staff's ability to explain treatments, answer questions, and allow patients to be involved in care decisions (Homa et al., 2015). Outcomes of this study have demonstrated that the CF patients in this centre perceived physiotherapy care delivery to be of a high standard, which was improved with the AHA inclusion. Further studies are required to verify these outcomes as this represents a meaningful change to patients in how the team delivers overall physiotherapy care.

Multidisciplinary team surveys

All members of the CF multidisciplinary team were represented in survey responses. Of concern was that this group perceived that access to physiotherapists for both inpatients and outpatients was reduced prior to the AHA implementation. This includes some respondents who felt outpatient access occurred quite rarely. Staff also noted that timely access to physiotherapy care was perceived to be reduced. Pre-emptive assessment and timely management of exacerbations involve physiotherapy management, which may result in avoiding hospital admissions (Castellani et al., 2018; Smyth et al., 2014) and contribute to reducing decline in lung function (Castellani et al., 2018; Smyth et al., 2014). In both inpatient and outpatient settings, access to timely physiotherapy care should be available for all CF patients (Smyth et al., 2014), especially for acutely unwell and/or complex patient presentations (Morrison & Parrott, 2020).

The multidisciplinary team recognised the physiotherapist's role and appreciated their contributions to team care. The multidisciplinary team noted a physiotherapy staffing shortfall pre-AHA inclusion. This was identified in Study 1 of this program of research which benchmarked the physiotherapy staffing issues objectively in this centre (Chapter 4). Pleasingly, after the inclusion of the AHA, the team acknowledged that the physiotherapists' role in clinical assessments was more comprehensive and proactive, increasing the availability of physiotherapy care. The multidisciplinary team considered exercise tests as necessary assessment tools, noting their increase with the AHA inclusion. As multidisciplinary care significantly contributes to patient outcomes in CF (Castellani et al., 2018; Smyth et al., 2014), the availability of physiotherapists to communicate, discuss, and help co-ordinate complex patient care with other multidisciplinary team members underpins successful overall management (Conway et al., 2014; Stern et al., 2014). It appears that with the AHA inclusion, the multidisciplinary team valued the increased availability of senior physiotherapists to contribute to these discussions.

The response rate was similar for both phases of the study. The low numbers were not unexpected. Internal validity of responses could be assumed to be high as the survey focused on recent contact with the CF service over a defined period, and anonymity was assured. Adults with CF in the participating facility were familiar with survey questionaries and well-informed about the types of treatments undertaken and the role of multidisciplinary team members, including physiotherapists, in their care (Ellemunter et al., 2015).

Surveys in this study asked about patient and staff experience of care based on exploring Picker principles of person-centred care (Jenkinson et al., 2002). An essential aspect of the survey development was to focus on patient and staff experience rather than their satisfaction (Jenkinson et al., 2002). Patient-reported satisfaction could be prone to a positivity bias (Di Palo, 1997). Responses could be quantified using Likert scales for most questions, adding accuracy to the findings. Survey responses identified aspects of care delivery that did and did not change associated with the AHA involvement. Survey outcomes also highlighted where service provision could be improved. Allowing more open questions to explore responses and/or conducting interviews may have yielded richer information. However, pragmatically this was not feasible. This is a limitation of this study, alongside the generalisability of the outcomes, as the surveys were conducted in a single centre. However, exploring the perspectives of adults with CF that identify positives and negatives in care delivery has been demonstrated to improve patient-centred care, which is considered significant for people with chronic disease (Ellemunter et al., 2015). Similar survey designs could be used in future research to explore patients' experiences of healthcare delivery and provide valuable feedback to staff about their service provision.

7.6 Conclusions

Including an AHA role resulted in perceived maintenance of high-quality physiotherapy care delivery reported by patients in this acute respiratory service. In fact, patients perceived improvement in the effectiveness of physiotherapy care delivery. Multidisciplinary team members reported positive outcomes with observed improvements in direct clinical care delivery and increased availability of physiotherapists for patient-related discussions and involvement in research. Across the survey, overall responses were positive regarding the physiotherapy services in both phases of the research. These findings suggest that an AHA role offers sustainable options for enhancing physiotherapy care delivery that is acceptable to CF patients and staff.

Chapter 8 – Discussion and Conclusion

Physiotherapy management is integral to the care provided for adults with CF. Demands for care provision are rapidly increasing as adults with CF live longer, and the number of adult patients grows. Currently, clinical guidelines recommend service provision, scope of practice and skill mix requirements for the delivery of physiotherapy care for adults with CF. There is evidence that CF services are challenged in meeting these requirements. Given the ongoing demand, it is likely that innovative strategies and resources are required to meet the growing demand for care. The overarching aim of this program of research was to identify, implement and evaluate a workforce redesign strategy to increase physiotherapy care delivery for adults with CF using an allied health assistant role and delegation procedures. This chapter provides a summary of the findings of this thesis and discusses these findings. The four studies included in this thesis have identified current physiotherapy care delivery in a large tertiary adult CF service (Study 1) and described the development and implementation of an AHA role using a workforce redesign system (Study 2). Study 3 evaluated outcomes for physiotherapy service provision, scope of practice and skills mix associated with the implementation of an AHA role and Study 4 reported CF patient and multidisciplinary staffs' perceptions of, and satisfaction with, the newly redesigned CF physiotherapy service. This chapter includes a detailed discussion of the clinical implications, strengths, and limitations of this program of research. Recommendations regarding future research directions will be discussed.

8.1 Summary of Results

Study 1 within this thesis (Chapter 4) was a cross-sectional study completed over three months in a large tertiary CF service examining inpatient and outpatient physiotherapy care delivery. Care delivery was described in terms of services provided (staff numbers), scope of practice (physiotherapy clinical and non-clinical activity) and skill mix. The most frequently reported physiotherapy treatments were respiratory and exercise treatments, with exercise testing and treatment reviews limited in frequency. Senior physiotherapists attended outpatient clinics, while junior physiotherapists undertook most exercise treatments daily. Staffing was below guideline-recommended levels, and 22 different physiotherapists were involved in care delivery across the three-months. Several recommended activities per the guidelines (Button et al., 2016; Morrison &Parrott, 2020) occurred infrequently in the centre.

Study 1 is the first research to describe physiotherapy care delivery in an adult tertiary CF service in terms of the provision of services, scope of practice and skill mix. These findings were benchmarked against current CF-specific clinical guidelines. Study 1 outcomes highlighted that although some of the recommended physiotherapy treatments were frequently occurring in the centre (respiratory and exercise treatments), other aspects of clinical care, such as routine exercise testing, detailed reviews of clinical physiotherapy care, and attending multidisciplinary outpatient clinics, occurred infrequently. Study 1 established that care delivery in the centre, with the staffing numbers and skill mix at the time this study was conducted, was not meeting clinical guideline recommendations.

Study 2 examined the application of a workforce redesign system, the Calderdale Framework, to implement a new AHA role within an acute respiratory physiotherapy service. Using an established workforce redesign system has the potential to mitigate perceived and/or possible risks associated with delegated clinical care (Barrett et al., 2015; Smith & Duffy, 2010, 2014) delivered by AHAs. A detailed description of the application of the Calderdale Framework to develop the role, including all training developed and undertaken for both physiotherapy and AHA staff, has been provided in Study 2. Training included delegation procedure training for all staff, both physiotherapists and AHA. Ongoing processes to facilitate embedding the AHA role into the physiotherapy service were also described. Six of the seven stages of the framework were undertaken. A range of clinical and non-clinical tasks were identified for delegation by consensus amongst the staff, using the Calderdale Framework risk mitigation strategies. Six new comprehensive training documents were developed to support competency training for the AHA role. Staff perceptions of the Calderdale Framework implementation were positive, with increased perception of the value of the AHA role development in the CF physiotherapy service and increased confidence in their understanding of delegation procedures. Workforce redesign processes can potentially be time-consuming for staff; however, this was not reported by staff in this study.

The impact of implementing an AHA role on physiotherapy care delivery, in terms of changes to service provision, scope of practice, and skill mix, was examined in Study 3. A pragmatic pre-post designed study quantified physiotherapy care delivery across two three-month time periods (Phase 1 (P1) vs Phase 2 (P2)). Study 3 reports the post-AHA implementation data collected during P2 compared to pre-AHA implementation data collected during P1 (Study 1). The main findings from Study 3 were that physiotherapy care delivery increased post-AHA implementation. Physiotherapists' activity changed as staff undertook fewer respiratory and exercise treatments with the AHA role established, with detailed clinical care reviews for inpatients increasing. Physiotherapists also increased attendance at multidisciplinary outpatient clinics. The AHA undertook mainly non-direct clinical care, such as setting up, cleaning, and completing paperwork associated with patient respiratory equipment use and other patient-related administrative tasks. The AHA contributed to direct clinical care, which included delegated supervision of established respiratory and exercise treatments, and the AHA undertook most of the exercise tests. Notably, no adverse events were reported with the inclusion of the AHA in the physiotherapy service.

Study 4 reports patient and staff perceptions of physiotherapy care delivery in an adult CF service. Using a pragmatic pre-post design study, purposely designed surveys examined both patient and CF multidisciplinary staff's perceptions of physiotherapy care delivery before and after implementing a new AHA role. Overall, perceptions of the physiotherapy care delivery across both inpatient and patient services were positive. Following the implementation of an AHA role, patients' perceptions of access to exercise sessions in hospital increased, alongside a perceived increase in overall confidence and trust in the physiotherapy staff. Prior to the AHA role within the physiotherapy service, there was some perception among outpatients as only having occasional access to physiotherapy care, which increased after the AHA implementation. Patients perceived increased opportunities to participate in their physiotherapy treatment decisions after the AHA joined the team.

Approximately two-thirds of patients reported the AHA had been involved in their care, with most perceiving this care had not varied with the AHA involvement. Most inpatients rated the overall quality of inpatient care as good to excellent. Positive comments about the quality of care, good physiotherapy team communication and AHAs role were reported, with no negative comments about the AHA. There was no change to the high satisfaction levels with physiotherapy care reported by both inpatients and outpatients post-AHA implementation. The multidisciplinary team acknowledged the value of the physiotherapy service in their responses. Multidisciplinary staff perceived increased access to physiotherapy care and that senior physiotherapy staff were more available for patient and team consultations after the AHA joined the team.

8.2 Implications for Clinical Practice

A number of implications for clinical practice can be drawn from this program of research. An AHA can be implemented successfully within a tertiary-level cardiorespiratory service using a workforce redesign framework, with engagement of all stakeholders, appropriate training and risk mitigation strategies planned for and implemented. Clinical and non-clinical tasks can be successfully delegated to an AHA with comprehensive delegation training. These clinical implications are now discussed.

8.2.1 AHA Role can be Implemented, is Viewed Positively by Physiotherapy, Multidisciplinary Team and Patients with No Adverse Events Reported

This program of research demonstrated that it is feasible to develop and implement an AHA role undertaking delegated non-clinical and clinical tasks within an acute respiratory physiotherapy service. Non-clinical tasks included managing many aspects of respiratory equipment, including completing local setting procedures for setting up, cleaning, and documenting the use and loan of respiratory equipment. Clinical tasks that could be delegated included delivering airway clearance and exercise treatments, and exercise tests.

A recent systematic review suggested that in acute hospitals, AHAs undertook assessment and discharge planning tasks (Snowdon et al., 2020) primarily. Other reports of clinical AHA roles in acute respiratory physiotherapy services outlined AHAs undertaking mobilisation of post-surgical patients (Boden, 2015) and assisting physiotherapists in exercise plans and mobilisation in an intensive care unit (Conti et al., 2007). These delegated clinical tasks could be described as having a lower skill level and requiring less detailed clinical knowledge. This program of research has demonstrated that AHAs can undertake a range of non-clinical and clinical tasks in an acute care setting.

The new model of care integrating the AHA role in CF physiotherapy care delivery was well accepted by staff and patients. Inpatients, outpatients, and multidisciplinary staff in this large tertiary CF service reported increased satisfaction and perceived effectiveness with physiotherapy care associated with implementing the AHA role. There were no changes to the perceived high quality of, and high satisfaction with, physiotherapy care being delivered to patients. Both patients and multidisciplinary staff perceived the effectiveness of the care delivery increased.

Previous studies have identified similar positive satisfaction associated with AHA roles (Nancarrow & Mackey, 2005; Nancarrow, Moran et al., 2015; Wood et al., 2011). The majority of the AHA roles included in these previous studies were not directly working with physiotherapists (Nancarrow & Mackey, 2005; Moran et al., 2015) and occurred predominantly in rehabilitation (Moran et al., 2015) and community settings (Nancarrow & Mackey, 2005; Wood et al., 2011).

Patients in the CF service within this program of research noted the high quality of the working relationships and communication among the physiotherapy staff, including the AHA. The importance of a close working relationship between staff has been highlighted previously as beneficial to the inclusion of an AHA (Nancarrow, Moran et al., 2015). This program of research is unique in investigating the perspectives of patients and staff related to the changes made to care delivery associated with the AHA.

No major adverse safety events were associated with the AHA undertaking delegated non-clinical and clinical acute respiratory physiotherapy tasks in this CF service. No safety concerns were anticipated related to the delegation of non-clinical tasks; however, for clinical tasks delegated to the AHA, particularly respiratory physiotherapy treatments, the increased skills and knowledge required potentially increased the risks for patients and staff. Inadequate AHA training for clinical tasks has previously been associated with adverse safety events for patients (Axelsson & Elmstahl, 2004). Reassuringly, two previous studies have described similar findings where no adverse safety events related to an AHA undertaking delegated exercise tasks in people with stroke in a community setting and on hospital wards occurred (Cannell et al., 2018; Lord, 2008).

Whilst the AHA in this program of research worked in a hospital setting, this is the first study reporting no major safety events associated with delegated acute respiratory care airway clearance and exercise treatments. Additionally, the delegated exercise tests that included 6 MWT and incremental shuttle walk tests were undertaken without safety implications. No studies have reported safety outcomes associated with AHAs undertaking exercise tests in acute care settings. Snowden et al. (2020) examined the effect of delegation of clinical tasks to AHAs on patient outcomes in a systematic review and found that of the eight studies that reported any safety outcome, no increased risk of harm was associated with delegated AHA tasks in either community or hospital settings. The findings from this systematic review suggested that there should be confidence in the safety associated with delegated tasks to AHAs when appropriately supervised byAHPs. This program of research adds further support to the safety associated with delegating clinical tasks to AHAs.

8.2.2 AHA Role can Positively Impact Scope of Practice of CF Physiotherapists, Including Overview of Change/Meeting Care Guidelines

Developing and implementing the new AHA role positively changed both the CF physiotherapy care delivery and physiotherapists' scope of practice. The change resulted in approximately 35% more activities undertaken by the physiotherapy service.   Whilst an increase in activity is perhaps not an unexpected outcome associated with an additional staff member, implications emerged regarding changes to how the care was delivered and to physiotherapists' scope of practice.

Cystic fibrosis physiotherapists in this facility increased activity by approximately 36% with the AHA. This increased activity was seen across broad areas of physiotherapy care delivery and included comprehensive respiratory and exercise reviews, attending multidisciplinary outpatient clinics and being more available for consultation and discussion regarding patient management with the multidisciplinary team. The physiotherapy care closer approximated benchmarked standards recommended in published clinical guidelines (Button et al., 2016; Morrison & Parrott, 2020). Having the AHA undertake both non-clinical and clinical delegated tasks provided the opportunity for physiotherapists to undertake tasks that had been previously limited or that there was no time to complete. This enhanced overall care delivery.

Alongside the increased activity, scope of practice of the physiotherapist also changed. The AHA undertook some exercise treatments, respiratory equipment-related activity, and most of the exercise tests. Senior physiotherapists undertook more reviews and attended outpatient clinics. Senior physiotherapists also engaged in research activity. Changes were also seen in the activity undertaken by junior physiotherapists; now undertaking some teaching and training and patient reviews. It could be argued that these tasks for both senior and junior physiotherapists require more skill and advanced practice. By having the most appropriate staff member performing the most appropriate tasks, overall care delivery was enhanced further (Nancarrow, 2015; Nancarrow, Moran et al., 2015; Nancarrow & Mackey, 2005; Nancarrow, Moran et al., 2012; Patterson et al., 2015).

Having relevant staff perform appropriate tasks is the Calderdale Framework's underlying aim (Smith & Duffy, 2010). However, there is a paucity of literature investigating the impact of service redesign using an AHA in terms of overall service provision, scope of practice and skill mix of all staff. Nancarrow, Moran et al. (2015) reported interview findings that suggested a perceived increase in service provision for speech therapists associated with implementing AHA roles. Occupational therapists also reported perceived benefits that included freeing up the occupational therapist's time to undertake other tasks (Nancarrow & Mackey, 2005; Russell & Kanny, 1998) and a perceived increase in service provision (Russell & Kanny, 1998). These studies, however, did not include quantitative data associated with changes to the scope of practice or care delivery.

For this research to translate to clinical practice, considerations about the time taken to develop the role comprehensively may prove challenging. Additional resources to allow for staffing and time for training may need to be considered for other projects of this nature. A grant was used to support the wages for the AHA role during the competency training and data collection phases in Study 2. Others have discussed resources for reimbursement of staff costs and training as essential to developing efficient and productive AHA roles (Moran et al., 2012, 2015).

8.2.3 There is a Need to Support AHA Implementation Using a Structured Workforce Redesign System

The use of a workforce redesign system supported the successful development and implementation of the AHA role in the CF physiotherapy service, in this case, the Calderdale Framework.

The Calderdale Framework was chosen for this program of research as it offered a comprehensive, systematic approach to service redesign. Tools and processes used included engagement of management, key stakeholders, and staff at the local level, analysing the service's current skill mix and scope of practice. Determining tasks that could be potentially included in the new AHA role, including understanding the risks and mitigating risks associated with delegating these tasks, occurred. A recent systematic review reporting AHA use and delegation concluded that an all-inclusive system that includes appropriate frameworks and processes to develop and implement AHA roles is vital to success (Sarigiovannis et al., 2021). Using a workforce design system in this program of research supported the facilitation of and addressed many barriers associated with developing and implementing a new AHA role.

The Calderdale Framework is just one system that supports workforce redesign. Others, such as the Victorian assistant workforce model (Somerville et al., 2018), the workforce change checklist (Nancarrow, Roots, Grace et al., 2013), allied health assistants framework NSW or the six steps methodology to integrated workforce planning (Powell et al., 2016; Skills for Health, 2016) could be used. Using other workforce redesign systems across 27 community-based healthcare organisations, AHP staff identified that 24% of their time could be delegated safely to AHAs, thereby improving efficiencies (Somerville et al., 2018). A six-month trial using AHAs for home-based delegated rehabilitation during and post-discharge versus usual care for geriatric patients resulted in a significant reduction in hospital length of stay during the initial admission (mean 15.7 days vs 21.6 days) and fewer repeat hospital admissions over six months for the rehabilitation group (Parsons et al., 2018). A workforce redesign framework is required for an AHA role to be developed and successfully implemented. Teams should examine what resources may be available within their facilities and/or review the literature to find a suitable system or framework that suits their organisation's needs.

The Calderdale Framework was modified for this program of research. Modifications made during the application of the stages met the needs of the participating tertiary-level facility. These modifications included using already existing team meetings to complete the process stages and abridging the content of several stages (awareness raising, service analysis and task analysis) to meet the time available in these meetings. This pragmatic approach to tailoring the content was aimed at increasing participation. The Calderdale Framework process is usually completed with teams over two or more days as part-day or whole-day workshops (Effective Workforce Solutions, 2021; Smith & Duffy, 2014). This may not be a practical option for some clinically based teams. Anecdotally, the workforce development officer, who was also a trained Calderdale Framework Facilitator, reported that critics of the Calderdale Framework suggest it requires too much time away from clinical care for staff and unnecessarily protracts changes to skill mix (M. Stute, personal communication, August 23, 2016). In this program of research, the awareness raising, service analysis and task analysis sessions were tailored to enable clinician participation in already scheduled team meetings and reduce workload burden. These modifications may have contributed to staff engagement and reported satisfaction with the process. Tailoring the workforce redesign system to meet local needs is an essential factor that underpins successful workforce redesign (Hastings, 2014).

Engaging both the AHA and physiotherapy staff was necessary. Having staff who work at the local level clinically engaged and involved in developing the AHA role worked well. This ground-up inclusive approach, which involves staff, is considered a strength of the Calderdale Framework (Patterson et al., 2015; Smith & Duffy, 2010). Engaging relevant staff likely contributed to staff awareness and understanding of the new AHA role. In fact, staff who did not see the AHA role as necessary at the beginning came to realise the importance of the role for care delivery.

Staff understanding of the role encompassed many components. Understanding included what tasks the AHA could undertake, the competency training that occurred, and knowing that processes were in place for ongoing supervision of the role. What also emerged was staff understanding of the scope of the AHA role and practice boundaries. Clarifying boundaries for staff roles facilitates trust between the AHAs and AHPs (Mackey & Nancarrow, 2005; Sarigiovannis et al., 2021). This trust reduces negative perceptions about AHA roles (Munn et al., 2013) and results in increased use of the AHA for delegated tasks (Munn et al., 2013; Sarigiovannis et al., 2021).

8.2.4 AHAs can Undertake Delegated Clinical and Non-clinical Tasks, Including Essential Training to do these Tasks

The AHA undertook several clinical tasks associated with respiratory physiotherapy assessments and treatments. Several of these respiratory physiotherapy clinical tasks have not previously been reported in the literature as AHA delegated clinical tasks. Undertaking supervised airway clearance treatments, exercise programs and conducting submaximal exercise tests can be considered potentially challenging; they require specific skill training and present a possible risk profile. For the AHA to competently provide the range of clinical tasks demonstrated in this research, several steps and processes needed to occur, many before the actual commencement of AHA training. These steps are detailed below.

8.2.4.1 Identify the 'Right' Tasks for AHA Training, Determine Potential Risks and Strategies to Mitigate and Include All Staff in the Process

Both physiotherapists and AHAs were involved in determining, with consensus, the non-clinical and clinical tasks for inclusion in the new AHA role. These tasks were considered of high value for the AHA to undertake as they were either completed often and/or identified as important to care delivery but were not occurring regularly. For each proposed new clinical task, staff using Calderdale Framework processes determined if potential risk/s could be mitigated. Each clinical task could not become part of the new role if the risk potential could not be addressed in the training processes.

The final set of clinical tasks was considered suitable and safe for the AHA to be trained in. All staff agreed on the tasks that would have the greatest value in being delegated. Detailed descriptions of the types of tasks, risk mitigation, all staff involvement and consensus about tasks and risk mitigation are largely missing in previous studies investigating AHA role development (Mackey & Nancarrow, 2005; Nancarrow & Mackey, 2005; Snowdon et al., 2020). These factors contribute to hesitancy in using AHA roles (Sarigiovannis et al., 2021; Snowdon et al., 2020). Selecting the right tasks for delegation training is critical to the overall success of a new AHA role.

8.2.4.2 Develop Comprehensive Training Documents and Resources to Facilitate AHA Competency Training

Training documents (CTIs and WPIs) were developed by staff and reviewed by all team members before AHA training commenced. Training documents were comprehensive and outlined the skills to be developed, knowledge underpinning the skill, safety precautions, and competency checklists associated with each task. Local resources, if available, were incorporated into these new documents. This approach to training preparation helped minimise the AHA's risk of undertaking tasks outside the scope of practice for the role. It has previously been suggested that AHAs may be concerned that physiotherapists' expectations of their roles could exceed their capabilities (Lizarondo et al., 2010). Such concerns were addressed by using a consensus approach to task selection, determining the competency training, and including all staff within the training process.

8.2.4.3 Comprehensive AHA Training and Competency Certification are Required

Dedicated time for both the AHA and the physiotherapy staff was required to undertake training and achieve competency certification in the new tasks. For this research, grant funding allowed a two-month training period for the AHA to work with the CF physiotherapists. For this research to translate to clinical practice, considerations around adequate time and resource allocations must be considered. Others have discussed resources for reimbursement of staff costs and training as important to develop efficient and productive AHA roles (Moran et al., 2012, 2015).

Detailed descriptions of the skill level achieved during competency training demonstrated in this research are largely missing in previous studies investigating AHA role development (Nancarrow & Mackey, 2005; Snowdon et al., 2020). Lack of knowledge of AHAs' skill and competency levels contributes to hesitancy in using AHA roles (Sarigiovannis et al., 2021; Snowdon et al., 2020). Previous research has demonstrated that lack of clarity about tasks AHAs can undertake (Conway & Kearin, 2007; Mackey & Nancarrow, 2005; Sarigiovannis et al., 2021; Saunders, 1995, 1998; Schwarz et al., 2019). Inadequate AHA training (Mackey & Nancarrow, 2005; Sarigiovannis et al., 2021; Schwarz et al., 2019) are further barriers to implementing AHA roles successfully. In contrast, confidence in the competency of the AHA (Mackey & Nancarrow, 2005; Nancarrow et al., 2015; Parry, 1997; Saunders, 1995), conducting AHA training with staff who are working with the AHA (Moran et al., 2015), and detailed knowledge of what training occurred (Snowdon et al., 2020) have all been shown to improve AHA role acceptance, and use, especially in undertaking delegated clinical tasks. Having developed comprehensive training resources, allowing time for training, and having staff at the local level undertake the training ensured there was confidence that the AHA was competent in the delegated non-clinical and clinical tasks.

Currently, best practice recommendations for AHA training in Queensland (Australia) is the completion of a relevant qualification such as Certificate III and Certificate IV in Allied Health Assistance (Allied Health Professions Office of Queensland, 2016a; Workforce Planning and Talent Development, 2020). These education qualifications have generic units covering communication, legal and ethical compliance, recognising health body systems, and following safe work practices (TAFE Queensland, 2021). There are options to undertake elective units such as delivering and monitoring physiotherapy mobility programs, maintaining functional status and using assistive equipment (TAFE Queensland, 2021). However, it is also acknowledged in Australian AHA frameworks that AHAs must be flexible and develop a scope of practice that fits the local context

(Allied Health Professions Office of Queensland, 2016b; Workforce Planning and Talent Development, 2020). Allied health assistants' scope of practice will likely vary depending on the types of patients (e.g., CF, paediatric, geriatric) and setting (acute rehabilitation, community, mental health). In this program of research, the scope of practice for the new AHA role comprised many tasks specific to acute respiratory physiotherapy. Comprehensive training for these tasks is not likely covered in certified courses. Despite certification, AHAs may need to undergo additional competency training that is fit for local context for AHA roles to be implemented successfully across AHP disciplines.

8.2.4.4 Delegation Training for Both AHAs and AHPs is Required

Delegation training is needed for both AHAs and AHPs for successful implementation of an AHA role (Allied Health Professions Office of Queensland, 2016b; Allied Health Workforce Advice and Coordination Unit, 2012; Nancarrow, 2015; Sarigiovannis et al., 2021; Stute et al., 2014; Workforce Planning and Talent Development, 2020). Delegation training should include information about the definition of delegation, the accountability and responsibility for both physiotherapists and AHAs associated with delegation, and overarching principles that apply to delegating clinical tasks (client-centred, safety ensured, competency of AHA, systems to support delegation, i.e. supervision and feedback are provided, and appropriate documentation occurs) (Allied Health Professions Office of Queensland, 2016a; Queensland Health, 2013; Workforce Planning and Talent Development, 2020). The importance of teamwork and good two-way communication is emphasised (Queensland Health., 2016). Clear instructions, processes, and guidance on managing perceived risks are included in delegation training (Queensland Health., 2013). An audit of 55 pilot programs implementing AHA roles demonstrated that more than 61% of staff withheld delegation of clinical tasks to AHAs because of their lack of knowledge about one or more aspects of the delegation procedure (Stute et al., 2014). This lack of delegation knowledge and skills are discussed in other studies (Moran et al., 2011; Nancarrow & Mackey, 2005; Sarigiovannis et al., 2021; Snowdon et al., 2020).

In this program of research, staff felt they could effectively undertake the delegation process after training occurred. Staff felt confident in the procedures associated with delegation, including the accountability and responsibility associated with delegation. Understanding accountability and responsibility levels when supervising and handing over clinical tasks are integral to successful AHA role development (Stanhope & Pearce, 2013). Previous research has identified a lack of clarification about the delegation process and accountability and responsibility in delegation impacts effective delegation (Mackey & Nancarrow, 2005; Sarigiovannis et al., 2021).

Delegation training increased staff understanding and knowledge of what skills are involved in delegation and understanding of requirements for supervision, communication/handovers, and documentation. Improved use of AHAs may occur if an understanding of the importance of delegation, what delegation skills are required, and confidence that systems to support delegation procedures are in place in the workplace (Stute et al., 2014). Barriers to delegation are likely to be addressed with appropriate delegation training undertaken as part of a workforce redesign implementing an AHA role.

Within many local hospital levels in Australia, guidelines for delegation procedures have been developed (ACT Allied Health Office, 2014; Allied Health Professions Office of Queensland, 2016a; WA Country Health Service , 2020). This program of research adapted a state-based training program (Queensland Health, 2013) that all team members could undertake during regular meeting times. This approach ensured high attendance and no additional time commitments for the staff.

Most staff involved in this program of research had not previously undergone formal delegation training. It seems this is not unusual, with a Delphi survey process of 107 AHAs and AHPs identifying that staff have little training in delegation procedures, limiting effective working relationships (Stute et al., 2013). Large hospital systems, such as the facility this research occurred in, may have access to delegation training packages (Queensland Health., 2013); however, mandatory delegation training appears inconsistent across hospital settings (Bellet, 2021). A recent systematic review examining delegation processes concluded that delegation training is also unlikely to occur during university training programs for AHPs (Sarigiovannis et al., 2021). Without exposure to delegation training, staff are often less willing to delegate tasks to AHAs (Allied Health Workforce Advice and Coordination Unit, 2012; Stute et al., 2014). Consequently, AHAs may be underutilised in their roles (Kuipers et al., 2015). Delegation training is therefore required.

8.2.4.5 Ongoing Supervision and Support Systems are Needed for the Physiotherapy and AHA Staff

Ongoing supervision, mentoring and training for the AHA is required once task competencies are achieved and task delegation occurs. In this program of research, daily handovers were held between the CF physiotherapist/s and AHA, reviewing the AHA tasks undertaken and documentation using the purpose-designed sticker within the patient medical record. The AHA attended all CF physiotherapy training alongside students and junior physiotherapy staff. Staff implemented a formal review process before and after delegated treatments, which is recommended in delegation training (Queensland Health., 2013). These processes likely facilitated team communication, feedback, and ongoing education for the AHA and the physiotherapists undertaking delegation with the AHA. Moran et al. (2015) suggest factors such as working closely with the physiotherapists, ongoing 'in-house' training, structured supervision and mentoring facilitate AHA role success (Moran et al., 2015). Previous studies have identified that supervision and ongoing training for AHAs are often inadequate for AHA needs (Snowdon et al., 2020; Stute et al., 2014). Allied health professionals have underestimated the amount and detail of supervision required for AHA roles (Stute et al., 2014). Similarly, AHAs report feeling underprepared and not well supported for roles (Munn et al., 2013; Stute et al., 2014); therefore, regular and comprehensive supervision, mentoring and training are required to implement an AHA role successfully.

The ongoing supervision, mentoring and training potentially contributed to the lack of safety issues and the positive responses from patients and staff regarding the quality of the care delivered by the AHA. A lack of training for both physiotherapists and AHAs in the skills of mentoring (Munn et al., 2013), supervision (Moran et al., 2015; Stute et al., 2014) and delegation (Sarigiovannis et al., 2021; Snowdon et al., 2020) has been suggested to limit the effectiveness of AHAs role, particularly the delegation of clinical tasks to the AHA.

8.2.4.6 Process Could be Implemented in Other Areas of Physiotherapy and Other Disciplines, Other Settings

There was a considerable investment of staff time in planning for, developing resources, and training the AHA role in this research. This program of research demonstrated the positive outcomes of a well-accepted and functional role that changed practice as a result.

Clinical implementation of AHA roles needs support for all staff members (AHAs and AHPs). Engagement of the AHPs in training AHAs (fit for local context) enhances understanding of AHA roles and effective delegation. Although AHA role implementation conducted as demonstrated in this program of research required substantial local investment, there is potential for efficient implementation of new AHAs consequently. Other efficiencies may include sharing new training resources, such as assessments, competency lists, and other training tools (Nancarrow, Moran et al., 2015). Research exploring the development and implementation of AHA using a workforce redesign tool could be undertaken in other acute hospital physiotherapy treatment areas and other AHP groups, with subsequent potential for increased scope for both AHAs and AHPs.

8.3 Limitations and Strengths

While every effort was made to ensure the rigour of the studies included in this program of research, some limitations should be acknowledged. A number of these limitations are discussed within each study chapter. The main limitations of the program of research will now be discussed.

8.3.1 Limitations

8.3.1.1 Single Site

All studies were conducted in a single large adult cohort CF service. Therefore, generalisability of the findings to other CF services, including paediatric centres, could be limited. Additionally, the centre is located in an Australian CF service, which may infer a bias associated with the care of CF patients delivered in this country, and, again, could limit the generalisability of the findings. However, this is a large centre, and the population would represent a typical population of adults with CF (Conway et al., 2014; Cystic Fibrosis Australia, 2017, 2020). All patients attending the centre during data collection periods were given the opportunity to be involved in the study. All staff delivering CF care were included, except for weekend staff.

Findings from this program of research may not be generalisable to healthcare settings in other countries where the roles of both AHAs and physiotherapists may differ. This may be influenced by different funding and care delivery models that occur in other countries' healthcare systems.

This program of research demonstrated the feasibility of developing and implementing an AHA role in an acute care service in a large hospital. The role development and implementation were established to fit the local context of the CF service, which may be seen as a limitation. To ensure feasibility in other hospital settings, it would be appropriate that the workforce redesign undertaken ensures the AHA role development relies on local context.

8.3.1.2 Data Collection

Activity data collection using the ABC scanning system had limitations. Not all clinical activities recommended in physiotherapy clinical care guidelines, such as use of non-invasive ventilation and end-of-life care (Button et al., 2016; Morrison & Parrott, 2020), could be included in the activity codes (see Table 3.1). Other enhanced-scope physiotherapy activities, such as detailed inhalation therapy and respiratory and exercise reviews, were combined under a single activity code. Future research could include detailed and specific examination of the clinical activities undertaken by the physiotherapists, as this level of detail was not captured.

Allocated FTE during Phase 1 and Phase 2 differed and could potentially be seen as a limitation in activity number data collection and comparisons. The allocated staffing for physiotherapists in the CF service changed in month three of Phase 1, with an additional junior physiotherapist rostered into the CF team. This was continued during Phase 2 of the study. However, the activity collected during the first two months of Phase 1 was contributed to by a large number of additional staff from other clinical areas. Highlighting this contribution from other areas within the hospital prompted physiotherapy management to increase the allocated staff to the CF area. The number of additional staff from other clinical areas within the hospital in P2 was reduced. Therefore, the actual activity number counts for all months across phases likely did not differ significantly with the change from 'additional staff' contribution to allocated staff contribution.

8.3.1.3 Applicability of the Workforce Redesign Tool (Calderdale Framework)

The Calderdale Framework is comprehensive; however, undertaking this system's stages in other hospital settings may not be feasible due to staffing (e.g. availability of trained facilitators and budget constraints). While acknowledging the strengths of the Calderdale Framework in addressing facilitators and barriers to AHA role development, other workforce redesign tools may similarly fit this purpose. One successful example is the Workforce change checklist (Nancarrow, Roots, Moran, Grace, & Lyons., 2013), an evidence-based guide recommended to support workforce redesign (Nancarrow, Roots, Grace, et al., 2013). Regardless, selecting a workforce redesign system is essential, and the choice will likely determine what system best fits the local content. Moreover, many of the training resources and tools developed for this program of research can be shared to enable other centres to reproduce the comprehensive training.

Time constraints to undertake the training and supervision of the AHA may not be feasible in other centres. It is acknowledged that time is required to undertake these activities, with implications for the quality and safety of delegated tasks if these are not done well.

The partial completion of stage seven of the Calderdale Framework associated with sustainability could also be considered a limitation. This seventh stage includes the evaluation of embedding the role within the team over time and the evaluation of the inclusion of competency training into induction processes at a local level. A lack of funding to sustain the AHA role long enough to evaluate these outcomes limited this important step in the Calderdale framework process. If there had been an opportunity to complete this stage, with consequent findings available, outcomes might have influenced the decision to continue the AHA role within the adult CF service. Potentially, a robust finding of sustainability coupled with findings of staff and client perceptions of a high-quality service may have led to more positive support for an ongoing role for the AHA.

8.3.1.4 Consumer Engagement

Health workforce redesign research should engage patients in its methodology (Duckett & Breadon, 2014; Nancarrow, Roots, Grace, et al., 2013; Rolfe et al., 2019). Proposed benefits include ensuring patients' needs are met and quality and safe care is delivered, sustained and/or improved (Duckett & Breadon, 2014; Nancarrow, Roots, Grace, et al., 2013). Patient engagement in health research can deliver increased feasibility, acceptability and alignment of research outcomes to the real-world needs of patients (Forsythe et al., 2019). Engaging patients is recommended to be included in future workforce redesign processes. Patients in this program of research were engaged in only a limited way, with input into the development of the patient surveys used in Study 4. There is also little research exploring patients' perspectives of changes to care delivery due to an AHA role development (Nancarrow, Roots, Grace, et al., 2013). This program aimed to address gaps in the literature regarding patients' perspectives with the inclusion of Study 4.

In broader terms, National Health and Medical Research Council recommends all health and medical research include consumer consultation, as this adds value to research delivery and outcomes (National Health and Medical Research Council and the Consumers Health Forum of Australia, 2016; National Health and Medical Research Council, 2020). This research was formulated and commenced in 2015, and at that time, resources such as those available through National Health and Medical Research Council were not readily available. Including consumers was still a somewhat emerging concept, and as such, adults with CF were not involved in the planning of the service redesign process. The main reason for the lack of engagement, in other aspects of research design, was a direct consequence of the funding model and associated time constants with the development of the study design. This is acknowledged as a potential weakness of the study design.

8.3.2 Strengths

Acknowledging the limitations discussed within the chapters and above, every effort was made to ensure this research program's overall strength and rigour. The main strengths will now be discussed.

8.3.2.1 Rigorous Cohort Study design

Cohort study designs are commonly used when examining the effects of an AHA role on organisational outcomes (Snowden et al., 2020). Every effort was made to ensure methodological rigour concerning the cohort study design used in this program of research. Strengths included that data collection was prospective. The research addressed workforce redesign locally; all eligible participants (all patients attending the CF service and the CF physiotherapy multidisciplinary team staff) were included. This aimed to reduce participant selection bias. The time periods for data collection for Studies 1, 3 and 4 were determined to reflect similar patient activity within the CF service and involved similar patient populations during each phase of the study. Finally, the use of two three-month data collection periods was considered reasonable to demonstrate change in the physiotherapy care delivery with the AHA role compared to the three-month period without the AHA role.

The multi-methods approach has provided primarily quantitative evidence that supports the safe and feasible inclusion of the AHA in this program of research. The collected outcomes were detailed and demonstrated tangible scope of practice outcomes alongside the views of patients, physiotherapists, and multidisciplinary staff. Undertaking the initial stages of the Calderdale Framework engendered broad support from key stakeholders for developing the new AHA role. This supports, in theory, a solid transferability to other centres.

Rigorous cohort-designed studies, such as the studies included in this program of research, are known to produce valid results (Rockers et al., 2015). Outcomes from such studies should inform health organisations about changes to clinical practice associated with health workforce redesign (Rockers et al., 2015; Snowden et al.,2020). Importantly, these research findings reflect real-world context and applicability, a strength of cohort-designed studies (Kadola & Balingit, 2021; Snowden et al., 2020).

Other design strengths included using a trained facilitator of the chosen workforce redesign tool (Calderdale Framework). This allowed for additional rigour as the stages of the Calderdale Framework progressed.

8.3.2.2 Rigorous Data Collection

Every effort was made to ensure that data collection for all studies was rigorous.

Grant monies allowed for a project officer role during the research data collection periods. This allowed for a consistent approach to data collection during these times. Demographic data was sourced from several data lists (medical, hospital recording system) and cross-checked to ensure accurate data collection weekly. Activity data were collected contemporaneously, and a thorough data fidelity checking process occurred weekly throughout the study data collection periods.

Additionally, physiotherapy activity data examined in Studies 1 and 3 included only those staff who worked weekdays within the adult CF service. Weekend data were excluded as data fidelity could not be assured. This study used the well-established hospital-wide data collection systems (ABC), and staff were familiar with this system, enhancing data collection integrity.

All survey data were collected anonymously to improve rigour. This ensured the participants' privacy, which permitted honesty of opinion in responses. This was important as patient and staff participants were all involved in the same centre.

8.4 Local Setting Outcomes and Future Roll Out

This section will discuss the local setting outcomes from this research and associated changes to AHA role development and training.

8.4.1 Use of local training documents to develop AHA roles in acute respiratory services

The comprehensive training documents created for the AHA role, using the Calderdale Framework, continue to be used within the acute cardiorespiratory service where this program of research was undertaken. Additionally, the training documents were made available at the local facility for broad implementation within the physiotherapy department. Training documents, and other associated resources developed for these studies, were also included in developing a standardised approach to AHA training across the hospitals in Queensland (Allied Health Professions Office of Queensland, 2017). The local physiotherapy head of department facilitated this into a state-based physiotherapy management group.

Alongside the document, data and outcomes from this thesis were shared with these key stakeholders of the physiotherapy management group for the state of Queensland. In late 2021 the Physiotherapy Assistant Clinical Training Program for AHA competency training was finalised (Bellet & Fish, 2021). This training package is multi-modal and contains self-directed and/or collaborative peer group learning, face-to-face review of learnings with a facilitator, and practical skills and drills sessions (Bellet & Fish, 2021) aligned with the approach to AHA training undertaken in this research. The training package includes all the cardiorespiratory skills developed for the AHA training in this research.

The CTI documents remain a valuable resource, with all-inclusive guidelines available to support their development (Smith & Duffy, 2014). Due to the rigour of their development, the Calderdale Framework suggests that CTIs be made available for broader distribution throughout organisations once endorsed by an appropriate governance body (Smith & Duffy, 2014). These comprehensive documents could become available for distribution within the state hospital system and, potentially, national distribution. To date, this progression has not occurred, despite the wide distribution of the documents, as discussed above. Factors that may need consideration to progress broader implementation of these training documents across the state-based hospital system include promoting an understanding that risk mitigation is intrinsic to the Calderdale Framework and that training, and support systems that underpin CTI development, reflect this risk mitigation. Identifying key stakeholders at senior levels of management across the broader governance body and informing and educating them about the Framework, particularly the risk mitigation strategies, should be a consideration to ensure the successful dissemination of these comprehensive training tools and warrant future research.

8.4.2 Local delegation training

This program of research sparked increased interest in the physiotherapy department in which the research was conducted in delegation training. The physiotherapy management staff identified delegation training for annual inclusion in staff training in the participating hospital. The candidate delivered a new departmental mandatory '*Introduction to delegation training',* focused on key training points and skills that underpin effective delegation. The one-hour department-wide presentation educated physiotherapy staff about the key inclusions for safe and successful delegation practices. The candidate was also responsible for the subsequent upskilling of other senior members of physiotherapy staff in delivering this training using the available resources used for delegation training in this research (Allied Health Professions Office of Queensland, 2013). This process replicated the delegation training undertaken in this research. Future possibilities include the development of 'Train-the-Trainer' resources and workshops to expand delegation training opportunities further.

8.4.3 Changes to staffing in the CF service

The physiotherapy staffing issues within the CF service identified by this program of research were acknowledged by the participating facility's senior physiotherapy and allied health management. Paradoxically, rather than an ongoing AHA position being established within the service, permanent funding for an additional rotational junior physiotherapy position was achieved. This position added to the number of new rotational junior staff requiring upskilling to undertake clinical activity within the CF service. Anecdotally, senior CF physiotherapy staff would have preferred maintaining the new AHA role, given the considerable investment in time, training, and successful outcomes. There has been previously identified reluctance of professional staff to use AHAs effectively because of protectionism of AHP roles and unwillingness to delegate clinical roles to AHAs (Lizarondo et al., 2010; Mackey & Nancarrow, 2005; Saunders, 1998). Recent research has seen similar outcomes where an AHA role in a dietetic service in the same large tertiary centre was not supported (Rushton et al., 2022). The authors questioned the importance Allied Health managers and leaders of organisations place on prioritising funding and maintaining AHA roles (Rushton et al., 2022). The lack of ongoing AHA positions suggests discordance between acknowledging the importance of AHA training and delegation (Bellet & Fish, 2021) and the lack of these new roles being supported (Rushton et al., 2022).

8.5 Future Research

Innovative approaches to remodelling healthcare delivery continue to be a priority as global healthcare populations age and numbers increase. This includes challenges faced by the multidisciplinary services involved in care delivery to adults with CF. Addressing these challenges by changing the skill mix, including utilising AHA roles within allied health services, such as physiotherapy, is not a new concept. This program of research has focussed on addressing the challenges of care delivery for physiotherapy services in an adult CF service by developing and implementing an AHA role. This research has identified several potential opportunities for future research in this area. Future research considerations are outlined below.8.5.1 Exploring AHA Roles in Acute Healthcare Services

Further investigation is warranted of an AHA role in other areas of physiotherapy care delivery and the wider allied healthcare delivery, including acute care. The clinical implications that an AHA role positively impacted the scope of practice of both physiotherapists and AHAs. The AHA role assisted the CF physiotherapy service to meet clinical care guideline recommendations in an acute respiratory service whilst gaining positive responses from the physiotherapy, multidisciplinary team and patients supporting the role. Benchmarking other acute respiratory services and identifying opportunities for increased use of AHAs to redesign care delivery could be an area of future research. Exploring, in detail, changes to the scope for AHAs working in these acute respiratory care areas, particularly detailed exploration of what is feasible as delegated clinical activity, is required. An example would be a detailed examination of activity that could be undertaken by AHAs in other specialist cardiorespiratory physiotherapy services, post-surgical and intensive care services.

The impact of the COVID-19 pandemic over the last few years has resulted in many rapid changes to healthcare delivery. Increased use of virtual platforms to deliver physiotherapy and other care (Compton et al., 2020) and a refocusing of care for many patient groups to outpatient and virtual models (Davies, 2020; Litvin et al., 2020) has occurred. Research is required to determine if AHA roles can perform safely delegated clinical tasks within these newer care delivery models. Non-clinical activities, such as the numerous administrative tasks associated with virtual appointments, are one area that is likely being undertaken by an AHA role. To investigate whether AHA roles can support physiotherapy care provision with these tasks, research is required. Research is also needed to examine what can be included in the scope of practice for AHAs within changing healthcare delivery.

This program of research demonstrated high overall satisfaction with physiotherapy care delivery and remained unchanged with the inclusion of the AHA role. There is limited evidence examining what contributes to this increased satisfaction with the inclusion of AHA roles. Possible reasons might include increased and perhaps more focused time spent by the AHA with patients, compared to AHP roles and/or if AHPs could spend more focused time with patients associated with the inclusion of an AHA. Previous studies have proposed that increased time with staff (Nancarrow & Mackey, 2005) and increased intensity of care delivery (Lizarondo et al., 2010) related to the inclusion of an AHA role contributed to increases in overall satisfaction with care delivery. These studies, however, lack objective evidence to support findings. Further research needs to be explored to examine the drivers for increased satisfaction with AHA roles.

Similarly, this research found no change in patients' perceived high quality of physiotherapy care delivery with the inclusion of an AHA role. Only one previous physiotherapy study, conducted approximately 25 years ago, demonstrated similar outcomes, with no reported loss of quality to hospital musculoskeletal outpatient clinic services with inclusion of AHA roles (Saunders, 1998).

Further rigorous research is required to investigate the perceptions of staff and patients and objective measures of the quality of care delivery with the inclusion of AHA roles.

The clinical implication that AHA roles can positively impact scope of practice of CF physiotherapists, including the positive impact on care delivery moving towards meeting care guidelines, warrants further investigation. Skill mix redesign, where more training, extension of professional skills, resultant expanded scope of practice and enabled succession planning for AHPs, as a result of AHA role development, needs further robust investigation. Finally, the potential for new AHA roles, with detailed examination of the development and expanded scope of practice associated with these roles for both AHAs and AHPs, should be investigated in other allied health disciplines working in acute care delivery.

8.5.2 Examining the Clinical Effectiveness of Delegation

Changes to the effectiveness of care delivery due to AHA inclusion require further examination. This program of research demonstrated improvements in patient perceptions of the effectiveness of physiotherapy care delivery with the AHA role inclusion in an acute respiratory care service. The literature that has explored the impact of AHA roles in terms of objective clinical effectiveness on treatment outcomes is lacking, particularly in acute respiratory care settings. Allied health assistant roles can be implemented as either an additional role in the service (as demonstrated in this program of research) and/or as a substitute for a physiotherapy or other AHP role.

Most studies that have examined additional activity with an AHA role in service delivery have reported no changes to the selected patient outcomes. This includes measures of activity limitation and quality of life associated with additional AHA role inclusion (Snowden et al., 2020). Clinical effectiveness of an AHA role as a substitution for a physiotherapy role has been reported in one randomised control trial examining outcomes for stroke patients. Post hoc analysis of specific clinical measures of the Rivermead motor assessment and Action research arm tests resulted in improvements in the group with additional AHA involvement in care compared to additional physiotherapy involvement in care (Parry et al., 1999). A potential explanation for these findings is that the AHA activity was directed towards repeated practice of active movements and functional activity compared to the physiotherapy activity, which was focused on teaching and education (Parry et al., 1999). This study, though, is more than 20 years old. A recent study examining ‘substitution’ and ‘additional’ models using a medical imaging assistant (AHA role) within a CT scanning service found that both models delivered similar efficiencies in terms of patient flow time and throughput of patients (Cartwright et al., 2021). Future research is required to determine if either additional AHA role implementation and/or substitution of AHA roles for AHP roles within different allied health services can result in changes to clinically relevant outcome measures. Furthermore, the design of studies to address these questions needs to be considered carefully.

Any research examining the effectiveness of AHA roles must ensure that the AHA undertaking the activity is competent in that activity. Detailed descriptions of competency training development and outcomes achieved for AHAs should be included in future research. Research design that examines AHA roles as a substitution for AHP roles should potentially use either equivalence or non-inferiority trial methodology. Equivalence trials would aim to determine if activity delivered by either AHPs or AHAs is found to be equivalent, not necessarily superior (Piaggio et al., 2006). Non-inferiority trials would evaluate if the AHA role clinical outcomes are no worse compared to current service outcomes whilst also demonstrating potentially other advantages, such as lower cost outcomes (Piaggio et al., 2006; Rehal et al., 2016). Nevertheless, non-inferiority trials are complex to conduct (Hanh et al., 2012), and future research using this design must clearly describe all methods and primary analysis information (Rehal et al., 2016). Without this information, ambiguous conclusions about AHA role inclusion could be made, with potential negative impacts on clinical care delivery. The primary criticism of most of the research examining the clinical effectiveness of AHA roles has been poor research design (Stanhope & Pearce, 2013; Sarigiovannis et al., 2021) and methodological quality (Lizarondo et al., 2010, Snowden et al., 2020). Therefore, future research needs to be considered carefully regarding methodological design and rigour.

8.5.3 Investigating Workforce Redesign Systems to Support AHA Role Development

The clinical implication that AHA implementation needs to be supported using a structured workforce redesign system requires further investigation. Research exploring current care delivery and consequent opportunities for redesign has not been reported using a workforce redesign system in acute care services. This is the first study that has reported detailed changes in scope of practice and consequent changes to care delivery resulting in a new care delivery model for CF physiotherapy services. What is not published is detailed evidence of the application of other redesign systems in other areas of physiotherapy and /or other allied health professions.

Somerville et al. (2015) reported that 11 – 17% of AHP tasks could potentially be delegated to AHAs across a broad range of public hospital and community settings. Surveys of physical therapists in the US reported underuse of AHAs across a wide range of physiotherapy settings, including private practices, community, and hospital settings (Jewell et al., 2022). Similarly, recent broad consultation and utilisation of the use of AHAs across health services in England reported demand for increased use of AHA roles across all broad work areas associated with the 14 allied health professions (Art therapists, Drama therapists, Music therapists, Chiropodists/podiatrists, Dietitians, Occupational therapists, Operating Department Practitioners, Orthoptists, Osteopaths, Paramedics, Physiotherapists, Prosthetists and Orthotists, Radiographers, Speech and language therapists (Snell & Grimwood, 2020; National Health Service, 2022).

The recurring themes regarding barriers to effective use of AHAs across these reports (Jewell et al., 2022; Snell & Grimwood, 2020; Sommerville et al., 2015; National Health Service, 2022) and other literature continue to include the lack of structured role development, scope of practice and competency standards for AHAs (Schwartz et al., 2020, Rushton et al., 2022), lack of standardised training to enable effective role development and utilisation (Somerville et al., 2015) and the need for a governance system or framework addressing the overall development and sustaining of new roles and changes to models of care delivery (Somerville et al., 2015; Huglin et al., 2021, National Health Service, 2022).

Using a workforce redesign system is likely to address known potential barriers to success, mainly where new skill development is occurring for AHAs (Hastings et al., 2014; Imison et al., 2016; Smith & Duffy, 2014). In this program of research, physiotherapy and AHA staff reported that the workforce redesign system addressed many of the barriers and facilitated the change in the care delivery model. Consequently, physiotherapy and AHA staff supported exploring further opportunities for role development and task delegation to AHAs using the workforce redesign tool.

Since this research was conducted, several other Frameworks outlining the stages involved in developing AHA roles have been published in Australia (Huglin et al., 2021) and the UK (Griffin & McVey, 2021). All have similar themes to the Calderdale Framework. Strategic planning for allied health workforce development currently focuses on developing new models of care where traditional professional boundaries and workplace culture in supported to change (Queensland Health, 2019). Strategic planning includes changing service delivery to optimise AHPs' scope of practice and use of AHAs (Queensland Health, 2019). These strategic plans will be supported by research and translating research into best practice evidence-based care (Queensland Health, 2019). Despite this planning, what is lacking in the current literature, is detailed qualitative and quantitative research that includes investigation of workforce redesign systems implementation that support workforce culture change and optimisation of scope of practice for both AHPs and AHAs and resultant direct changes to service delivery. This represents an opportunity to develop research using these Frameworks in other physiotherapy and AHP services. Research in this area needs to investigate specific changes to scope of practice and model of care delivery with quantitative outcomes. Robust qualitative studies conducted alongside the quantitative analyses to determine AHA and AHP perceptions of the use of the frameworks, and overall impact on role satisfaction and improvements to model of care delivery, will allow for triangulation of findings.

8.5.4 Investigating Delegation Training and Procedures

Currently, there is a lack of evidence examining delegation practices within allied health professions. In this program of research, the requirements for delegation training and procedures involved in developing and undertaking the delegation training were identified, outlined, and performed proactively to standardise the practice for AHA and AHP staff. Details of this level of training/approach to delegation procedures are lacking in published research to date. Examining delegation procedures and delegation training occurring in hospital and community allied health settings within Queensland, Australia and internationally, and likely resulting research to address gaps in these practices is required. Furthermore, delegation training and procedures used within AHP disciplines other than physiotherapy should be explored. Determining if delegation practices are standardised across various allied health professions and/or within subspecialties within professions (e.g. orthopaedic, cardiorespiratory, neurological physiotherapy services) is also required.

Published evidence of the approach to delegation training and procedures is scarce. Nancarrow et al. (2015) reported on the successful implementation of a speech therapist assistant role in a rehabilitation setting using a traineeship approach. In this study, it was noted that speech therapists were given clear guidance in the delegation process (the what and the how) (Nancarrow et al., 2015). The speech therapists that undertook delegation training in this study reported they would require further training to pass this knowledge on to the speech therapy assistants and other 'trainees" (Nancarrow et al., 2015). Including what formalised or structured approach to delegation training was undertaken in research publications is required and should result in better transferability of training procedures to other staff in other disciplines.

Saunders (1998) reported the successful use of an AHA within several physiotherapy outpatient departments in Trent, UK, where AHAs' activity increased and accounted for 45% of the overall activity within these outpatient services (Saunders, 1998). This author comprehensively detailed the steps involved in implementing their model for establishing delegation practices. The AHA implementation model outlined in the publication included training for physiotherapists in structured and formalised communication processes, decision-making to determine appropriate delegated tasks, and a step-by-step approach to delegation with the AHAs (Saunders, 1998). Interestingly, Saunders (1998) did not report the inclusion of AHAs as part of the formalised training model. Whilst guidelines to facilitate delegation implementation using this model were developed by Saunders (1998), no further published evidence of the application of this training approach is presented in any literature to date. Saunders (1998) publication was comprehensive in detailing AHA delegation training practices. However, it was conducted and published 24 years ago, highlighting the need for additional and current research outcomes establishing the evidence for using structured delegation training and procedures for AHA implementation. Indeed, training in delegation is considered by AHA and AHP staff as being essential to supporting effective delegation (Rushton et al., 2022; Sarigiovannis et al., 2021), however detailed evidence for the approach to, and application of, this training is still required.

Notwithstanding the limited evidence about delegation training practices, several other questions relating to the application of delegation training require investigation. It is feasible that local training may be available in some areas of health, in both hospital and community-delivered services, for a broad range of AHP services. Such training may not be standardised and has likely developed to fit the local centre. In such circumstances, the effectiveness of this training should be investigated, with the aim of then expanding validated training to other services.

A small body of evidence for local delegation training and resultant positive outcomes has been published. Schwartz et al. (2019) reported on the feasibility of training AHAs to complete a delegated structured mealtime observation task for patients with dysphagia in a Queensland hospital setting. Strong agreement between the AHAs and AHPs grading of a pass/fail for risk of aspiration was found (94%) after AHA specific training had occurred. Both the AHAs and the AHPs involved in the study perceived the quality of the training to be high, which resulted in perceived benefits for the ongoing use of the AHA for this task, and overall benefits for the service. Of note, this study only focused on AHA training in a single, specific task. Nancarrow et al. (2015) reported the successful implementation of a speech therapy assistant after training was conducted using a work-based traineeship approach over a two-year period. The development of the AHA role in this study involved a hierarchy of supervision for the AHAs and AHPs to develop the role (Nancarrow et al., 2015). Formal weekly meetings to examine supervision and training processes occurred (Nancarrow et al., 2015). Significant informal training that included instruction, demonstration, observation of the AHA undertaking tasks and other practice and feedback also occurred (Nancarrow et al., 2015). Training and tasks developed were specific to the needs of this speech therapy service in that rehabilitation setting (Nancarrow et al., 2015). Training and supervision totalled three hours per week, resulting in increased capacity within the speech therapy service of 28 hours per week (Nancarrow et al., 2015). Despite the positive outcomes, Nancarrow et al. (2015) reported that management in the service felt this approach to AHA role development was too resource intensive as the competency framework and training resources had to be created by the staff without using any external training model. This brings the applicability and transferability of this training model therefore into question. A broader research approach is required to determine what training packages are currently available worldwide, what is included in these packages, and what has resulted in the effective implementation of AHA roles.

Finally, other research areas that currently lack evidence regarding delegation training and practices include research investigating if delegation training should occur for AHPs and/or AHAs regularly and if the training should be considered mandatory. Such evidence may support embedding delegation training for both AHAs and AHPs within health services. Research exploring changes in delegation training practices impacted by the recent COVID-19 pandemic (e.g., changed from face-to-face training to online training) is another area of research yet to be published. There remains a paucity of evidence investigating many aspects associated with delegation training and procedures, offering opportunities for future research in this area.

8.5.5 Explore What AHA Training and Competency Certification Occur in Healthcare Settings and Educational Institutions

Lack of knowledge about AHA skills and competencies contribute to hesitation about using AHA roles (Rushton et al., 2022; Sarigiovannis et al., 2021; Snowdon et al., 2020). The level of skill achieved during competency training demonstrated in this program of research is missing from previous studies of AHA role development (Nancarrow & Mackey, 2005; Snowdon et al., 2020). Factors associated with AHA role acceptance and use include having a sense of trust in the AHAs' ability to perform the assigned tasks (Mackey et al., 2005; Nancarrow, Moran et al., 2015; Parry, 1997; Saunders, 1995). This trust appears to be supported by staff knowledge of what training was conducted (Snowdon et al., 2020) and the comprehensive documentation of the training (Moran et al., 2015).

Further research examining current competency training for AHA roles is required. Details of what competency and delegation training is occurring for AHAs are needed. Resources such as the Allied Health Assistant Frameworks (Allied Health Professions Office of Queensland, 2016a), institution-developed clinical task instructions (including competencies) (Queensland Health., 2021), Physiotherapy Assistant Clinical Training package (Bellet & Fish, 2021), the Credentialing, Competency and Capability Framework (Department of Health and Human Services Victorian Government., 2016) and the Allied Health Professions Support Worker Competency, Education, and Career Development Framework (Griffin & McVey, 2021) are available. Huglin et al., 2021 reported that frameworks available to AHPs and AHAs in the Victorian state health system, for example, were not used by staff (Huglin et al., 2021). Examining the application of and/or barriers to the application of training frameworks on a national and international level is required.

In this research, the tasks and consequent competency training undertaken by the AHA were specifically tailored to meet the needs of the CF physiotherapy service. Therefore, other AHA roles will likely require tasks and competency training that are site-specific specific. However, such training can be challenging within busy healthcare settings (i.e. 'on-the-job training' requires time, resources and expertise) (Huglin et al., 2021). One logical step towards implementing competency levels in AHA roles would be to encourage the uptake of training programs (Queensland Health, 2019; Workforce Planning and Talent Development, 2020) such as Certificate IV for Allied Health professionals in Australia (National Vocational Education and Training, 2022) or the Healthcare assistant practitioner (level 5) apprenticeship training in the United Kingdom (Institute for Apprenticeships and Technical Education, 2022) or a Level 5 Diploma for Assistant Practitioners in Healthcare (Northern Council for Further Education, 2022). The Australian national training program in Certificate IV in Allied health assistance involves undertaking a 16-unit course with seven core units (learning to work with diverse people, managing legal and ethical compliance, confirming physical health status, following safe work practices for direct client care, interpreting and applying medical terminology appropriately) and nine elective units. The nine electives allow for specialisation of the qualification of the AHA role in either Physiotherapy, Podiatry, Occupational Therapy, Speech Pathology, Community Rehabilitation and Nutrition and dietetics (National Vocational Education and Training, 2022). There is also a placement component of 120 hours. Assessment includes the AHA presenting case studies, knowledge tests, practical assessments, and other presentations (Health Industry Training, 2021). The UK program involves 20 mandatory units and 120 hours of placement (Northern Council for Further Education, 2022). This UK curriculum appears not to offer any specialisation units (Northern Council for Further Education, 2022). Assessment includes direct observation of practice, professional discussion, work product or a portfolio of evidence (Northern Council for Further Education, 2022).

Whilst these are excellent examples of competency training, it is unclear what options are available for site-specific task training and competency assessments or if facilities perceive site-specific training is required. In the United States, a recent survey of 1830 physiotherapists and physiotherapy assistants found inconsistencies in task delegation and competency standards for assistants across all states and clinical settings (Jewell et al., 2022). Survey respondents felt that the current formal assistant training programs available for physiotherapy assistants did not prepare physiotherapy assistants for their roles and that ongoing education and training for these staff was required (Jewell et al., 2022). Jewell et al. (2022) concluded that future education of physiotherapy assistants requires a curriculum change that focuses on developing consistent practice standards, an emphasis on delegation training and an efficient education program (Jewell et al., 2022). Therefore, no current training appears to develop an AHA role that is site ready for an extensive range of possible roles. These qualifications appear to offer broad steps in training. However, ongoing development of competency that is site specific for that clinical service is likely required in many health settings. Investigation of what, if any, particular training in undertaking delegation procedures and the suitability of this for varied workplaces is not known.

8.5.6 Cost Effectiveness of AHAs

Robust research that investigates AHA role implementation, accounting for the costs required for training and competency certification, and then examining if potential cost savings can offset these costs, as AHAs take up appropriate roles within clinical services, as opposed to junior or senior AHPs undertaking tasks, is required. One of the potential drivers for AHA role development and implementation is the proposed cost-effectiveness associated with AHA role usage as part of skill mix redesign. To date, only one published paper has assessed this clinical implication rigorously. Cartwright et al. (2021) costed four different models using different skill mix with AHAs and AHPs in a computerized tomography service, with the cheapest workforce consisting of an AHA and AHP combination to deliver services (Cartwright et al., 2021). The AHA role comprised administrative tasks only (i.e., undertaking hospital patient bookings and fielding and scheduling telephone calls (Cartwright et al., 2021). Cost implications are also associated with skill mix redesign, where the potential opportunity for junior staff to change their scope of practice and absorb more responsibilities is also required.

Evaluating the cost-effectiveness of a remodelled service that has implemented changes to staffing/skill mix requires a robust economic evaluation. Simply comparing the salary costs of a model of care (without AHA) against a model of care (with an AHA) without including an analysis of the impact of this change on patient and broader service delivery outcomes does not represent a robust health economic evaluation (Turner et al., 2021). Therefore, it is inappropriate to simply look at the costs associated with delivering the two models of care. It is crucial for policymakers and health service providers to consider the potential trade-offs between all relevant costs and benefits using more robust economic evaluations.

Health economic evaluations are commonly conducted as a cost-utility analysis, where the evaluation of two types of models of care are reported in terms of the relative cost and a generic measure, the quality-adjusted life years (QALYs) (Jackson et al., 2017; Turner et al., 2021). A QALY is a summary measure representing the impact of a change in healthcare delivery on a person's quantity and quality of life (Whitehead and Ali, 2010). Quality-adjusted life year outcomes allow for comparisons across different interventions and across different disease conditions (Jackson, 2017). However, QALYs are resource heavy to measure (Turner et al., 2021) and insensitive to some medical conditions (McDonough & Tosteson, 2007). Quality-adjusted life years does not necessarily account for all the broader health benefits associated with a new model of care (Whitehead & Ali, 2010), including clinically meaningful changes in healthcare status, symptoms and functional abilities associated with a change to care delivery for a person (Stamuli, 2011; Turner et al., 2021; Whitehead & Ali, 2010). In particular, QALYs may not be the best measure of a complex intervention, such as the development and implementation of an AHA role, as maximising quality of life is not the primary goal of this intervention (Turner et al., 2021; Weatherly et al., 2009). Therefore, although cost-utility economic evaluations are commonly reported in the literature, alternatives to evaluating a new model of care using an AHA should be used.

A cost-consequence analysis is proposed as a robust alternative approach to economic evaluation of the two models of care. Cost-consequence analysis evaluates all relative costs and outcomes. However, the outcomes are listed separately, i.e. multiple clinically important outcomes are reported (Turner et al., 2021). A cost-consequence analysis tabulates all the costs and benefits separately in the form of a balance sheet. There is, therefore, no single costing evaluation based on one outcome alone. This approach to economic evaluation would provide a comprehensive and itemised account of each model of care's impact.

Additionally, this approach includes the clinicians and incorporates factors relevant to routine clinical decision-making. Therefore, future economic evaluation of this research should consider the total cost of delivering the two models of care in terms of salaries and longer-term resource utilisations, specifically time to next exacerbation and number of outpatient appointments. Outcomes should include safety (number of adverse events), quality of care (measured by length of stay, number of outpatient appointments), and clinical outcomes (measured as change in lung function and readmission rates). Specific data from included participants in the two phases would also include bed cost data for length of stay; AHP staff costs (overall time, number of treatments, time per treatment) and AHA staff costs (overall time, number of treatments, time per treatment) and interventions provided during phase one and phase two. Presenting the costs and outcomes in this way will provide a descriptive summary for healthcare managers to determine the value for expenditure based on the outcome measures most relevant to or most valued by that service associated with the change in service delivery. Cost-consequence analysis is considered a practical measure (Hartfield & Edwards, 2008) and appropriate when QALY's cannot be determined easily (Hartfield & Edwards, 2008).

In summary, evaluation of the cost implications associated with the implementation of new AHA roles should include examination of overall treatment effectiveness (patient throughput, hospital length of stay, rehospitalisation rates etc.), overall skill mix costings (number of AHAs, junior, and senior AHPs within a service to deliver comparable care) and the maintenance of patient's quality of life outcomes. Investigation of these outcomes, all linked to a comprehensive cost analysis as previously discussed, was proposed, but was considered beyond the scope of this current program of research. However, cost analysis should be included in future research to inform best evidence for the further development and implementation of AHA roles and the overall skill mix redesign of healthcare services.

8.6 Conclusion

This program of research has contributed new evidence evaluating the inclusion of an allied health assistant role within an acute respiratory physiotherapy service in terms of scope of practice and the impact on physiotherapy care delivery. The redesign of the CF physiotherapy service was proposed to address the rapidly changing demands for services for adults with CF due to increasing life expectancy and numbers.

To date, there has been no published data reporting quantitative evidence of the clinical and non-clinical activities that comprise service provision and scope of practice undertaken by physiotherapists in a large CF service and benchmarking these outcomes against recommendations in current CF physiotherapy specific clinical guidelines. Key aspects of care delivery did not meet clinical guideline recommendations with the current numbers and skill mix of staff. Quantifying the physiotherapy care delivery supported the need for service redesign. Developing and implementing a new AHA role was proposed. Allied health professional services should consider using comprehensive data collection and benchmarking processes to gain insights into current services and identify gaps and solutions.

To maximise success and mitigate potential risk with an AHA undertaking delegated clinical activity, a workforce redesign system was chosen to facilitate and support the changes to skill mix within the service. Detailed descriptions of the application of the Calderdale Framework used in the redesign resulted in comprehensive training documents and resources that can inform appropriate clinical and non-clinical AHA scope of practice inclusions and consequent comprehensive competency training. The use of the workforce redesign system contributed to both AHA and physiotherapy staff's positive perceptions of the scope and value of a new role within an acute respiratory service. Ensuring all staff underwent training in delegation procedures further contributed to staff confidence in undertaking delegation with the AHA. When considering redesigning a health service, particularly skill mix redesign, using an evidence-based redesign system is recommended. A system that is comprehensive, systematic and engages all stakeholders is critical. Including comprehensive training for new and appropriate AHA activity, training for all staff in delegation procedures and ongoing mentoring and supervision for the role are all critical to successfully implementing new AHA roles.

Key learnings from quantifying the scope of practice for a new AHA role and subsequent changes to physiotherapy care delivery can influence future development of AHA roles in acute AHP respiratory services. An AHA role has been shown to undertake delegated clinical respiratory and exercise treatments and exercise tests. Non-clinical activity also occurred, specific to the needs of the acute respiratory service. Scope of practice did not change for the AHAs as they continued undertaking tasks following delegation practices. The AHAs in this research did, however, expanded their practice to perform acute clinical cardiorespiratory tasks and this required training and competency assessment as detailed in this research. Notably, no adverse events were reported with care delivery within the remodelled service. The new role was well received by CF patients and the CF multidisciplinary team. Significantly, clinical scope of practice and activity for physiotherapists changed, increasing complex clinical care and other activity that moved the service towards meeting clinical guideline recommendations for CF physiotherapy services. Detailed evidence to demonstrate the acceptability of an AHA role in acute respiratory physiotherapy care delivery supports the development of AHA roles in other AHP services and other hospital and community settings.

The increasing demand for healthcare services is not solely a problem for CF physiotherapy services. Redesigning a service by developing an AHA role can enhance care delivery. Moving services towards evidenced based care delivery recommendations, with perceived improved effectiveness and no change to the perceived high quality of the service, has applicability to many other healthcare service delivery models. Service redesign needs to be considered wisely, however. A proven workforce redesign system that can ensure comprehensive engagement, communication, and systematic development of new AHA roles, with appropriately developed new scope of practice, competency training, ongoing supervision and mentoring, are keys to the successful implementation of new roles. Further research is required to deliver robust data supporting the effectiveness of these new models of care delivery which extend the scope of practice for AHAs whilst enhancing the contributions of both junior and senior physiotherapists. Identifying improved overall workforce delivery, including the cost-effectiveness of these changes, should be the aim of future research.

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Appendices

Appendix 1: Appendices to Chapter 5

Surveys and Interview guide

1.1. AHA Implementation using the Calderdale Framework: Pre-implementation Survey

Cystic Fibrosis Allied Health Assistant Project

Welcome to the Cystic Fibrosis Allied Health Assistant Project Survey

You are receiving this survey as you are participating in the Cystic Fibrosis Allied Health Assistant Project which examines the team's model of care

The purpose of this survey is to capture the views of physiotherapists and physiotherapy assistants at the start and the end of the project. Survey responses will be used as part of the quality management process for the project.

Participation is voluntary.

The survey is anonymous. You are not required to provide your name or other identifying information.

Use of survey data:
The survey data from all respondents will be aggregated. The aggregated data may be presented in project reports that will be provided to project stakeholders and the sponsor. Data will not be reported in a way that identifies an individual by name or by profession.

Instructions:
The survey will take approximately ten minutes. All questions except one are multiple choice.

For further information, contact Kathleen Hall (phone 3139 6273), or Michelle Stute (michelle.stute@health.qld.gov.au)

Cystic Fibrosis Allied Health Assistant Project

1. Please indicate your role. Are you a.....

◯ Physiotherapist

◯ Physiotherapy Assistant

1

2. How many years have you been working as a physiotherapist or physiotherapy assistant since your first job (do not include periods of extended leave. E.g. maternity leave)?

- Less than 2 years
- 2-10 years
- 10 years +

* 3. When thinking about the *current* *Cystic Fibrosis physiotherapy (PT) service,* indicate your level of agreement/disagreement with the following statements:

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
Patients find it easy to access our services	○	○	○	○	○
Patients receive benefit from our services	○	○	○	○	○
The Cystic Fibrosis PT service coordinates patient care effectively	○	○	○	○	○
Referrers are able to engage the Cystic Fibrosis PT service without difficulty	○	○	○	○	○
Communication within the CF PT service is effective	○	○	○	○	○
Patients receive PT services in a timely way (ie when they need it, as much as they need)	○	○	○	○	○
Waste is not a major issue for the PT service (ie duplication of clinical tasks, unproductive time)	○	○	○	○	○

* 4. When thinking about the current workforce profile in the*Cystic Fibrosis Physiotherapy Service,* indicate your level of agreement/disagreement with the following statements:

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
In general, new staff have *no* difficulty adjusting to the PT service model of care (model of care means the way services are organised and delivered)	○	○	○	○	○

2

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
In general, new staff have *no* difficulty meeting the clinical requirements of their role in the team (including caseload demands)	◯	◯	◯	◯	◯
I have a good understanding of the role and functions of different members of the CF PT service team	◯	◯	◯	◯	◯
Physiotherapists and Physiotherapy Assistants in the Cystic Fibrosis PT service work to their full scope of practice most of the time	◯	◯	◯	◯	◯
The role of each team member (PTs and PTAs) is clear	◯	◯	◯	◯	◯
Team members demonstrate a good understanding of the scope of practice of Physiotherapy Assistants	◯	◯	◯	◯	◯
I understand the scope of practice of Physiotherapy Assistants in this team	◯	◯	◯	◯	◯
Physiotherapy Assistants in this team work to their full scope of practice most of the time	◯	◯	◯	◯	◯
Physiotherapists in the team delegate appropriately and effectively to Physiotherapy Assistants	◯	◯	◯	◯	◯

Cystic Fibrosis Allied Health Assistant Project

* 5. In relation to the current Calderdale Project reviewing the tasks that could be delegated to physiotherapy assistants, indicate your level of agreement/disagreement with the following statements:

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
I feel there is value in undertaking this work on the delegation of tasks and optimising the role of physiotherapy assistants	○	○	○	○	○
I feel that patients will benefit from this work reviewing the delegation of tasks and optimising the role of physiotherapy assistants	○	○	○	○	○
I support investigating greater opportunities for task delegation (to PTAs) within the team	○	○	○	○	○
The work is being driven from within the team	○	○	○	○	○
I feel I have the knowledge and skills to participate fully in this work	○	○	○	○	○
I feel my team will benefit from working on our delegation practices	○	○	○	○	○
I feel I have the time and capacity to participate in this work	○	○	○	○	○
Management supports this project reviewing the team's utilisation of physiotherapy assistants	○	○	○	○	○
I feel the work will positively influence recruitment and retention of staff in the team	○	○	○	○	○

6. Please provide any other thoughts or reflections regarding the Cystic Fibrosis Allied Health Assistant Project

1.2 AHA Implementation using the Calderdale Framework: Post-implementation survey

Review of the Cystic Fibrosis Allied Health Assistant Project

Welcome to the Cystic Fibrosis Allied Health Assistant Project Survey

You are receiving this survey as you have participated in the development of and/or implementation of the Cystic Fibrosis Allied Health Assistant Project which examines the team's model of care.

The purpose of this survey is to capture the views of physiotherapists and physiotherapy assistants at the start and the end of the project. Survey responses will be used as part of the quality management process for the project.

Participation is voluntary.

The survey is anonymous. You are not required to provide your name or other identifying information.

Use of survey data:
The survey data from all respondents will be aggregated. The aggregated data may be presented in project reports that will be provided to project stakeholders and the sponsor. Data will not be reported in a way that identifies an individual by name or by profession.

Instructions:
The survey will take approximately ten minutes. All questions except one are multiple choice.

For further information, contact Kathleen Hall (phone 3139 6273), or Michelle Stute (michelle.stute@health.qld.gov.au)

Review of the Cystic Fibrosis Allied Health Assistant Project

1. Please indicate your role. Are you a.....

- ◯ Physiotherapist
- ◯ Physiotherapy Assistant

1

2. How many years have you been working as a physiotherapist or physiotherapy assistant since your first job (do not include periods of extended leave. E.g. maternity leave)?

- ◯ Less than 2 years
- ◯ 2-10 years
- ◯ 10 years +

* 3. When thinking about the *Cystic Fibrosis physiotherapy (PT) service during February to end June 2016* indicate your level of agreement/disagreement with the following statements:

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
Patients find it easy to access our services	◯	◯	◯	◯	◯
Patients receive benefit from our services	◯	◯	◯	◯	◯
The Cystic Fibrosis PT service coordinates patient care effectively	◯	◯	◯	◯	◯
Referrers are able to engage the Cystic Fibrosis PT service without difficulty	◯	◯	◯	◯	◯
Communication within the CF PT service is effective	◯	◯	◯	◯	◯
Patients receive PT services in a timely way (ie when they need it, as much as they need)	◯	◯	◯	◯	◯
Waste is not a major issue for the PT service (ie duplication of clinical tasks, unproductive time)	◯	◯	◯	◯	◯

* 4. When thinking about the workforce profile during February to end June 2016 in the*Cystic Fibrosis Physiotherapy Service,* indicate your level of agreement/disagreement with the following statements:

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
In general, new staff have *no* difficulty adjusting to the PT service model of care (model of care means the way services are organised and delivered)	◯	◯	◯	◯	◯

2

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
In general, new staff have *no* difficulty meeting the clinical requirements of their role in the team (including caseload demands)	◯	◯	◯	◯	◯
I have a good understanding of the role and functions of different members of the CF PT service team	◯	◯	◯	◯	◯
Physiotherapists and Physiotherapy Assistants in the Cystic Fibrosis PT service work to their full scope of practice most of the time	◯	◯	◯	◯	◯
The role of each team member (PTs and PTAs) is clear	◯	◯	◯	◯	◯
Team members demonstrate a good understanding of the scope of practice of Physiotherapy Assistants	◯	◯	◯	◯	◯
I understand the scope of practice of Physiotherapy Assistants in this team	◯	◯	◯	◯	◯
Physiotherapy Assistants in this team work to their full scope of practice most of the time	◯	◯	◯	◯	◯
Physiotherapists in the team delegate appropriately and effectively to Physiotherapy Assistants	◯	◯	◯	◯	◯

Review of the Cystic Fibrosis Allied Health Assistant Project

* 5. In relation to the Calderdale Project that reviewed the tasks that could be delegated to physiotherapy assistants, indicate your level of agreement/disagreement with the following statements:

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
I feel there is value in undertaking this work on the delegation of tasks and optimising the role of physiotherapy assistants	◯	◯	◯	◯	◯
I feel that patients did benefit from this work reviewing the delegation of tasks and optimising the role of physiotherapy assistants	◯	◯	◯	◯	◯
I support investigating greater opportunities for task delegation (to PTAs) within the team	◯	◯	◯	◯	◯
The work is being driven from within the team	◯	◯	◯	◯	◯
I feel I have the knowledge and skills to participate fully in this work	◯	◯	◯	◯	◯
I feel my team has benefitted from working on our delegation practices	◯	◯	◯	◯	◯
I feel I had the time and capacity to participate in this work	◯	◯	◯	◯	◯
Management supports this project reviewing the team's utilisation of physiotherapy assistants	◯	◯	◯	◯	◯
I feel the work will positively influence recruitment and retention of staff in the team	◯	◯	◯	◯	◯

6. Please provide any other thoughts or reflections regarding the use of the Calderdale framework to guide the development of the AHA role in CF

7. Please provide any thoughts or reflections on the OVERALL project "developing an AHA role in CF".

5

1.3 Pre-delegation Training Survey

Thoracic Physiotherapy Team delegation practices survey

You are receiving this survey as you are participating in the Thoracic physiotherapy delegation training.

The purpose of this survey is to capture the views and understanding of physiotherapists and physiotherapy assistants at the start and the end of the delegation training. Survey responses will be used as part of the quality management process for the project.

Participation is voluntary.

The survey is anonymous. You are not required to provide your name or other identifying information.

Use of survey data:
The survey data from all respondents will be aggregated. The aggregated data may be presented in project reports that will be provided to project stakeholders and the sponsor. Data will not be reported in a way that identifies an individual by name or by profession.

Instructions:
The survey will take approximately ten minutes. All questions are multiple choice.

For further information, contact Kathleen Hall (phone 3139 6273), or Mark Roll (phone 3139 5920).

Thoracic Physiotherapy Team delegation practices survey

1. Please answer these questions relating to the HP and AHA roles in the Physiotherapy Thoracic and CF area

	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
I have good a good understanding of the role and functions of the HP 5's in the Thoracic and CF area	○	○	○	○	○
I have good a good understanding of the role and functions of the HP 4's in the Thoracic and CF area	○	○	○	○	○
I have good a good understanding of the role and functions of the HP 3's in the Thoracic and CF area	○	○	○	○	○
I have good a good					

1

understanding of the role and functions of the AHA in the Thoracic area	◯	◯	◯	◯	◯
I have good a good understanding of the role and functions of the AHA in the CF area	◯	◯	◯	◯	◯
I have good a good understanding of the scope of practice of the AHA in the CF area	◯	◯	◯	◯	◯
HP's in the Team currently delegate appropriately and effectively to the AHA in the Thoracic team	◯	◯	◯	◯	◯
HP's in the Team currently delegate appropriately and effectively to the AHA in the CF team	◯	◯	◯	◯	◯
AHA's in the Thoracic and CF team are currently working to full scope of practice most of the time	◯	◯	◯	◯	◯

2

2. Please answer these questions relating to your understanding / training in Delegation practices.

	Very Confident	Confident	Neutral	Unconfident	Very Unconfident
How confident are you in your understanding of delegation practices generally?	◯	◯	◯	◯	◯
How confident are you in your understanding of the responsibilities and role of the HP in delegating clinical tasks to an AHA?	◯	◯	◯	◯	◯
How confident are you in your understanding of the responsibilities and role of the AHA in carrying out delegated clinical tasks?	◯	◯	◯	◯	◯
How confident are you in your understanding of the competency requirements for an AHA to take on delegated clinical tasks?	◯	◯	◯	◯	◯

3. Answer these as either a HP or AHA

	Yes	No
Are you aware of what clients are appropriate for a HP to delegate clinical care for?	◯	◯
Are you aware of the 'When to Stop" guideline and it's content as part of delegation practices?	◯	◯
Have you completed formal delegation training as part of your study/ orientation/ induction?	◯	◯

How long has it been since you last did delegation training/update?

3

4. Some general information: Please

	Yes	No
Are you a HP	◯	◯
Are you a AHA	◯	◯
Have you worked one year or less?	◯	◯
Have you worked > one year but < 5 years?	◯	◯
Have you worked > 5 year but < 10 years?	◯	◯
Have you worked > 10 years?	◯	◯

4

1.4 Post-delegation Training survey

Review of Thoracic Physiotherapy Team delegation practices survey

You are receiving this survey as you are participating in the Thoracic physiotherapy delegation training.

The purpose of this survey is to capture the views and understanding of physiotherapists and physiotherapy assistants at the start and the end of the delegation training. Survey responses will be used as part of the quality management process for the project.

Participation is voluntary.

The survey is anonymous. You are not required to provide your name or other identifying information.

Use of survey data:
The survey data from all respondents will be aggregated. The aggregated data may be presented in project reports that will be provided to project stakeholders and the sponsor. Data will not be reported in a way that identifies an individual by name or by profession.

Instructions:
The survey will take approximately ten minutes. All questions are multiple choice.

For further information, contact Kathleen Hall (phone 3139 6273), or Mark Roll (phone 3139 5920).

Review of Thoracic Physiotherapy Team delegation practices survey

1. Please answer these questions relating to the HP and AHA roles in the Physiotherapy Thoracic and CF area

	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
I have good a good understanding of the role and functions of the HP 5's in the Thoracic and CF area	○	○	○	○	○
I have good a good understanding of the role and functions of the HP 4's in the Thoracic and CF area	○	○	○	○	○
I have good a good understanding of the role and functions of the HP 3's in the Thoracic and CF area	○	○	○	○	○
I have good a good understanding of the role and functions of the	○	○	○	○	○

1

AHA in the Thoracic area					
I have good a good understanding of the role and functions of the AHA in the CF area	○	○	○	○	○
I have good a good understanding of the scope of practice of the AHA in the CF area	○	○	○	○	○
HP's in the Team currently delegate appropriately and effectively to the AHA in the Thoracic team	○	○	○	○	○
HP's in the Team currently delegate appropriately and effectively to the AHA in the CF team	○	○	○	○	○
AHA's in the Thoracic and CF team are currently working to full scope of practice most of the time	○	○	○	○	○

2

2. Please answer these questions relating to your understanding / training in Delegation practices.

	Very Confident	Confident	Neutral	Unconfident	Very Unconfident
How confident are you in your understanding of delegation practices generally?	◯	◯	◯	◯	◯
How confident are you in your understanding of the responsibilities and role of the HP in delegating clinical tasks to an AHA?	◯	◯	◯	◯	◯
How confident are you in your understanding of the responsibilities and role of the AHA in carrying out delegated clinical tasks?	◯	◯	◯	◯	◯
How confident are you in your understanding of the competency requirements for an AHA to take on delegated clinical tasks?	◯	◯	◯	◯	◯

3. Answer these as either a HP or AHA

	Yes	No
Are you aware of what clients are appropriate for a HP to delegate clinical care for?	◯	◯
Are you aware of the 'When to Stop" guideline and it's content as part of delegation practices?	◯	◯
Have you completed formal delegation training as part of your study/ orientation/ induction?	◯	◯

How long has it been since you last did delegation training/update?

[ ]

3

4. Some general information: Please

	Yes	No
Are you a HP	◯	◯
Are you a AHA	◯	◯
Have you worked one year or less?	◯	◯
Have you worked > one year but < 5 years?	◯	◯
Have you worked > 5 year but < 10 years?	◯	◯
Have you worked > 10 years?	◯	◯

5. To help evaluate your learning experience in this workshop please provide responses to the following statements:

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
I understand delegated practice in the context of a model of care as opposed to the delgation of individual tasks	◯	◯	◯	◯	◯
I can describe the scope, roles and responsibilities of the allied health professional and the allied health assistant in a delegation relationship	◯	◯	◯	◯	◯
I understand the concept of structural delegation as it applies to clinical supervision within a delegation relationship	◯	◯	◯	◯	◯
I can discuss the concepts of responsibility and accountability as they apply to allied health professionals and allied health assistants	◯	◯	◯	◯	◯
I can apply systems to assist implementation of models of care incorporating allied health assistants	◯	◯	◯	◯	◯

4

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
I understand and apply the five rights of delegation					
I can describe the elements of effective teamwork as they apply in delegated practice					
I can provide effective performance feedback to team members					
I understand the role and application of situational leadership to delegation practices and clinical supervision					
I found this workshop to be useful to my professional practice					

6. As this is the first time we have run this information in the department an you provide feedback about the course: (did it work?, how can we make it better? What needs to be included? What could be taken out / Were the videos and then the follow-up information helpful?) Other??

5

1.5 Interview Guide

De-identified number:		
Staff discipline (AHA or physiotherapist):		
Years of experience as a practising physiotherapist or AHA (circle one):		
_____________ (number of years)		
< 2 years	2 to 10 years	>10 years

The list of questions is a guide for the interviewer. To develop rapport, the interviewer will seek to set a conversational tone, using their interview skills and experience. The interviewer will use discretion in phrasing and in using probes and additional questions to fully understand the interviewee's perspective and to consider prior responses.

Be sure to ask physiotherapists and AHAs if they are comfortable in the space or if they would need to be elsewhere to feel comfortable completing the interview. As appropriate, remind participants they do not have to answer questions if they're not comfortable responding.

INTRODUCTION

Introduce yourself.

"You are being invited to participate in this research study because you have been involved in the project that is developing a new AHA role in CF physiotherapy using the Calderdale Framework. We are interested in your thoughts about this implementation process. We are looking for your thoughts and suggestions. The interview should take about 15 – 20 minutes. I will be taking notes during the interview to record your thoughts.

Are you happy to continue with the interview? By saying yes, you agree to participate in the study. Do you have any questions for me before we go any further?

Are you happy to continue?

Questions:

1. What are the key challenges or issues for the CF physiotherapy service at TPCH?

If I were to summarise your answer, this is what I think I've heard from you…

2. When thinking about the PT and PTA workforce in the CF unit, what are your thoughts about the following questions?

- How easy or not is it for new staff to orientate to the PT service?
- Is the size of the caseload appropriate?
- Are roles (of PTs and AHAs) well delineated and understood by all?
- Do PTs and AHAs work to their full scope of practice? If not, why?
- Are delegation practices clear and appropriate?

If I were to summarise your answer, this is what I think I've heard from you…

3. In relation to the role of a dedicated AHA in the CF unit, what are your thoughts about the following questions?

- Do you see value in this role?
- What benefits, if any, do you see for patients?
- What benefits, if any, do you see for PTs or AHAs (e.g., retention, morale)

If I were to summarise your answer, this is what I think I've heard from you…

4. In relation to the Project processes, what are your thoughts about the following questions?

- Has the time allocation been reasonable or difficult to fit in? How could this have been improved?
- Is management/leadership supportive of the project?
- Has the project been a positive, negative or neutral influence on team dynamics and cooperation?
- Does the team have ownership and drive of the project, or do members perceive it is being driven externally or by one person?
- Do you feel as though you have a good understanding of the project or insufficient knowledge and skills to participate?

If I were to summarise your answer, this is what I think I've heard from you…

5. Are there any other comments you'd like to include about the project?

6. Is there anything we haven't asked that you would like to tell us?

Thanks so much for your time. It's been great getting to hear your thoughts about developing a new AHA role in CF physiotherapy using the Calderdale Framework.

1.6 Service Analysis Task List

Service Analysis Task list: Cystic Fibrosis Physiotherapy Service

Assessment Tasks	Treatment Tasks	General non-clinical tasks
INPATIENT 1. Oximetry 2. Auscultation 3. Observation 4. BP 5. RR 6. HR 7. Supp Oxygen 8. Palpation 9. Cough 10. Sputum 11. Haemoptysis 12. Case conference 13. MDT handover 14. NIV 15. Airvo 16. RFT 17. Inhalation devices 18. ACT Equipment 19. Trial inhalation drug therapies including: a. HS (Hypertonic Saline) b. Manitol c. AB d. Pulmozyme 20. Balance testing:	**AIRWAY CLEARANCE** 1. ACBT 2. P and V 3. AD 4. PEP 5. Hydra PEP 6. Acapella 7. Flutter 8. AerobiKa 9. Threshold PEP 10. +/- Manometers 11. Astra PEP 12. AIRVO 13. NIV 14. Positioning: a. Ventilation and/or mGAD b. SOB 15. Exercise for ACT (and huff Co) 16. Thoracic Expansion 17. Modified PD 18. Chest stroking 19. Supported cough **INHALATION** 20. Inhaled antibiotics a. Colistin b. Tobra	1. Patient handouts 2. Work unit guidelines 3. Statistics 4. Databases 5. QCRPN Subgroup meetings 6. National CF Google Group 7. Equipment: a. Maintaining inventory b. Organising trials of new equipment c. Collecting and returning equipment d. Preparing and cleaning equipment e. Ordering equipment for departments/wards f. Repairing/servicing equipment 8. Collecting physiotherapy charts for outpatient clinics 9. Documentation 10. Research 11. QA 12. Planning sessions/days 13. Orientation 14. Mandatory training 15. Teaching 16. Tutorials 17. Mentoring 18. Supervision and Support: g. Receiving h. Providing

<table>
<tr><th>Assessment Tasks</th><th>Treatment Tasks</th><th>General non-clinical tasks</th></tr>
<tr><td>a. Individual/ specific referral
b. Screen
21. C/O – Q's
22. Compliance:
a. Individual/ specific referral
b. Screen/scales
23. 6 minute walk test
24. Modified shuttle test
25. Step test
26. Muscle strength testing
27. Exercise tolerance – c/o
28. Aids
29. Exercise equipment
30. Exercise routine
31. M/S:
a. Individual/ specific referral
b. Screen
32. Incontinence
OUTPATIENT
33. Full annual review
34. Discharge planning
35. Clinical handover to:
a. Rural/regional
b. Post-acute care
c. HITH (Hospital In The Home)
36. Equipment prescription:</td><td>c. TOBI – Neb Solution
d. TOBI Pod
21. Mucolytics
a. HS
b. Pulmozyme
c. Manitol
d. Na Cl
22. Bronchodilators
23. Inhaled steroids (DPI/MDI)
24. Home program development and documentation- AC +/- inhalation
EXERCISE
25. HIIT
26. Strength training:
a. Upper limb
b. Lower limb
27. Cardiovascular/Endurance
28. Yoga
29. Other exercise
a. Core stability
b. Fit ball
c. Pilates
d. Game console
e. Transplant conditioning
f. Walking
g. Ballistic load-bearing exercise
h. Pelvic floor
i. Sport/exercising outside</td><td>19. Workload delegation
20. Physiotherapy staff meetings
21. CF unit journal club
22. PT in-services
TOTAL = 22</td></tr>
</table>

Assessment Tasks	Treatment Tasks	General non-clinical tasks
a. MASS b. CFQ 37. Triage of referral to OPD for exacerbation 38. Outreach trips **TOTAL = 38**	j. NIV + exercise 30. Basic mobility with oxygen 31. Sitting out of bed /Transfers 32. Home program development and documentation- Exercise **OTHER** 33. Strapping 34. Acupuncture 35. Trigger point massage 36. TENS 37. Other musculoskeletal treatments – individualised 38. Patient education - all treatment groups 39. Self-management strategies 40. Phone calls re patient treatment and equipment 41. Attending MDT meetings: a. Family meetings b. Management c. Clinical HO **TOTAL = 41**	

1.7: Example of Decision-making Table for Task Analysis

Decision-making table for task analysis (PEP/OPEP devices)

DECISION-MAKING TABLE 1: TASK ANALYSIS					
TASK: Airway clearance devices PROFESSION/S: PT, PTA	TEAM: Physio CF service		SETTING: TPCH CF Unit	Present at task analysis: RD, RC, LT, ML, ST, CR, LL, RB, KH, MS	DATE: 23 Sept 15
Task description: Supervising an established airway clearance session in a non-complex patients that involves an airway clearance device: PEP, Hydrapep, Accapella, Flutter, Aerobika,					
FOR EACH TASK DISCUSS AND GAIN CONSENSUS ON THE FOLLOWING STATEMENTS	**GO**	**RISK IDENTIFIED** consider the risk & how it can be managed		**DESCRIBE THE RISK**	**HOW CAN THIS BE MANAGED?**
Is the task carried out frequently? (Skill)	YES	NO →		Specify frequency: Daily	
Is the Task procedure complex? (multifaceted, how many strands, which bits most variable) (Rule/Knowledge)	NO	YES →		Not once set up and established	
Does the task require skilled manual adjustment throughout? (Skill/Rule/Knowledge)	Yes	YES →		Positional changes monitor respiratory rate and response to treatment, monitoring amount of time spent doing task – not detrimental – just not very effective	Clear instructions in CTI about the technique and device
a) If error occurs, is there an **immediate** negative consequence? (fall/blood flow – time for contingency) b) Is this reversible? (Rule/Knowledge)	NO	YES →			
	YES	NO →			
Is ongoing assessment and clinical reasoning required throughout the task in order to adjust input? (dealing with changing situation) (Knowledge/Rule/Skill)	NO	YES →		If situation has changed, the PTA should take this back to the PT, who would need to re-evaluate patient. This should be written into CTA in 'when to stop' instruction	
Is information collection involved? (could info. Be collected with template?) (Rule/Knowledge)	Yes	YES →		PTA should report back to PT volume, colour, consistency of sputum, sets completed and repetitions, tolerance,	Information collected on sticker 'PTA device sticker' for PTA to fill in and go in file. Verbally report back any other changes.

Is decision-making involved based on this information? (Knowledge/Rule)	NO	YES →		
Are protocols available to follow or Can they be written to support? (Rule/Knowledge)	YES YES	NO NO →		CTI needs to be written – could be adapted from current documentation
With all the above measures in place: a) Is likelihood of error high(0-5) b) Is consequence of error serious (0-5)	**Score =0** **Score=0**			
Decision: (circle) Delegate			Comments:	

1.8 Training Resources

1.8.1 CTI Delegation: When to Stop

Department of Health

Clinical Task Instruction

DELEGATED TASK

WTS01: When to stop

Scope and objectives of clinical task

This CTI will enable the Allied Health Assistant (AHA) to:

- assess whether it is safe to proceed with a delegated task,
- recognise danger / warning signs that indicate the need to stop a delegated task, and
- take appropriate actions following the cessation of the delegated task.

The safety and wellbeing of the client is the primary concern of all healthcare providers. It is the AHA's responsibility to only undertake delegated tasks with a client if the AHA is satisfied that it is safe to do so. Consequently, this CTI overrides delegation instructions and all other CTIs that the AHA has been trained to implement.

VERSION CONTROL

Version # / date:	V1.2 (16/12/2015)		
Approved:	Chief Allied Health Officer, AHPOQ, Dept of Health	Date approved:	16 / 12 / 2015
Document custodian:	Chief Allied Health Officer, AHPOQ, Dept of Health	Review date:	16 / 12 / 2017
Acknowledgements:	Effective Workforce Solutions (Ltd) provided the concept for When to Stop CTI and limited content		

The CTI reflects best practice and agreed process for conduct of the task at the time of publication and should not be altered. Requests for amendment or review of this document should be directed to AHPOQ: allied_health_advisory@health.qld.gov.au.

This CTI should be used under a delegation framework implemented at the work unit level. The framework is available at: http://qheps.health.qld.gov.au/ahwac/docs/MOC/ssdp-framework.pdf

Please check http://www.health.qld.gov.au/ahwac/html/calderdale-framework.asp for the latest version of this CTI.

Queensland Government

Requisite training, knowledge, skills and experience

Training

- The AHA shall complete workplace-specific orientation and be able to identify appropriate methods to access assistance in the case of any emergency in each setting the AHA will work in e.g. facility, community.
- If relevant to the clinical service, the AHA will complete orientation and training relevant home visiting including understanding of workplace health and safety policies and procedures.
- If relevant to the setting and patient group, the AHA will complete workplace-based training and demonstrate competent use of oxygen equipment (delivery methods, mobile oxygen) during allied health interventions.
- Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this CTI including manual handling, infection control and basic life support.

Clinical knowledge

The following content knowledge is required by an AHA delivering this task:

- knowledge of normal values for clinical observations listed in this CTI, and signs and symptoms of adverse reactions to allied health delegated tasks
- knowledge and demonstrated ability to obtain clinical information from medical records / observations charts to the extent required to implement this CTI including the ability to identify clinical terminology relevant to:
  - variance from normal values listed in this CTI including the terms dyspnoea, hypotension, hypertension, tachycardia, bradycardia, febrile, pyrexia, hypoxia, ischaemia and cyanosis, and
  - conditions listed in this CTI including the terms angina, acute myocardial infarct (AMI), chronic obstructive pulmonary disease (COPD) or chronic obstructive airways disease (COAD), emphysema, chronic bronchitis, asthma, chronic cardiac failure (CCF), cerebrovascular accident (CVA), delirium.

The knowledge requirements will be met by the following activities:

- reviewing information in this CTI, and
- receiving instruction from allied health professionals in training phase, which may include scenario-based discussions of common and rare events, and supported decision making on information in medical records e.g. the AHA reviews a record and discusses with the allied health professional their decision to proceed with the task or not.

Skills or experience

The following skills or experience are required by an AHA delivering this task:

- experience accessing and reviewing the variety of client medical records relevant to the setting, with guidance and instruction from the delegating health professional.

The following skills or experience are desirable for an AHA delivering this task:

- Nil

Safety

Environment

- For all clinical tasks conducted outdoors or outside regular clinical environments the AHA should consider the points below in addition to any task-specific environment risk factors.
  - The AHA should be aware of communication methods to call for assistance e.g. external emergency alarms / call buttons, mobile telephone, and be able to promptly contact the delegating health professional or seek assistance if an emergency arises.
  - The AHA will ensure that during the task the client maintains access to oxygen at the flow rate and delivery method prescribed by the healthcare team, unless otherwise directed by the delegating health professional e.g. use of mobile oxygen bottle.
  - The AHA will ensure the client has access to prescribed self-administered medications, including inhalers, GTN (angina) spray, or any similar medication for treatment of episodic conditions. The allied health professional delegating the activity should advise the AHA regarding appropriate use of these medications by the client.
  - The AHA should be aware of forecast weather conditions and ensure the client is appropriately dressed, has adequate sun protection and access to hydration, and there are no obvious risks related to exposure to weather conditions e.g. forecast high winds or rain constituting a risk to outdoor mobility.
  - The delegating health professional or another member of the team must be aware of the AHA's plan to leave the healthcare facility including approximate timeframes for delivering the offsite task. This should be consistent with local procedural documents that govern safety of staff and clients while outside the healthcare facility.

Performance of clinical tasks

1. Delegation instructions

- The AHA receives a delegated task from an allied health professional including any specific considerations with regard to the client's health status e.g. recent loss / improvement in functional status, recent change in symptoms, potential risk of adverse event, variation from standard clinical observation values that are relevant to the specific client e.g. 'normal' oxygen saturation for a client with COPD.

2. Preparation

- As some time may have elapsed between the health professional providing the delegation instruction and the AHA reviewing the client, the AHA must ascertain if the client's condition has changed sufficiently in that period to invalidate the instruction and require advice of the health professional before proceeding.
- Before starting any task with a client, obtain current information on health status. Depending on the setting and client group the AHA may:
  - review recent observations in the medical record or observations chart (heart rate, blood pressure, respiratory rate, oxygen saturation, temperature),
  - review recent entries in the client's medical record for changes since the delegating health professional last reviewed the client and provided the delegation instruction to the AHA,

– seek information from the client and carers if relevant about how the client is feeling, any recent changes to symptoms or health status, function etc., or
– seek information from another member of the healthcare team e.g. ward nurse.

Discontinuing delegated tasks

1. Consent

- For all delegated tasks, the AHA will:
  – introduces him/herself to client,
  – check three forms of client identification: full name, date of birth plus one of the following; hospital UR number, Medicare number, or address,
  – describe the task to the client, and
  – seek informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare.
- The client and/or carer may not agree to participate i.e. does not provide consent or withdraws consent previously provided. In these circumstances the AHA should:
  – be polite and confirm / acknowledge the client's decision to decline to participate, and
  – respectfully request that the client indicate the reason, ask if the AHA can provide more information on the task or its purpose, or ask the client if anything may enable the client to participate.
- If the client continues to decline to participate the AHA should:
  – accept the client's decision,
  – feedback to the delegating health professional as soon as able, and
  – clearly document the client's decision and reported reason (if elicited) in the medical record and specify which health professional was informed of the outcome. The record should be concise and objective, and avoid personal or subjective comments. An example of an appropriate chart entry is: "Client declined to participate in bed exercise program due to knee pain. Orthopaedic Ward physiotherapist notified."

2. Clinical observation measures outside accepted range

- The AHA should source the client's clinical observations and:
  – compare to normal ranges listed below and/or
  – apply information provided by the delegating health professional on acceptable variance from normal values for an individual client.

Normal adult clinical observations[1] (Queensland Health, 2014)

Blood pressure (systolic)	110 – 159 mmHg
Pulse/heart rate (HR)	50 – 99 beats/min
Temperature (oral)	36.1 °C – 37.9 °C

[1] Normal adult clinical observations are based on the Queensland Adult Deterioration Detection System (Q-ADDS) for Tertiary and Secondary Facilities. Normal ranges reflect the Q-ADDS Score 0.

Respiratory rate (RR)	13 – 20 breaths/min
Oxygen saturation (SpO_2) above	95% or higher

Note: For children, the AHA will receive instruction from the delegating health professional regarding normal ranges for the client, considering age and presenting condition.

- If a client has measurements outside the normal or client-specific range, the AHA will consult with the delegating health professional before commencing the task.
- Oxygen
  - The AHA will consult with the delegating practitioner prior to commencing the task if:
    - the client is receiving oxygen and this was not identified in the delegation instruction, or
    - the client is receiving oxygen and this was identified in the delegation instruction but the flow rate differs from the information provided by the delegating health professional and is greater than two litres / minute (Queensland Health, 2014).
- If the AHA has concerns about the client's medical status at any time, stop and immediately consult a health professional.

3. Feeling unwell

- If the client reports that they are feeling unwell (non-specific), the AHA should:
  - not proceed with the task or continue with the task if already commenced,
  - promptly move the client into a supported position e.g supported sitting or lying,
  - elicit information from the client on their symptoms e.g. "Can you describe your symptoms?", or more specific probing questions such as "Are you light headed?", "Do you feel dizzy?", "Are you in pain?", "Do you feel sick/nauseous?",
  - ask if the client has had these symptoms before, and if the client has an action plan for the symptoms if they are commonly experienced (e.g. medication) e.g. "have you had these symptoms before / often?", "what do you usually do when you get these symptoms?", and
  - seek information through observation and questioning the client on relevant signs and symptoms:
    - dizziness e.g. swaying, balance problems, unable to focus eyes on AHA,
    - nausea,
    - pain e.g. grimacing, protecting of a painful area
    - altered sensation e.g. numbness, burning, pins and needles
    - shortness of breath or difficulty breathing
    - profuse sweating
    - pale skin, lips appear blue or other skin colour changes
    - other signs and symptoms.
- If the client's symptoms do not quickly improve and resolve, or their level of consciousness deteriorates i.e. the client becomes less responsive, confused, fails to follow commands, the AHA should:
  - ensure the client is positioned safely, e.g. returned to bed and placed in a side-lying position,
  - apply basic life support principles and

- immediately notify a health professional and / or action the emergency procedure relevant to the setting (emergency call in a hospital, phone 000 if outside a health facility).

- If the client's symptoms resolve quickly and completely, the AHA should ask the client if they feel they are able to go ahead with the planned tasks and proceed with caution if able, monitoring closely for further symptoms. If symptoms reoccur the AHA should:
  - stop the task, and
  - report it to a health professional i.e. delegating health professional if easily contactable, or another member of the healthcare team such as a nurse or other AHP.
- The AHA should clearly document the episode in the medical record including:
  - the client's activities immediately prior to the episode,
  - the actions taken e.g. cease task, rest,
  - the outcome, and
  - the health professional/s who were notified.

4. Shortness of breath

- Prior to commencing a delegated task the AHA should:
  - observe the client's breathing and note whether the client is experiencing shortness of breath at rest, or a change to usual shortness of breath at rest. If the AHA is not familiar with the client's usual level of shortness of breath they may clarify this with the client and/or confirm with the delegating health professional.
- During and at the conclusion of a delegated task the AHA should monitor for signs of shortness of breath. It is normal for most people to become slightly breathless during exercise or physical tasks but excessive shortness of breath will require action by the AHA.
- If the client is experiencing shortness of breath or an abnormal level of shortness of breath for the client the AHA should:
  - not proceed / continue with the task,
  - move the client into a supported upright position, ideally sitting, leaning forward with hands / elbows resting on knees or on a table; or if a chair / bed is not available, assist the client to move to a supported standing position (e.g. wall or rail available to lean on) with hands / arms placed on a stable surface (e.g. table, rail),
  - check if the client requires a regular self-administered medication (e.g. inhaler), and if so ensure the client is safe get the medication for the client and encourage the client to use it. Note: the client must administer their own medication,
  - ask the client if he/she knows the cause of the shortness of breath or has had these symptoms before e.g. asthma, chest infection,
  - observe the client's breathing including counting the respiratory rate and noting quality of breathing e.g. laboured, shallow and any audible signs of breathing distress e.g. wheezing, grunting and:
    - o if the client's breathlessness does not rapidly begin to improve following the implementation of the positioning strategies above, report it to a health professional i.e. the delegating health professional, or another member of the healthcare team such as a nurse or other AHP, or

- if the client's breathlessness does rapidly begin to improve and completely resolves (or decrease to the normal level for the client), continue with the delegated task if the client agrees to proceed with the task considering the episode of breathlessness.

- The AHA should clearly document the episode of shortness of breath in the medical record including:
  - the client's activities immediately prior to the episode,
  - the actions taken to try to resolve the breathlessness e.g. cease task, rest, positioning, self-administered medication,
  - the outcome, and
  - the health professional/s who were notified.

5. Chest pain

Chest pain identified prior to commencing a delegated task

- The AHA should not commence a task if the client currently has chest pain or reports experiencing an episode of chest pain since he / she was last reviewed by the delegating health professional.
- Ensure the client is in a supported position e.g. lying down or in a supported sitting position
- If the client reports chest pain to the AHA but the client has not reported it to any other member of the healthcare team the AHA should immediately inform a health professional (delegating health professional if easily contactable, or another member of the healthcare team e.g. nurse, allied health professional or medical officer). If the AHA is not in a health facility / cannot immediately access a health professional, the AHA should phone 000.
- If the client's episode of chest pain is known to the medical team, obtain current health status information from the client and relevant health professionals and contact the delegating heath professional. The AHA should provide information to the delegating health professional including:
  - when the episode of chest pain occurred and how long it lasted, and if multiple episodes, how many,
  - what precipitated the chest pain, if anything e.g. exertion, exercise,
  - what interventions were used to resolve the chest pain e.g. "GTN spray", "nitro spray/tablet" and
  - any information relevant to the delegated task e.g. doctor advised client to rest in bed today, client placed on oxygen.
- Document what has occurred and specify which health professional/s were informed / consulted and the impact on the delegated task (e.g. task not delivered, or task delivered following consultation with delegating health professional).

Chest pain identified during or at the conclusion of a delegated task

- The AHA should:
  - stop the task immediately and move the client into a supported position e.g. sitting in chair or lying on a bed or plinth,
  - If the client has a prescribed self-administered medication for these symptoms the AHA should encourage the client to take it e.g. spray or tablet,

- immediately inform a health professional i.e. the delegating health professional if easily accessible, or another member of the healthcare team such as a nurse or other AHP. If a health professional is not available to immediately review the client, implement the appropriate emergency procedure for the setting e.g. emergency call in a hospital, phone 000 if outside a health facility,
- not continue with the task, even if the chest pain subsides.

• Document the episode of chest pain in the medical record including:
  - the client's activities prior to the episode,
  - the actions taken e.g. cease task, positioning, self-administered medication,
  - the outcome, and
  - the health professional/s who were notified.

6. Not following instructions safely

- Sometimes clients have difficulty following instructions, which may impact on safety and the effectiveness of the delegated task. If a client is not following instructions, the AHA should try to ascertain the reason. Common reasons are hearing problems, cognition problems such as capacity to understand instructions and respond appropriately, English as a second language or the agreement / motivation to participate.
- The AHA should adjust the way the instructions are delivered using one or more of the following strategies:
  - speak clearly and not too quickly (do not yell),
  - keep instructions concise and deliver instructions for each step in the task separately rather than as a long list of points,
  - use everyday language rather than jargon or complex terms,
  - demonstrate the activity or provide visual cues to show the client what is expected e.g. write the instructions down, draw diagrams,
  - face the client directly to assist the client to pick up facial cues or to encourage attention,
  - if the client uses hearing aids, encourage the client to place in ear/s, turn on / check, or
  - ensure the client continues to consent to participate.
- If the intervention continues to be ineffective because the client is not following instructions well the AHA should:
  - stop the activity and
  - inform the delegating health professional.
- If the client and/or healthcare staff are at risk because the client is not following instructions well, or if the client's difficulty following instructions appears to increase during the session, the AHA should:
  - stop the activity,
  - if possible ensure the client and staff are free from potential harm e.g. client returned to chair/bed, staff maintain safe distance from an aggressive client and
  - inform a health professional immediately i.e. the delegating health professional if easily contactable, or another member of the healthcare team e.g. nurse, allied health professional or medical officer.

- The AHA should clearly document the client's difficulty following instructions in the medical record including:
  - concise objective information on the impact on the task e.g. "AHA requested client remain sitting on mobile shower chair in preparation for functional shower retraining session. Client attempted to stand and walk, but was assisted back to a seated position on the shower chair.",
  - the actions taken e.g. task ceased due to safety concerns, provided adjusted / additional instructions,
  - the outcome, and
  - the health professional/s who were notified.

7. Accident / Injury

- If a client is involved in an accident and/or obtains an injury during a clinical task such as a fall, or sustains a skin tear, the AHA should:
  - support the client where possible to minimise the extent of injury, as per clinical Client Handling and Basic Life Support training,
  - cease the clinical task,
  - ensure the client is safe and inform a health professional immediately of the accident / injury i.e. delegating health professional if easily contactable, or another member of the healthcare team such as a nurse, allied health professional or medical officer,
  - clearly document the event in the medical record, including cause (if known), actions taken and health professional/s who were notified, and
  - complete a PRIME Clinical Incident as per Queensland Health policy, located on QHEPS at http://qheps.health.qld.gov.au/psu/prime/default.htm

8. Psychological distress

- Clients may experience distress due to physical symptoms such as pain, or psychological consequences of ill health such as fear, anxiety, sadness. If a client becomes distressed the AHA should:
  - not proceed with the task, or do not continue the task if it has already commenced,
  - acknowledge the person's distress with a simple statement e.g. "I can see that you are quite distressed at the moment", " It sounds like you are having a hard time this morning",
  - provide supportive actions e.g. offer the person some tissues if crying, or some water if not nil by mouth or with other restrictions on fluid consumption, and
  - ask the client to advise whether he/she feels able to continue, needs a break or wishes to stop the task i.e. withdraw consent to participate.
- If the client's distress eases and he/she consents, the AHA should:
  - continue and complete the delegated task,
  - before concluding the session, ask the client if he/she would like to speak with a member of the healthcare team about his/her distress e.g. social worker, psychologist, nurse, doctor. If yes, reassure the client that this request will be reported to the delegating professional for actioning.

- If the client remains distressed or the client cannot continue with the delegated task, the AHA should:
  - provide reassurance to the client,
  - indicate that feedback will be provided to the delegating health professional that the client is experiencing distress and any planned change to the delegated tasks that have resulted e.g. postponed, and
  - inform a relevant health professional promptly about the client's distress and notify the delegating health professional.
- The AHA should clearly document the client's distress in the medical record, including:
  - the cause if reported by the client,
  - actions taken e.g. provided support to client, requested nursing staff review client due to significant distress,
  - outcome e.g. client agreed to continue with task, task postponed) and
  - the health professional/s who were notified and the feedback provided by the AHA to the delegating health professional.

9. Document

- The AHA should document the outcomes of the task in the clinical record, consistent with relevant documentation standards and local procedures.

10. Report to delegating health professional

- The AHA should provide comprehensive feedback to the health professional who delegated the task including specific information about problems or adverse events, actions taken and outcomes.

References and supporting documents

- Queensland Health, 2012. *Guide to Informed Decision Making in Healthcare*. http://www.health.qld.gov.au/consent/default.asp
- Queensland Health, 2014. *Queensland Adult Deterioration Detection System (Q-ADDS)* (Version 5.00, 9/2014).

Acknowledgement

This CTI is based on Effective Workforce Solutions, 2012. *When to Stop (Precautions when working with clients).* http://www.calderdaleframework.com/

Queensland Government

WTS01: When to Stop

Assessment: Performance Criteria Checklist (Delegated Task)

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
1. Demonstrates knowledge of fundamental concepts required to undertake the task including clinical observation measures normal values.			
2. Demonstrates ability to obtain all required information from delegating health professional on client's health status and potential impacts on task, and seeks clarification if required.			
3. Completes preparation for task including sourcing information on client's current health status and appropriately addressing risks associated with working with the client 'offsite' or outdoors (if relevant).			
4. Demonstrates knowledge of reasons to stop a task and actions required to address: a) Client does not consent to participate b) Clinical observations deviate from normal / client-specific range c) Client unwell d) Shortness of breath e) Chest pain f) Not following instructions safely g) Accident or injury h) Psychological distress			
5. Documents accurately and comprehensively in clinical notes.			
6. Provides accurate and comprehensive feedback to the delegating health professional.			

Comments:		
Record of assessment of competence		
Assessor name:	Assessor position:	Competence achieved: / /
Scheduled review		
Review date / /		

1.8.2 CTI Delegation-1 Pulse Oximetry Recordings

Queensland Health

Clinical Task Instruction

DELEGATED TASK

D-CM01: Pulse oximetry recordings

Scope and objectives of clinical task

This CTI will enable the Allied Health Assistant (AHA) to:

- correctly measure and document a client's oxygen saturation level (SpO2) using finger pulse oximetry
- identify indications for initiating pulse oximetry

VERSION CONTROL

Version V1.0		
Endorsed: (Professional)	Allied Health Professions' Office of Queensland	Date approved: 22/04/2016
Approved: (Operational)	Chief Allied Health Officer, AHPOQ	Date approved: 22/04/2016
Document custodian:	Chief Allied Health Officer, AHPOQ	Review date: April 2019

The CTI reflects best practice and agreed process for conduct of the task at the time of publication and should not be altered. Requests for amendment or review of this document should be directed to AHPOQ: allied_health_advisory@health.qld.gov.au.

This CTI should be used under a delegation framework implemented at the work unit level. The framework is available at: https://www.health.qld.gov.au/ahwac/html/calderdale-framework.asp

Please check https://www.health.qld.gov.au/ahwac/html/clintaskinstructions.asp for the latest version of this CTI.

Queensland Government

Requisite training, knowledge, skills and experience

Training

- Completion of CTI D-WTS01 When to stop
- Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this CTI.
- Achievement of the following competencies (which relate to HLT - Health Training Package qualifications HLT43015 Certificate IV in Allied Health Assistance) would be beneficial:
  - Deliver and monitor a client-specific physiotherapy program

Note: if above competencies have not been achieved by the AHA as part of the formal Certificate training program, the workplace may implement workplace-based training that encompasses these competencies and provides equivalency of knowledge and skills.

- Completion of the Clinical Skills Development Service Oxygen Therapy eLearning course is desirable.

Clinical knowledge

The following content knowledge is required by an AHA delivering this task:

- Knowledge of basic anatomy and physiology to the extent required to undertake this task, including terminology such as oxygen saturation, and positioning of the pulse oximetry probe.
- Knowledge of the indications for initiating pulse oximetry.

The knowledge requirements will be met by the following activities:

- Completing the training programs (listed above)
- Reviewing the Learning Resource
- Receiving instruction from an allied health professional in the training phase.

Skills or experience

The following skills or experience are <u>required</u> by an AHA delivering this task:

- Nil

The following skills or experience are <u>desirable</u> for an AHA delivering this task:

- Nil

Safety and quality

Client

- The AHA will apply CTI D-WTS01 When to stop at all times.
- This CTI should be administered in conjunction with CTI D-WTS01 When to stop which includes normal values for a range of standard clinical observations and actions to implement if observations fall outside these ranges.

Equipment, aids and appliances

- Ensure the pulse oximeter is clean and in safe working order.

Environment

- Ensure that an appropriate level of client privacy is maintained during the task.

Performance of Clinical Task

1. Delegation instructions

- Receive delegated task from the allied health professional.
- The delegating allied health professional should clearly identify parameters for delivering the clinical task to the specific client, including any variance from the usual task procedure and expected outcomes (e.g. if the client's acceptable oxygen saturation level varies from normal parameters). The delegating practitioner should provide guidance regarding the timing of the measurement in the broader intervention if relevant e.g. at the commencement, at 15 minute intervals, at conclusion.
- The AHA may implement this task in variance to the timing or frequency in the delegation instruction, or initiate the task if indicated by circumstances outlined in CTI D-WTS01 When to stop. The following may indicate oxygen saturation level monitoring is required:
  - Instructed by delegating allied health professional
  - One or more of the following is reported by the client or is documented in the client's chart:
    - light headedness, when standing from a sitting or lying position
    - dizziness e.g. swaying, balance problems, unable to focus eyes on AHA
    - weakness
    - blurred vision
    - fatigue
    - fainting
    - feeling hot or sweaty or clammy

- shortness of breath or difficulty breathing
- nausea or vomiting
- recent surgery or trauma
- low haemoglobin level (<90 g/L)

2. Preparation

- Check the pulse oximeter is fully charged.
- Turn power on to allow time for the machine to self-test or initialise.

3. Introduce task and seek consent

- The AHA introduces him/herself to client.
- The AHA checks three forms of client identification: full name, date of birth plus one of the following; hospital UR number, Medicare number, or address.
- The AHA describes the task to the client. For example: "I would like to check the oxygen saturation level in your blood using this pulse oximeter. Is that ok?" and "I am going to place this probe on your finger to check the oxygen saturation level in your blood".
- The AHA seeks informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare.

4. Positioning

The client's position during the task should be:

- comfortable on the bed or chair

The AHA's position during the task should be:

- standing or sitting at the client's side so that the client's oxygen saturation level can be effectively measured.

5. Task procedure

- Explain the task to the client.
- Check the client has understood the task and provide the opportunity to ask questions.
- The task comprises the following steps:
  1. Place the probe on the client's finger (thumbs should not be used), and ensure the finger is kept still. The fingernail should be free of nail varnish.
  2. Await a response from the machine. A good reading is indicated by a strong flow (up and down) of the LED lights next to the reading.
  3. Note current oxygenation therapy in situ (how many L/min and the device used to deliver oxygen) that may be assisting the client.

4. Record the client's oxygen saturation level clearly and accurately as per local health service guidelines.
5. Provide feedback to the client on their oxygen saturation level at the completion of the task.
6. Remove the probe and clean in line with infection control protocols.

- At the conclusion of the task:
  - Take appropriate actions including CTI D-WTS01 When to stop if indicated by the client's oxygen saturation level.

6. Document

- Document the oxygen saturation level in the clinical record, consistent with relevant documentation standards and local procedures.

7. Report to delegating health professional

- Provide comprehensive feedback to the health professional who delegated the task.

References and supporting documents

- Department of Health. (2015). Clinical Task Instruction D-WTS01 When to stop. https://www.health.qld.gov.au/ahwac/html/clintaskinstructions.asp
- Queensland Health. (2012). Guide to Informed Decision Making in Healthcare. http://www.health.qld.gov.au/consent/default.asp
- The Joanna Briggs Institute. (2016). Pulse Oximetry. Retrieved 14 April 2014 from http://ovidsp.tx.ovid.com/sp-3.19.0a/ovidweb.cgi
- World Health Organization. (2011). Pulse oximetry training manual. Retrieved 7 April 2016 from http://www.who.int/patientsafety/safesurgery/pulse_oximetry/who_ps_pulse_oxymetry_training_manual_en.pdf

Assessment: Performance Criteria Checklist
D-CM01: Pulse oximetry recordings

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
Demonstrates knowledge of fundamental concepts required to undertake the task.			
Obtains all required information from delegating health professional, and seeks clarification if required.			
Completes preparation for task including compliance with infection control and obtaining appropriate equipment.			
Introduces self to client and checks client identification.			
Describes purpose of delegated task and seeks informed consent.			
Positions self and client appropriately to complete task and ensure safety.			
Delivers task effectively and safely as per delegated instructions and CTI procedure. a) Clearly explains task, checking client's understanding. b) Places probe on finger, ensuring finger is kept still. c) Awaits response from machine. d) Notes current oxygenation therapy in situ. e) Records reading clearly and accurately as per local health service guidelines. f) Removes probe and ensures infection control protocol is completed. g) Provides feedback to client on their oxygen saturation level at completion of task. h) Takes appropriate actions if indicated by the oxygen saturation level.			
Documents the outcomes of the task in the clinical record, consistent with relevant documentation standards and local procedures.			
Provides accurate and comprehensive feedback to the delegating health professional.			

Comments:		
Record of assessment of competence		
Assessor name:	Assessor position:	Competence achieved: / /
Scheduled review		
Review date / /		

Pulse oximetry recordings: Learning Resource

Relevant training program

Queensland Health. *Deliver and monitor a client-specific physiotherapy program.* http://qheps.health.qld.gov.au/alliedhealth/html/strategies/allied-health-assistants.htm

Oxygen Therapy eLearning course

Clinical Skills Development Service: Oxygen Therapy eLearning course

https://www.sdc.qld.edu.au/courses/122

How to use a pulse oximeter

World Health Organization. (2011). *Pulse oximetry training manual.* Pages 7-11. http://www.who.int/patientsafety/safesurgery/pulse_oximetry/who_ps_pulse_oxymetry_training_manual_en.pdf

Images of oxygen therapy equipment

Monash Health. (2014). *Orientation 2014: Oxygen Delivery Workshop.* Handout pages 4 to 6.

https://www.monashhealth.org/en/page/Orientation_2014

1.8.3 CTI Delegation-2 Heart Rate Measuring

Queensland Health

Clinical Task Instruction

DELEGATED TASK

D-CM02: Heart rate measuring

Scope and objectives of clinical task

This CTI will enable the Allied Health Assistant (AHA) to:

- correctly measure and document a client's heart rate (pulse) using radial pulse
- identify indications for initiating heart rate measurement

VERSION CONTROL

Version	V1.0		
Endorsed: (Professional)	Allied Health Professions' Office of Queensland	Date approved:	April 2016
Approved: (Operational)	Chief Allied Health Officer, AHPOQ	Date approved:	April 2016
Document custodian:	Chief Allied Health Officer, AHPOQ	Review date:	April 2019

The CTI reflects best practice and agreed process for conduct of the task at the time of publication and should not be altered. Requests for amendment or review of this document should be directed to AHPOQ: allied_health_advisory@health.qld.gov.au.

This CTI should be used under a delegation framework implemented at the work unit level. The framework is available at: https://www.health.qld.gov.au/ahwac/html/calderdale-framework.asp

Please check https://www.health.qld.gov.au/ahwac/html/clintaskinstructions.asp for the latest version of this CTI.

Queensland Government

Requisite training, knowledge, skills and experience

Training

- Completion of CTI D-WTS01 When to stop
- Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this CTI.
- Achievement of the following competencies (which relate to HLT - Health Training Package qualifications HLT43015 Certificate IV in Allied Health Assistance) would be beneficial:
  - Deliver and monitor a client-specific physiotherapy program

Note: if above competencies have not been achieved by the AHA as part of the formal Certificate training program, the workplace may implement workplace-based training that encompasses these competencies and provides equivalency of knowledge and skills.

Clinical knowledge

The following content knowledge is required by an AHA delivering this task:

- Knowledge of basic anatomy and physiology to the extent required to undertake this task, including terminology such as radial pulse, tachycardia and bradycardia.
- Knowledge of the indications for initiating heart rate measuring.

The knowledge requirements will be met by the following activities:

- Completing the training programs (listed above)
- Reviewing the Learning Resource
- Receiving instruction from an allied health professional in the training phase.

Skills or experience

The following skills or experience are <u>required</u> by an AHA delivering this task:

- Nil

The following skills or experience are <u>desirable</u> for an AHA delivering this task:

- Nil

Safety and quality

Client

- The AHA will apply CTI D-WTS01 When to stop at all times.
- This CTI should be administered in conjunction with CTI D-WTS01 When to stop which includes normal values for a range of standard clinical observations and actions to implement if observations fall outside these ranges.

Equipment, aids and appliances

- Stop watch, or clock or watch with a second hand.

Environment

- Ensure that an appropriate level of client privacy is maintained during the task.

Performance of Clinical Task

1. Delegation instructions

- Receive delegated task from the allied health professional.
- The delegating allied health professional should clearly identify parameters for delivering the clinical task to the specific client, including any variance from the usual task procedure and expected outcomes (e.g the delegating allied health professional should indicate if an irregular heartbeat might be normal for the client). The delegating practitioner should provide guidance regarding the timing of the measurement in the broader intervention if relevant e.g. at the commencement, at 15 minute intervals, at conclusion.
- The AHA may implement this task in variance to the timing or frequency in the delegation instruction, or initiate the task if indicated by circumstances outlined in CTI D-WTS01 When to stop. The following may indicate heart rate monitoring is required:
  - Instructed by delegating allied health professional
  - One or more of the following is reported by the client or is documented in the client's chart:
    - light headedness, when standing from a sitting or lying position
    - dizziness e.g. swaying, balance problems, unable to focus eyes on AHA
    - weakness
    - blurred vision
    - fatigue
    - fainting
    - feeling hot or sweaty or clammy
    - recent surgery or trauma

    - low haemoglobin level (<90 g/L)
  - Also consider if client has any of the following which may affect their heart rate:
    - infection
    - dehydration
    - recent physical activity
    - recent ingestion of caffeine
    - recent cigarette smoking

2. Preparation

- Nil

3. Introduce task and seek consent

- The AHA introduces him/herself to client.
- The AHA checks three forms of client identification: full name, date of birth plus one of the following; hospital UR number, Medicare number, or address.
- The AHA describes the task to the client. For example: "I would like to measure your heart rate. Is that OK?"
- The AHA seeks informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare.

4. Positioning

The client's position during the task should be:

- comfortable on the bed or chair

The AHA's position during the task should be:

- standing or sitting at the client's side so that the client's heart rate can be effectively measured.

5. Task procedure

- Explain the task to the client.
- Check the client has understood the task and provide the opportunity to ask questions.
- The task comprises the following steps:
  1. Locate the radial pulse using your index and middle fingers over the pulse. Do not use the thumb to measure a heart rate as it has its own pulse that may be felt.
  2. Count the beats for 30 seconds, then double the result to get the number of beats per minute.
  3. Record heart rate clearly and accurately as per local health service guidelines.
  4. Provide feedback to the client on their heart rate at the completion of the task.

- At the conclusion of the task:
  - Take appropriate actions including CTI D-WTS01 When to stop if indicated by the heart rate reading.

6. Document

- Document the heart rate in the clinical record, consistent with relevant documentation standards and local procedures.

7. Report to delegating health professional

- Provide comprehensive feedback to the health professional who delegated the task.

References and supporting documents

- Queensland Health. (2015). CTI D-WTS01 When to stop. https://www.health.qld.gov.au/ahwac/html/clintaskinstructions.asp
- Queensland Health. (2012). Guide to Informed Decision Making in Healthcare. http://www.health.qld.gov.au/consent/default.asp

Assessment: Performance Criteria Checklist
D-CM02: Heart rate measuring

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
Demonstrates knowledge of fundamental concepts required to undertake the task.			
Obtains all required information from delegating health professional, and seeks clarification if required.			
Completes preparation for task including compliance with infection control and obtaining appropriate equipment.			
Introduces self to client and checks client identification.			
Describes purpose of delegated task and seeks informed consent.			
Positions self and client appropriately to complete task and ensure safety.			
Delivers task effectively and safely as per delegated instructions and CTI procedure. a) Clearly explains task, checking client's understanding. b) Cleans hands in compliance with infection control protocols. c) Ensure the client's arm is supported. d) Locates client's radial pulse using index and middle fingers over the pulse. e) Counts the pulse for 30 seconds – timed correctly. f) Records heart rate clearly and accurately as per local health service guidelines. g) Provides feedback to client on their heart rate at the completion of the task. h) Takes appropriate actions if indicated by the heart rate reading.			
Documents the outcomes of the task in the clinical record, consistent with relevant documentation standards and local procedures.			
Provides accurate and comprehensive feedback to the delegating health professional.			

Comments:		
Record of assessment of competence		
Assessor name:	Assessor position:	Competence achieved: / /
Scheduled review		
Review date / /		

Heart rate measuring: Learning Resource

Relevant training program

Queensland Health. *Deliver and monitor a client-specific physiotherapy program.*
http://qheps.health.qld.gov.au/alliedhealth/html/strategies/allied-health-assistants.htm

How do I check someone's pulse?

NHS. (2015). How do I check someone's pulse?
http://www.nhs.uk/chq/Pages/2314.aspx?CategoryID=72&SubCategoryID=725

Image of radial pulse

Medline Plus. (2014). *Radial pulse* https://www.nlm.nih.gov/medlineplus/ency/imagepages/19395.htm

1.8.4 Local CTI Delegation – Airway Clearance – Active Cycle of Breathing Technique (ACBT)

Local CTI: Airway clearance – Active Cycle of Breathing Technique (ACBT)

Scope and objectives of clinical task

This CTI will enable the Allied Health Assistant (AHA) to safely and effectively supervise clients using the active cycle of breathing technique (ACBT) to assist airway clearance including:

- explaining the purpose of and procedure for the ACBT
- competently facilitate and monitor the use of ACBT, including correcting common errors or causes of ineffective performance, and
- providing clear and relevant feedback to improve a client's performance of ACBT.

VERSION CONTROL *(for use by HHS for local CTI, and AHPOQ for state-wide CTI)*				
Version date: 23.6.2016	V1.3 23.6.2016	Author:	Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS	
Endorsed: (Professional)	Dr Nicole Bellet per DOP, Queensland Dr Peter Thomas, QCRPN Local CTI ONLY		Date approved:	31.5.2016
Approved: (Operational)	Dr Nicole Bellet DOP Physiotherapy TPCH MNHHS		Date approved:	31.5.2017
Document custodian:	Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS		Review date:	

Acknowledgements: Robyn Cobb, Rebecca Chambers, Trent Donnoley, Mark Roll ; Physiotherapy, TPCH, MNHHS

The CTI reflects best practice and agreed process for conduct of the task at the time of approval and should not be altered. Requests for amendment or review of this document should be directed to AHPOQ: allied_health_advisory@health.qld.gov.au.

This CTI should be used under a delegation framework implemented at the work unit level. The framework is available at: http://qheps.health.qld.gov.au/ahwac/docs/MOC/ssdp-framework.pdf

Please check http://www.health.qld.gov.au/ahwac/html/calderdale-framework.asp for the latest version of this CTI.

Requisite training, knowledge, skills and experience

Training

- Completion of the following CTIs:
  - D- CTI WTS01 When to stop
  - D-CM01 Pulse oximetry recording
- Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this CTI.
- Achievement of the following competencies (which relate to HLT07 - Health Training Package qualifications which includes the HLTAH402C Certificate IV in Allied Health Assistance qualification) would be beneficial:
- Unit code: HLTAH402C: Assist with physiotherapy treatments and interventions

  Note: if above competencies have not been achieved by the AHA as part of a formal Certificate training program, the workplace may elect to implement workplace based training that encompasses these competencies and provides equivalence of knowledge and skills.

Clinical knowledge

The following content knowledge is required by an AHA delivering this task:

- knowledge sufficient to be able to understand and preform this supervisory role
  - of normal and abnormal airway clearance mechanisms including basic anatomy and physiology of the lungs and upper respiratory system and conditions relevant to the task including causes, presenting signs and impacts on the health and wellbeing of the client: COPD, Cystic Fibrosis, Bronchiectasis; other suppurative lung diseases.
  - of the normal components of the airway clearance technique ACBT including breathing control, thoracic expansion exercises and the forced expiration technique

knowledge of equipment relevant to ACBT, including patient self administration of inhaled medications, tubes to assist huffing

The knowledge requirements will be met by:

- completing training program (listed above)
- reviewing the Learning Resource
- receiving instruction from allied health professional in training phase

Skills or experience

The following skills or experience are <u>required</u> by an AHA delivering this task:

- Experience and confidence in:
  - assisting with client movement and positioning
  - facilitating and supporting clients to achieve therapy goals
- experience and confidence in communicating effectively with clients of a health service

The following skills or experience are <u>desirable</u> for an AHA delivering this task:

- experience working with patients who have chronic respiratory conditions

Safety and quality

Client

The Allied Health Assistant will:

- apply CTI D-WTS01 When to stop at all times
- review the medical record, observations chart and/or speak with members of the healthcare team prior to commencing the task and advise the delegating health professional if there are any recent changes which may impact on a client's capacity to participate in the task. Specifically, the AHA should note:
  - Recent / new blood in sputum
  - Increased shortness of breath
  - Increased supplemental oxygen requirements
  - Other sudden changes to bedside observations: heat rate, blood pressure
  - Changed consciousness that won't allow co-operation with AHA

  Any changes to patient's stability would be reported to the delegating HP and the task would not proceed until the HP had reassessed the patient and redelegated the task, if appropriate.

Equipment, aids and appliances

- Clean 'huffing tube' if required

Environment

- Setup up the environment for safe and efficient completion of ACBT airway clearance – usually in patient's room.
- Ensure Infection Control protocols for respiratory patients are adhered to at all times
  - Wear protective gowns
  - Hand washing
  - Minimal / no contact with sputum cups (patients handles these)
  - Positon behind patient / to the side of patient
  - Draw curtains if in a ward

Performance of Clinical Task

1. Delegation instructions

- Receive the delegated task from the health professional.
- Clearly identify parameters for delivering the clinical task for the specific client including any variance from the usual task procedure such as.
  - specific positioning
  - any equipment used, including use of supplementary oxygen and /or use of patient self-administered medication such as Ventolin or hypertonic saline

– number of repetitions or time treatment (where a number of cycles are required to be completed with the client)
– expected outcome (eg sputum production)
– risks and precautions for the individual client e.g. observation of sputum, signs of haemoptysis, increased breathlessness with technique, manual handling risks and management strategies
– possible compensatory strategies / errors / problems, or variations permitted from normal task procedure specific for that patient

2. Preparation

- Obtain relevant equipment and an instruction sheet if relevant and as directed by delegating health professional.
- Review the medical record, observations chart and/or speak with members of the healthcare team and client to determine if the client has experienced any change in health status since last reviewed by the delegating health professional. Changes potentially relevant to the client's capacity to participate in the task that were not discussed in the delegation instruction should be raised with the delegating health professional before commencing the task.

3. Introduce task and seek consent

- The AHA introduces him/herself to client
- The AHA checks three forms of client identification: full name, date of birth plus one of the following; hospital UR number, Medicare number, or address
- The AHA describes the task to the client. For example:
  – "I have been asked by the (relevant health professional) to assist you to complete your airway clearance today using ACBT. This will help you clear your lungs of any sputum and help with your breathing in general.
- The AHA seeks informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare

4. Positioning

The client's position during the task should be:

- specified by the delegating health professional for the individual's airway clearance routine

The AHA's position during the task should be:

- specified by the delegating health professional for the individual's airway clearance routine including hand placements

5. Task procedure

- Explain and demonstrate (where applicable) the task to the client.
- Check client has understood the task and provide an opportunity to ask questions.
- The task comprises the following steps:
  – Breathing control
  – Thoracic expansion exercises

- – Forced expiration technique or Huffing
- A typical cycle of ACBT consists of:
  - – breathing control (until the patient is settled and ready to commence)
  - – thoracic expansion exercises – 3 to 5 breaths
  - – breathing control (until patient returns to their normal resting breathing rate)
  - – thoracic expansion exercises – 3 to 5 breaths
  - – breathing control
  - – huffs
  - – breathing control
  - – coughing

  The flexibility of the regimen (the number of deep breaths, the number of huffs and the length of the periods of breathing control) and order of the components varies with the patients' condition and should be adapted to suit the individual as delegated by the physiotherapist. Each component plays a key role in the clearance of secretions.

If required and as instructed by the physiotherapist the AHA may

a) Explain how to perform ACBT cycle. See Learning Resource for detailed information on ACBT

b) Demonstrate how to perform ACBT, including modifying huffing, using a 'huffing tube'. This includes highlighting potential errors.

c) Follow the airway clearance session as described by the delegating health professional, which will provide guidance on positioning, risks and precautions and any other relevant considerations for the individual client.

- During the task:
  - – provide feedback and correct errors in the performance of the task using the delegation instruction and knowledge from the competency training. This may include:
    - providing verbal prompting and encouragement,
    - providing verbal correction and/or manual guidance,
    - counting repetitions / noting time elapsed for the client and indicating when to rest, use breathing control
    - watching for signs of fatigue such as increased respiratory rate and increasing use of accessory muscles of breathing
    - monitor sputum produced – noting amount, colour and consistency
  - – monitor for adverse reactions and implement appropriate mitigation strategies as outlined in CTI D-WTS01 When to stop
- At the conclusion of the task:
  - – provide summary feedback to client, emphasising positive aspects of the airway clearance session
  - – provide instructions for independent practice of the task (including reinforcing safety considerations) if this was requested by delegating health professional
  - – ensure the client is comfortable and safe

6. Document

- Clearly document the outcomes of the task in the client's notes. This would include:
  - Number of repetitions completed
  - Signs of fatigue, discomfort or any other abnormal observations
  - Sputum produced

7. Report to delegating health professional

- Provide comprehensive feedback to the health professional who delegated the task
- Include observations of client performance, expected outcomes that were and were not achieved, and difficulties encountered or symptoms reported by the client during the task. References and supporting documents

REFERENCES:

- Queensland Health (2012) *Guide to Informed Decision Making in Healthcare*. http://www.health.qld.gov.au/consent/default.asp
- Effective Workforce Solutions (2012) *When to Stop (Precautions when working with clients).* http://qheps.health.qld.gov.au/ahwac/content/clinical-tasks-Q.htm
- Nicolson C, Lee A. et al.,(2016) Bronchiectasis TOOLBOX : http://bronchiectasis.com.au/about-us

Queensland Government

Airway clearance – Active Cycle of Breathing Technique (ACBT)

Assessment: Performance Criteria Checklist (Delegated Task)

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
1. Demonstrates knowledge of fundamental concepts required to undertake the task.			
2. Obtains all required information from delegating health professional and seeks clarification if required.			
3. Completes preparation for task including obtaining relevant instruction sheet/equipment, ensuring a safe and appropriate environment for completion of the task, and checking client functional and medical status.			
4. Introduces self to client and checks client identity.			
5. Describes purpose of delegated task and seeks informed consent.			
6. Positions self and client appropriately to complete task and ensure safety.			
7. Delivers task effectively and safely as per delegated instructions and CTI procedure. a. Clearly explains and demonstrates task, checking client's understanding. b. During task, maintains a safe clinical environment and manages risks appropriately. c. Supervises and facilitates ○ Positioning ○ Breathing control ○ Thoracic expansion exercises ○ Forced expiration technique or Huffing ○ Use of huffing tube			
8. Provides feedback to client on performance during and at completion of task.			
9. Documents accurately and comprehensively in clinical notes.			

- 7 -

10. Provides accurate and comprehensive feedback to the delegating health professional.			
Comments:			
Record of assessment of competence			
Assessor name:	Assessor position:	Competence achieved:	
Scheduled review			
Review date / /			

Learning Resource

General information / background knowledge

- Reviewing online resource : Bronchiectasis Toolbox - Airway clearance in Normal Lung http://bronchiectasis.com.au/physiotherapy/principles-of-airway-clearance/airway-clearance-in-the-normal-lung
- Factsheet : The Lungs – An overview of how they work Lung Foundation Australia brochure; http://lungfoundation.com.au/wp-content/uploads/2013/12/The-Lungs-%E2%80%93-An-overview-of-how-they-work_july2013.pdf

Conditions relevant to task

- Webpage ; About Cystic Fibrosis : Australian Cystic Fibrosis Association : 2016 ; http://www.cysticfibrosis.org.au/all/learn/
- The Basics of Cystic Fibrosis, Stanford University CF Centre, 2016; http://med.stanford.edu/cfcenter/education/english/BasicsOfCF.html
- Factsheet : Bronchiectasis ; Lung Foundation Australia ; http://lungfoundation.com.au/wp-content/uploads/2013/12/Bronchiectasis-Sept-2014.pdf
- Factsheet : COPD; Lung Foundation Australia http://lungfoundation.com.au/wp-content/uploads/2013/12/COPD-Chronic-Obstructive-Pulmonary-Disease.pdf
- Factsheet: Pneumonia ; Lung Foundation Australia; http://lungfoundation.com.au/wp-content/uploads/2014/04/Pneumonia-July-2014.pdf

Local physiotherapy department resources as required

Therapeutic approach and relevant terminology

- TPCH: Patient guide to ACBT ; G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\ACBTMar13 – v3
- TPCH: Patient handout – Airway clearance techniques :G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\airway clearance techniques Sept 03 –V1
- TPCH: Patient handout - Haemoptysis; G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\Haemoptysis
- TPCH: Patient handout – Postural drainage and modified postural drainage; G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\ Postural drainage and modified postural drainage; April 13 –V3
- Nicolson C, Lee A. et al.,(2016) ; ACBT technique handout : Bronchiectasis Toolbox ACBT: http://bronchiectasis.com.au/physiotherapy/techniques/the-active-cycle-of-breathing-technique
- Nicolson C, Lee A. et al.,(2016) ; ACBT technique VIDEO : http://bronchiectasis.com.au/resources/videos/the-active-cycle-of-breathing-technique
- reviewing local resource : Infection Control guidelines for Cystic Fibrosis

Local CTI: Administer assessment tool – Six Minute Walk Test

Scope and objectives of clinical task

This CTI will enable the Allied Health Assistant (AHA) to:

- accurately collect and record information using a standard screening / assessment tool and procedure for the six minute walk test (6MWT), in a select group of clients::
  - with stable chronic respiratory conditions including cystic fibrosis
  - who can walk independently;
  - have been assessed as stable and well controlled on drug therapy and do not have high oxygen requirements,
  - who are primarily undergoing evaluation or enrolled in clinical research

VERSION CONTROL *(for use by HHS for local CTI, and AHPOQ for state-wide CTI)*

Version # / date:	V1.3, 23.6.2016	Author:	Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS
Endorsed: (Professional)	Dr Nicole Bellet per DOP, Queensland Dr Peter Thomas, QCRPN Local CTI ONLY	Date approved:	31.5.2016
Approved: (Operational)	Dr Nicole Bellet DOP Physiotherapy TPCH MNHHS	Date approved:	31.5.2016
Document custodian:	Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS	Review date:	TBA

Acknowledgements: Robyn Cobb, Rebecca Chambers, Trent Donnoley, Mark Roll ; Physiotherapy, TPCH, MNHHS

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Please check http://www.health.qld.gov.au/ahwac/html/calderdale-framework.asp for the latest version of this CTI.

Requisite training, knowledge, skills and experience

Training

- Completion of the following CTIs:
  - CTI D-WTS01 When to stop
  - D-CM01 Pulse oximetry recording
  - D-CM02 Heart rate monitoring
- Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this CTI.
- Achievement of the following competencies (which relate to HLT07 - Health Training Package qualifications which includes the HLT43015 Certificate IV in Allied Health Assistance qualification) would be beneficial:
  - HLTAH402B: Assist with physiotherapy treatments and interventions

  Note: if above competencies have not been achieved by the AHA as part of a formal Certificate training program, the workplace may elect to implement workplace based training that encompasses these competencies and provides equivalence of knowledge and skills.
- Completion of the Clinical Skills Development Service Oxygen Therapy eLearning course is desirable

Clinical knowledge

The 6MWT is a self-paced test of walking capacity. Patients are asked to walk as far as possible in 6 min along a flat corridor. The distance in metres is recorded. Standardised instructions must be

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Endorsed: (Professional) Dr Nicole Bellet per DOP, Queensland; Dr Peter Thomas, QCRPN; Local CTI ONLY — Date approved: 31.5.2016

Approved: (Operational) Dr Nicole Bellet DOP Physiotherapy TPCH MNHHS — Date approved: 31.5.2016

Document custodian: Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS — Review date: TBA

Acknowledgements: Robyn Cobb, Rebecca Chambers, Trent Donnoley, Mark Roll ; Physiotherapy, TPCH, MNHHS

used, and encouragement is provided during the test. The main outcome is the 6-min walk distance (6MWD).

The following content knowledge is required by an AHA delivering this task:

- understand the reasoning behind use of this self paced standardised walking test
- have knowledge and understanding of basic anatomy and physiology related to a normal and abnormal response to an increased walking pace test. This would include understanding of basic terminology such as increased / decreased shortness of breath, dysponea, oxygen saturations, blood pressure and heart rate.
- basic knowledge of conditions relevant to the task including causes, presenting signs and impacts on the health and wellbeing of the client: COPD; Cystic Fibrosis; Asthma; Bronchiectasis.

The knowledge requirements will be met by:

- completing the training program (as above)
- reviewing the Learning Resource
- receiving instruction from the allied health professional in the training phase

Skills or experience

The following skills or experience are desirable for an AHA training to deliver this task:

- experience and confidence in
  - administering standardised screening / assessment tools within a healthcare setting
  - competent use of mobile oxygen equipment, pulse oximeter, blood pressure measurement equipment
  - experience in assessing potential adverse symptoms including chest pain, rapidly increasing or intolerable shortness of breath, dizziness, staggering, leg cramps, excessive sweatiness, pale or ashen appearance.
  - Administering modified BORG and RPE scales

Safety & quality

Client

The Allied Health Assistant will:

- – apply CTI D-WTS01 When to stop at all times
- – review the medical record, observation chart and/or speak with members of the healthcare team prior to commencing the task and advise the delegating health professional if there are any recent changes which may impact on a client's capacity to participate in the task e.g. recent deterioration.
- Some patients can be at risk of developing arrhythmias or cardiovascular collapse during testing. However, each patient does determine the intensity of their exercise as the test is self paced. Delegated walk tests are performed only in stable patients (as determined by the

delegating professional) however, AHAs performing tests should be experienced in assessing potential adverse symptoms such as

- chest pain,
- rapidly increased or intolerable shortness of breath,
- dizziness,
- staggering,
- leg cramps,
- excessive sweatiness,
- pale or ashen appearance.

- The AHA would also understand and know to stop a walk test if there was profound desaturation or abnormal increase or decrease in heart rate.
  - STOP 6MWT if S_{pO2} falls to <80%. If S_{pO2} recovers to ≥85% during the 6MWT, the patient may be asked to recommence walking.
  - Stop the walk test if bradycardia < 60bpm or Tachycardia (i.e. heart rate > 210 – age) bpm occurs.

Walks are **immediately stopped if any of these symptoms or signs occurs** and immediate contact with the delegating health professional must occur. A predetermined emergency plan (determined by the local institution) is required to ensure this timely communication, including carrying a phone, close proximity of delegating professional to AHA / test site and calling an emergency code if required.

Equipment, aids and appliances

- Ensure equipment is in good working order
  - Pulse oximeter
  - Access to oxygen and telephone in case of an emergency
  - Portable supplemental oxygen if required to perform exercise test by patient (if required)
  - Sphygmomanometer for blood pressure measurement (if required)

Environment

The 6MWT should be performed along a flat, straight course with a hard surface with minimal pedestrian traffic. It is recommended that the walking course be ≥30 m in length. The ends of the course should be marked so that they are easily visible to patients. Additional measurements marks at 5 meter intervals along the track are required. It is recommended that your institution have standardised tracks / designated areas where a walk test would be performed.

- Testing should be performed in a location where a rapid response to an emergency is possible and emergency procedures have been discussed as part of the training process. A telephone or other means of calling for help should be available in case of emergency.
- Emergency oxygen therapy is to be available to the patient throughout the test. This oxygen and the delivery system (eg mask……) is placed near the start of the walking corridor during testing.
- Additional portable oxygen therapy may also be required to be worn during testing (if this is required it should be noted when the task is delegated).

- Chairs can be placed at intervals along the circuit to enable the patient to rest appropriately, if assessed to be required.

Performance of Clinical Task

1. Delegation instructions

- Receive the delegated task from the health professional
- Clearly identify parameters for delivering the clinical task for the specific client including any variance from the usual task procedure. This may include:
  – English as a second language (ESL)
  – client's acceptable respiratory rate, oxygen saturation, heart rate and blood pressure (if applicable) range for participation in intervention
  – use of aid e.g 4WW, SPS
  – portable oxygen requirements (if applicable).
  – Requirement for chairs to be placed at intervals along the walking circuit

2. Preparation

- Obtain relevant screening / assessment form and all equipment listed below:
  – At least one chair, positioned at one end of the walking course
  – The modified BORG and RPE scales
  – Sphygmomanometer for blood pressure measurement (if required)
  – Pulse oximeter
  – Stopwatch
  – Pre-measured marks along the track/corridor
  – Access to oxygen and telephone in case of an emergency
  – An emergency plan
  – Portable supplemental oxygen if required to perform exercise test by patient
  – Clipboard with reporting sheet and pen

- Review the medical record and/or speak with members of the healthcare team and client to determine if the client has any of the following conditions that may impact his/her capacity to undertake the task and which were not discussed in the delegation instruction. Contact the delegating health professional for further advice before commencing the task if required.
  – **Absolutely** no testing if there has been any change to the patient's oxygen saturation, oxygen requirements, heart rate, blood pressure, shortness of breath, development of pain symptoms or conscious state outside the delegated instructions. Any change requires the assistant to speak with physiotherapist prior to the test.

Absolute and relative contraindications to 6 minute walk tests would be determined by the delegating physiotherapist prior to any delegation process. These include:

- **Absolute**: Acute myocardial infarction (3–5 days)
  Unstable angina

Uncontrolled arrhythmias causing symptoms or hemodynamic compromise
Syncope
Active endocarditis
Acute myocarditis or pericarditis
Symptomatic severe aortic stenosis
Uncontrolled heart failure
Acute pulmonary embolus or pulmonary infarction
Thrombosis of lower extremities
Suspected dissecting aneurysm
Uncontrolled asthma
Pulmonary oedema
Room air S_{pO2} at rest ≤85%#
Acute respiratory failure
Acute noncardiopulmonary disorder that may affect exercise performance or be aggravated by exercise (*i.e.* infection, renal failure, thyrotoxicosis)
Mental impairment leading to inability to cooperate

- **Possible:**
  - Left main coronary stenosis or its equivalent
  - Moderate stenotic valvular heart disease
  - Severe untreated arterial hypertension at rest (200 mmHg systolic, 120 mmHg diastolic)
  - Tachyarrhythmias or bradyarrhythmias
  - High-degree atrioventricular block
  - Hypertrophic cardiomyopathy
  - Significant pulmonary hypertension
  - Advanced or complicated pregnancy
  - Electrolyte abnormalities
  - Orthopaedic impairment that prevents walking

(Holland, Spruit, Singh; 2015)

3. Introduce task and seek consent

- The AHA introduces him/herself to client
- The AHA checks three forms of client identification: full name, date of birth plus one of the following; hospital UR number, Medicare number, or address
- The AHA describes the task to the client. For example:
  - "I have been asked by the (relevant health professional) to complete a six minute walk test with you to asses your exercise capacity. It is a standard test that involves walking up and down the corridor for six minutes. There is a set list of instructions which I will go through with you before we start the test. Is there any reason why you think you may not be able to do this test with me now?"
- The AHA obtains informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare

4. Positioning

The client's position during the task should be:

- Standing at the start of walk test circuit.

The AHA's position during the task should be:

- Standing to the side or behind the patient. The AHA should be able to see the readout from pulse oximeter during the test.

5. Task procedure

- The task comprises of the following steps:
  - Patients should rest in a chair, located near the starting position, before the test starts.
  - The following measurements should be obtained at rest:
    - Oxygen saturation and heart rate from pulse oximeter
    - Baseline dyspnoea and fatigue using the modified BORG and RPE scales)
    - Blood pressure, if applicable

<u>Immediately prior to the test</u>

- The AHA should provide standardised instructions as per 6MWT protocol:
  - "The aim of this test is to walk <u>as far as possible</u> for six minutes. You will walk along this hallway between the markers, as many times as you can in six minutes."

    "I will let you know as each minute goes past and then at six minutes I will ask you to stop where you are. Six minutes is a long time to walk, so you will be exerting yourself. You are permitted to slow down, to stop, and to rest as necessary, but please resume walking as soon as you are able."

    "Remember that the objective is to walk AS FAR AS POSSIBLE for six minutes, but don't run or jog."

    "Do you have any questions?"
- Position the patient at the starting line. For the 6MWT, start the timer as soon as the patient starts to walk.
- A pulse oximeter records continuous measurement of the oxygen saturation and heart rate.
- The assessor should not "pace" the patient during the test, but should walk behind such that measures of SpO_2 and end-test heart rate can be recorded without influencing the patient's movement.

<u>During the task:</u>

- Encourage the patient every 60 seconds using the standard phrases:
  - 1 min: "You are doing well. You have five minutes to go."
  - 2 min: "Keep up the good work. You have four minutes to go."
  - 3 min: "You are doing well. You are halfway."
  - 4 min: "Keep up the good work. You have only two minutes left."
  - 5 min: "You are doing well. You have only one minute to go."
  - 6 min: "Please stop where you are."
  - If the patient stops during the test, provide the following encouragement every 30 seconds once SpO_2 is ≥85%: "Please resume walking whenever you feel able."

Do not use any other words of encouragement or provide other non-verbal prompts.

- If the patient stops walking during the test, do not stop the timer. Allow the patient to rest in sitting or standing as they prefer. Whilst the patient is stopped, provide standardised encouragement above every 30 seconds. Record the time that the patient stopped and the time that walking is recommenced. Also record the oxygen saturation and heart rate at time of stopping.
- Immediately on test cessation:
  - record the oxygen saturation and heart rate from the oximeter,
  - ask the patient to rate their dyspnoea and subjective fatigue on the modified BORG and RPE scales.

  It is important to understand the patient's perception of limitations to their performance, so patients should be asked why they could not walk any further. It is common for patients to report either dyspnoea or leg fatigue as the primary factor limiting their performance on the test.
- Record on the testing form:
  - the lowest oxygen saturation and highest heart rate recorded during the test
  - pre and highest score patient felt they achieved during the walk for both dyspnoea and fatigue. Questions on the post scores are taken at end of the test but relate to the 'highest level' they reached during the test.
  - pre and post test systemic blood pressure, if applicable.
  - the total distance covered in six minutes by calculating the number of laps by the lap length and adding any distance covered in the final partial lap (round the distance to the nearest metre.
  - if the patient stopped during the test, report the total time stopped and the number of stops.

  Monitor for adverse reactions and implement appropriate mitigation strategies as outlined in CTI D-WTS01 When to stop and outlined in Safety and quality: client above.
- At the conclusion of the task:
  - provide a summary comment to the client on performance, and
  - ensure the client is comfortable and safe.

6. Document

- On the 6 Minute Walk Test tool used by the health service,
  - document the outcomes as outlined above
  - file the tool in the medical record as per local health service documentation guidelines.
- In the medical record document that
  - the 6 Minute Walk Test has been administered and
  - the documented outcomes on the 6MWT tool.
  - If oxygen used during walk note delivery system (e.g. nasal prongs) and liters per min used.

7. Report to delegating health professional

- Provide comprehensive feedback to the health professional who delegated the task, including:
  - outcomes of the 6MWT
  - relevant observations of the client's performance

– difficulties or questions reported by the client or carer/family.

References and supporting documents

- Queensland Health (2012) *Guide to Informed Decision Making in Healthcare*. http://www.health.qld.gov.au/consent/default.asp
- Effective Workforce Solutions (2012) *When to Stop (Precautions when working with clients).* http://qheps.health.qld.gov.au/ahwac/content/clinical-tasks-Q.htm
- Anne E. Holland, Martijn A. Spruit, Sally J. Singh; 2015;How to carry out a field walking test in chronic respiratory disease; http://breathe.ersjournals.com/content/11/2/128.

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Administer a screening / assessment tool – 6MWT

Assessment: Performance Criteria Checklist (Delegated Task)

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
1. Demonstrates knowledge of fundamental concepts required to undertake the 6MWT.			
2. Obtains all required information from delegating health professional and seeks clarification if required.			
3. Completes preparation for task including obtains relevant form and equipment and ensures client and environment are prepared for the task (i.e. client has glasses or hearing aids, appropriate footwear, oxygen, oximeter, other environmental modifications complete) as per the 6MWT CTI lists.			
4. Introduces self to client and checks client identity.			
5. Describes purpose of delegated task and seeks informed consent.			
6. Positions self and client appropriately to complete task and ensure safety.			
7. Delivers task effectively and safely as per delegated instructions and CTI procedure. a. Clearly explains the 6 MWT procedure using standardised instructions, checking client's understanding. b. Completes 6MWT as per standard procedure (or deviates from standard procedure where appropriate to maintain safety). c. Records information from task accurately and appropriately as per standard procedure, and where relevant, obtains additional relevant information (observations, client comments or questions) for reporting to the delegating health professional and/or recording in the medical record. d. During task, maintains a safe clinical environment and manages risks appropriately. e. Provides feedback to client on performance during and at completion of task.			
8. Documents accurately and comprehensively in clinical notes.			
9. Provides accurate and comprehensive feedback to the delegating health professional.			

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Comments:		
Record of assessment of competence		
Assessor name:	Assessor position:	Competence achieved: / /
Scheduled review		
Review date / /		

Learning Resource

General information / background knowledge

- Training package for delegation of 6 MWT to AHA : Heart Lung Institute (HLI), The Prince Charles Hospital, MNHHS. (2015) G:\Physiotherapy\General\PHYSIO\8. PTA\6MWT

- Anne E. Holland, Martijn A. Spruit, Sally J. Singh; 2015; How to carry out a field walking test in chronic respiratory disease; http://breathe.ersjournals.com/content/11/2/128.

- Skills Development Service Oxygen Therapy eLearning https://www.sdc.qld.edu.au/courses/122

Conditions relevant to task

Webpage; About Cystic Fibrosis : Australian Cystic Fibrosis Association : 2016 ; http://www.cysticfibrosis.org.au/all/learn/

Webpage: The basics of Cystic Fibrosis, Stanford University CF Centre, 2016; http://med.stanford.edu/cfcenter/education/english/BasicsOfCF.html

Factsheet: Bronchiectasis ; Lung Foundation Australia ; http://lungfoundation.com.au/wp-content/uploads/2013/12/Bronchiectasis-Sept-2014.pdf

Factsheet: COPD; Lung Foundation Australia http://lungfoundation.com.au/wp-content/uploads/2013/12/COPD-Chronic-Obstructive-Pulmonary-Disease.pdf

Factsheet: Pneumonia; Lung Foundation Australia; http://lungfoundation.com.au/wp-content/uploads/2014/04/Pneumonia-July-2014.pdf

Local physiotherapy department resources as required as part of local training requirements

1.8.6 Local CTI Delegation- Airway clearance – Manual Techniques for Airway Clearance

Local CTI: Airway clearance – Manual techniques for airway clearance

This CTI will enable the Allied Health Assistant (AHA) to safely and effectively administer manual techniques for airway clearance. These are performed in conjunction with the Active Cycle of Breathing Technique (ACBT) and positioning.

Scope and objectives of clinical task

Requisite training, knowledge, skills and experience

Training

- Completion of the following CTIs:
  - CTI D- CTI WTS01 When to stop
  - D-CM01 Pulse oximetry recording
  - ACBT delegation CTI (in draft currently)

VERSION CONTROL *(for use by HHS for local CTI, and AHPOQ for state-wide CTI)*

Version # / date:	V1.3 23.6.2016	Author:	Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS
Endorsed: (Professional)	Dr Nicole Bellet per DOP, Queensland Dr Peter Thomas, QCRPN Local CTI ONLY	Date approved:	31.5.2016
Approved: (Operational)	Dr Nicole Bellet DOP Physiotherapy TPCH MNHHS	Date approved:	31.5.2016
Document custodian:	Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS	Review date:	

Acknowledgements: Robyn Cobb, Rebecca Chambers, Trent Donnoley, Mark Roll ; Physiotherapy, TPCH, MNHHS

The CTI reflects best practice and agreed process for conduct of the task at the time of approval and should not be altered. Requests for amendment or review of this document should be directed to AHPOQ: allied_health_advisory@health.qld.gov.au.

This CTI should be used under a delegation framework implemented at the work unit level. The framework is available at: http://qheps.health.qld.gov.au/ahwac/docs/MOC/ssdp-framework.pdf

Please check http://www.health.qld.gov.au/ahwac/html/calderdale-framework.asp for the latest version of this CTI.

- Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this CTI.
- Achievement of the following competencies (which relate to HLT07 - Health Training Package qualifications which includes the HLTAH402C Certificate IV in Allied Health Assistance qualification) would be beneficial:
- Unit code: HLTAH402C: Assist with physiotherapy treatments and interventions

  Note: if above competencies have not been achieved by the AHA as part of a formal Certificate training program, the workplace may elect to implement workplace-based training that encompasses these competencies and provides equivalence of knowledge and skills.

Clinical knowledge

The following content knowledge is required by an AHA delivering this task:

- knowledge
  - of normal and abnormal airway clearance mechanisms including basic anatomy and physiology of the lungs and upper respiratory system and conditions relevant to the task including causes, presenting signs and impacts on the health and wellbeing of the client: COPD, Cystic Fibrosis, Bronchiectasis; other suppurative lung diseases.
  - of the normal components of the airway clearance technique ACBT including breathing control, thoracic expansion exercises and the forced expiration technique
- knowledge of equipment relevant to ACBT, including patient self administration of inhaled medications and tubes to assist huffing

The knowledge requirements will be met by:

- completing training program (listed above)
- reviewing the Learning Resource
- receiving instruction from allied health professional in training phase

Skills or experience

The following skills or experience are <u>required</u> by an AHA delivering this task:

- Experience and confidence in:
  - assisting with client movement and positioning
  - facilitating and supporting clients to achieve therapy goals
- experience and confidence in communicating effectively with clients of a health service

The following skills or experience are <u>desirable</u> for an AHA delivering this task:

- experience and competency in manual techniques for airway clearance

Safety and quality

Client

The Allied Health Assistant will:

  - apply CTI D-WTS01 When to stop at all times

– review the medical record, observations chart and/or speak with members of the healthcare team prior to commencing the task and advise the delegating health professional if there are any recent changes which may impact on a client's capacity to participate in the task. Specifically, the AHA should note:
  - Recent / new haemoptysis
  - Increased shortness of breath
  - Increased supplemental oxygen requirements
  - Other sudden changes to bedside observations: heat rate, blood pressure
  - Changed consciousness that won't allow co-operation with AHA
  - Additional or changed areas of pain

In addition, the following potential risks have been identified for this clinical task and should be monitored carefully by the Allied Health Assistant during the task:

- pain associated with the technique over the chest wall area
- dizziness associated with the manoeuvres

Prior to delegation the physiotherapist will have assessed patients for any contra-indications / precautions for manual techniques. These would include:

- Osteoporosis
- # ribs / rib pathology
- Thoracic / cardiac surgery
- Pain
- Frank blood in sputum (haemoptysis)
- Bronchospasm
- Liver disease, coagulopathies, BMD deficiency
- Metastatic deposits
- Clotting disorders
- Loss of skin integrity (surgery, burns, wounds)
- Subcutaneous emphysema

Equipment, aids and appliances

- Pulse oximeter if required as delegated by physiotherapist
- Clean 'huffing tube' if required as delegated by physiotherapist

Environment

- Setup up the environment for safe and efficient completion of ACBT airway clearance – usually in patient's room.
- Ensure Infection Control protocols for respiratory patients are adhered to at all times
  – Wear protective gowns

- Hand washing
- Minimal / no contact with sputum cups (patients handles these)
- Positon behind patient / to the side of patient
- Draw curtains if in a ward

Performance of Clinical Task

Delegation instructions

1. Receive the delegated task from the health professional.
2. Clearly identify parameters for delivering the clinical task for the specific client including any variance from the usual task procedure such as:
    a. specific positioning
    b. any equipment used, including use of supplementary oxygen and /or use of patient self-administered medication such as Ventolin or hypertonic saline
    c. number of repetitions or time treatment (where a number of cycles are required to be completed with the client)
    d. expected outcome (eg sputum production)
    e. risks and precautions for the individual client e.g. observation of sputum, signs of haemoptysis, increased breathlessness with technique, manual handling risks and management strategies
    f. possible compensatory strategies / errors / problems, or variations permitted from normal task procedure specific for that patient

3. Preparation

- Obtain relevant equipment and instruction sheet if relevant and as directed by delegating health professional.
- Review the medical record, observations chart and/or speak with members of the healthcare team and client to determine if the client has experienced any change in health status since last reviewed by the delegating health professional. Changes potentially relevant to the client's capacity to participate in the task that were not discussed in the delegation instruction should be raised with the delegating health professional before commencing the task.

4. Introduce task and seek consent

- The AHA introduces him/herself to client
- The AHA checks three forms of client identification: full name, date of birth <u>plus one</u> of the following; hospital UR number, Medicare number, or address
- The AHA describes the task to the client. For example:
    - "I have been asked by the (relevant health professional) to assist you to complete your airway clearance today using positioning and hands on techniques that include percussion and vibrations. These will help you clear your sputum more effectively.
- The AHA seeks informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare

5. Positioning

The client's position during the task should be:

- to be specified by the delegating health professional for the individual's airway clearance routine

The AHA's position during the task should be:

- to be specified by the delegating health professional for the individual's airway clearance routine including hand placements, use of additional **patient self administered** inhalation medication/devices, use of additional AC techniques such as ACBT /huffing (refer to CTI Airway Clearance – ACBT)

6. Task procedure

- Explain and demonstrate (where applicable) the task to the client.
- Check client has understood the task and provide an opportunity to ask questions.
- The task comprises the following steps: (Note that individual delegation required for each step for each patient)
- A typical airway clearance session that included manual techniques consists of:
  - Positioning
  - breathing control (until the patient is settled and ready to commence)
  - percussion over lung surface for delegated number of breaths / cycle / time: usually patient performs thoracic expansion exercises while percussion is performed
  - breathing control (until patient returns to their normal resting breathing rate)
  - repeat percussion and breathing for delegated number of cycles / tolerance of patients
  - breathing control (until patient returns to their normal resting breathing rate) between percussion cycles
  - Vibrations with thoracic expansion exercises as delegated
  - breathing control
  - huffs – at the appropriate inspiratory volume, depending on the position of the sputum
  - breathing control

  The flexibility of the regimen (the percussion combined with the number of deep breaths, the number of vibrations, huffs and the length of the periods of breathing control) and order of the components varies with the patients' condition and should be adapted to suit the individual as delegated by the physiotherapist. Each component plays a key role in the clearance of secretions.

  If required and as instructed by the physiotherapist, the AHA may

  a) Demonstrate how to perform ACBT, including modifying huffing, using a 'huffing tube'. This includes highlighting potential errors which are outlined in the ACBT CTI.

  b) Follow the airway clearance session as described by the delegating health professional, which will provide guidance on positioning, risks and precautions and any other relevant considerations for the individual client.
- During the task:
  - provide feedback and correct errors in the performance of the task using the delegation instruction and knowledge of common errors as a guide. This may include:
    - providing verbal prompting and encouragement,

    - providing verbal correction and/or manual guidance,
    - counting repetitions / noting time elapsed for the client and indicating when to rest, use breathing control
    - watching for signs of fatigue such as increased respiratory rate and increasing use of accessory muscles of breathing
    - monitor sputum produced – noting amount, colour and tenacity
  - monitor for adverse reactions and implement appropriate mitigation strategies as outlined in CTI D-WTS01 When to stop
- At the conclusion of the task:
  - provide summary feedback to client, emphasising positive aspects of the airway clearance session
  - provide instructions for independent practice of the applicable parts of the task (including reinforcing safety considerations) if this was requested by delegating health professional
  - ensure the client is comfortable and safe

7. Document

- Clearly document the outcomes of the task in the client's notes such as number of repetitions, whether the task was modified in any way in response to patient's signs/tolerance, whether sputum was produced, breathing improved etc.

8. Report to delegating health professional

- Provide comprehensive feedback to the health professional who delegated the task
- Include observations of client performance, expected outcomes that were and were not achieved, and difficulties encountered, or symptoms reported by the client during the task. The AHA may also provide a recommendation to the health professional regarding potential changes to the program such as the need to progress an exercise.

References and supporting documents

- Queensland Health (2012) *Guide to Informed Decision Making in Healthcare*. http://www.health.qld.gov.au/consent/default.asp
- Effective Workforce Solutions (2012) *When to Stop (Precautions when working with clients).* http://qheps.health.qld.gov.au/ahwac/content/clinical-tasks-Q.htm

Airway clearance – Manual techniques for airway clearance Assessment: Performance Criteria Checklist (Delegated Task)

Queensland Government

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
1. Demonstrates knowledge of fundamental concepts required to undertake the task.			
2. Obtains all required information from delegating health professional and seeks clarification if required.			
3. Completes preparation for task including obtaining relevant instruction sheet/equipment, ensuring a safe and appropriate environment for completion of the task, and checking client functional and medical status.			
4. Introduces self to client and checks client identity.			
5. Describes purpose of delegated task and seeks informed consent.			
6. Positions self and client appropriately to complete task and ensure safety, as delegated.			
7. Delivers task effectively and safely as per delegated instructions and CTI procedure. a. Clearly explains the airway clearance using manual techniques, checking client's understanding. b. During task, maintains a safe clinical environment and manages risks appropriately. c. Performs percussion safety and effectively d. Performs vibrations /shaking safety and effectively e. Facilitates breathing exercises / activities as per delegation instruction. f. Provides feedback to client on performance during and at completion of task.			
8. Documents accurately and comprehensively in clinical notes.			
9. Provides accurate and comprehensive feedback to the delegating health professional.			
Comments:			

Record of assessment of competence		
Assessor name:	Assessor position:	Competence achieved: / /
Scheduled review		
Review date / /		

Learning Resource

General information / background knowledge

- Reviewing online resource : Bronchiectasis Toolbox - Airway clearance in Normal Lung http://bronchiectasis.com.au/physiotherapy/principles-of-airway-clearance/airway-clearance-in-the-normal-lung
- Factsheet : The Lungs – An overview of how they work Lung Foundation Australia brochure; http://lungfoundation.com.au/wp-content/uploads/2013/12/The-Lungs-%E2%80%93-An-overview-of-how-they-work_july2013.pdf

Conditions relevant to task

- Webpage ; About Cystic Fibrosis : Australian Cystic Fibrosis Association : 2016 ; http://www.cysticfibrosis.org.au/all/learn/
- The Basics of Cystic Fibrosis, Stanford University CF Centre, 2016; http://med.stanford.edu/cfcenter/education/english/BasicsOfCF.html
- Factsheet : Bronchiectasis ; Lung Foundation Australia ; http://lungfoundation.com.au/wp-content/uploads/2013/12/Bronchiectasis-Sept-2014.pdf
- Factsheet : COPD; Lung Foundation Australia http://lungfoundation.com.au/wp-content/uploads/2013/12/COPD-Chronic-Obstructive-Pulmonary-Disease.pdf
- Factsheet: Pneumonia ; Lung Foundation Australia; http://lungfoundation.com.au/wp-content/uploads/2014/04/Pneumonia-July-2014.pdf

Local physiotherapy department resources as required

Therapeutic approach and relevant terminology

Manual techniques apply external forces against the chest wall to facilitate airway clearance when a patient is in a modified or traditional gravity assisted drainage position. These techniques include: Chest percussion / clapping, Vibrations, Chest shaking

- TPCH: Patient guide to ACBT; G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\ACBTMar13 – v3
- TPCH: Patient handout – Airway clearance techniques: G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\airway clearance techniques Sept 03 –V1
- TPCH: Patient handout - Haemoptysis; G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\Haemoptysis
- TPCH: Patient handout – Postural drainage and modified postural drainage; G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\ Postural drainage and modified postural drainage; April 13 –V3

- Nicolson C, Lee A. et al.,(2016) ; Manual techniques handout : Bronchiectasis Toolbox http://bronchiectasis.com.au/physiotherapy/techniques/manual-techniques
- Nicolson C, Lee A. et al.,(2016) ; Manual technique video : Bronchiectasis Toolbox : http://bronchiectasis.com.au/resources/videos/manual-techniques
- Nicolson C, Lee A. et al.,(2016) ; ACBT technique handout : Bronchiectasis Toolbox : http://bronchiectasis.com.au/physiotherapy/techniques/the-active-cycle-of-breathing-technique
- Nicolson C, Lee A. et al.,(2016) ; ACBT technique VIDEO : http://bronchiectasis.com.au/resources/videos/the-active-cycle-of-breathing-technique

1.8.7 WPI Delegation - Administer Assessment Tool - Modified Shuttle Walk Test

DELEGATED TASK WORK INSTRUCTION

The Prince Charles Hospital Physiotherapy Department

Administer assessment tool – Modified Shuttle Walk Test

Scope and objectives of clinical task

This CTI will enable the Allied Health Assistant (AHA) to:

- accurately collect and record information using a standard screening / assessment tool and procedure for the modified shuttle walk test (MSWT), in a select group of clients with stable chronic respiratory conditions including cystic fibrosis.
- support the delegating practitioner and multi-disciplinary team's assessment process for selected patients with chronic respiratory disease who are primarily undergoing evaluation or enrolled in clinical research and who can walk independently, have respiratory and/or cardiovascular disease that is assessed as stable and well controlled on drug therapy and do not have high oxygen requirements.

Requisite training, knowledge, skills and experience

Training

- Completion of the following CTIs:
  - CTI D-WTS01 When to stop
  - D-CM01 Pulse oximetry recording
  - D-CM02 Heart rate monitoring
- Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this CTI.
- Completion of the Clinical Skills Development Service Oxygen Therapy eLearning course is desirable

Clinical knowledge

The MSWT is a test of walking capacity. The ISWT is an externally paced maximal exercise test where the speed of walking increases with each level, controlled by a series of pre-recorded signals. The test continues until the participant can no longer continue or cannot keep up with the required pace. The maximum duration of the test is 20 min.

The following content knowledge is required by an AHA delivering this task:

- understand the reasoning behind use of this standardised walking test
- have knowledge and understanding of basic anatomy and physiology related to a normal and abnormal response to an increased walking pace test. This would include understanding of basic terminology such as increased / decreased shortness of breath, dysponea, oxygen saturations, blood pressure and heart rate.

basic knowledge of conditions relevant to the task including causes, presenting signs and impacts on the health and wellbeing of the client: COPD; Cystic Fibrosis; Asthma; Bronchiectasis. The knowledge requirements will be met by:

- completing the training program (as above)
- reviewing the Learning Resource
- receiving instruction from the allied health professional in the training phase

Skills or experience

The following skills or experience are desirable for an AHA delivering this task:

- experience and confidence in
  - administering standardised screening / assessment tools within a healthcare setting
  - competent use of mobile oxygen equipment, pulse oximeter, blood pressure measurement equipment

Safety & quality

Client

The Allied Health Assistant will:

- apply CTI D-WTS01 When to stop at all times
- review the medical record, observation chart and/or speak with members of the healthcare team prior to commencing the task and advise the delegating health professional if there are any recent changes which may impact on a client's capacity to participate in the task e.g. recent deterioration.

- Some patients can be at risk of developing arrhythmias or cardiovascular collapse during testing. Delegated walk tests are performed only in stable patients (as determined by the delegating professional) however staff performing tests should be experienced in assessing potential adverse symptoms such as
  - chest pain,
  - rapidly increased or intolerable shortness of breath,
  - dizziness,
  - staggering,
  - leg cramps,
  - excessive sweatiness,
  - pale or ashen appearance.
- The AHA would also understand and know to stop a walk test if there was profound desaturation or abnormal increase or decrease in heart rate.
  - STOP test if S_{pO2} falls to <80%. If S_{pO2} recovers to ≥85% during the 6MWT, the patient may be asked to recommence walking.
  - Stop the walk test if bradycardia < 60bpm or Tachycardia (i.e. heart rate > 210 – age) bpm occurs.

Walks are **immediately stopped if any of these symptoms or signs occurs** and immediate contact with the delegating health professional must occur. A predetermined emergency plan (determined by the local institution) is required to ensure this timely communication, including carrying a phone, close proximity of delegating professional to AHA / test site and calling an emergency code if required.

Equipment, aids and appliances

- Ensure equipment is in good working order
  - Pulse oximeter
  - Access to oxygen and telephone in case of an emergency
  - Portable supplemental oxygen if required to perform exercise test by patient (if required)
  - Sphygmomanometer for blood pressure measurement (if required)

Environment

Course

- The course is 10 m in length with two markers inset of 0.5 m from either end (fig. 1). The patient walks around the cones, thus avoiding abrupt changes in direction. Refer to Holland (2015) for diagram of how to set up MSWT course.
- Testing should be performed in a location where a rapid response to an emergency is possible and emergency procedures have been discussed as part of the training process. A telephone or other means of calling for help should be available in case of emergency.
- Emergency oxygen therapy is to be available to the patient throughout the test. This oxygen and the delivery system is placed near the start of the walking corridor during testing.
- Additional portable oxygen therapy may also be required to be worn during testing (as delegated).

Performance of Clinical Task

1. Delegation instructions

- Receive the delegated task from the health professional
- Clearly identify parameters for delivering the clinical task for the specific client including any variance from the usual task procedure. This may include:
  - English as a second language (ESL)
  - client’s acceptable respiratory rate, oxygen saturation, heart rate and blood pressure (if applicable) range for participation in intervention
  - portable oxygen requirements (if applicable)

2. Preparation

- Obtain relevant screening / assessment form and all equipment listed below:
  - Audio recording and player
  - The modified BORG and RPE scales
  - Sphygmomanometer for blood pressure measurement (if required)
  - Pulse oximeter
  - Cone and pre measured area

– Access to oxygen and telephone in case of an emergency
– An emergency plan
– Portable supplemental oxygen if required to perform exercise test by patient
– Clipboard with reporting sheet and pen

- Review the medical record, observations chart and/or speak with members of the healthcare team and client to determine if the client has any of the following conditions that may impact his/her capacity to undertake the task and which were not discussed in the delegation instruction. Contact the delegating health professional for further advice before commencing the task if required.
  – **Absolutely** no testing if there has been any change to the patients oxygen saturation, oxygen requirements, heart rate, blood pressure, shortness of breath, development of pain symptoms or conscious state outside the delegated instructions. Any change requires the assistant to speak with physiotherapist prior to the test.

Absolute and relative contraindications to 6 minute walk tests would be determined by the delegating physiotherapist prior to any delegation process. These include:

- **Absolute**: Acute myocardial infarction (3–5 days)
  Unstable angina
  Uncontrolled arrhythmias causing symptoms or hemodynamic compromise
  Syncope
  Active endocarditis
  Acute myocarditis or pericarditis
  Symptomatic severe aortic stenosis
  Uncontrolled heart failure
  Acute pulmonary embolus or pulmonary infarction
  Thrombosis of lower extremities
  Suspected dissecting aneurysm
  Uncontrolled asthma
  Pulmonary oedema
  Room air S_{pO2} at rest ≤85%#
  Acute respiratory failure
  Acute noncardiopulmonary disorder that may affect exercise performance or be aggravated by exercise (*i.e.* infection, renal failure, thyrotoxicosis)
  Mental impairment leading to inability to cooperate
- **Relative:**
  – Left main coronary stenosis or its equivalent
  – Moderate stenotic valvular heart disease
  – Severe untreated arterial hypertension at rest (200 mmHg systolic, 120 mmHg diastolic)
  – Tachyarrhythmias or bradyarrhythmias
  – High-degree atrioventricular block
  – Hypertrophic cardiomyopathy
  – Significant pulmonary hypertension
  – Advanced or complicated pregnancy
  – Electrolyte abnormalities

– Orthopaedic impairment that prevents walking

(Holland, Spruit, Singh; 2015)

3. Introduce task and seek consent

- The AHA introduces him/herself to client
- The AHA checks three forms of client identification: full name, date of birth plus one of the following; hospital UR number, Medicare number, or address
- The AHA describes the task to the client. For example:
  – "I have been asked by the (relevant health professional) to complete the Shuttle walk test with you to asses your exercise capacity. There is a set list of instructions which I will go through with you before we start the test. Is there any reason why you think you may not be able to do this test with me now?"
- The AHA obtains informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare

4. Positioning

The client's position during the task should be:

- Standing at the start of walk test track.

The AHA's position during the task should be:

- Standing at the side of track, not impeding the patients walk field.

5. Task procedure

The task comprises of the following steps:

- At the beginning of the test, the instructions are played to the patient from an audio recording. Once the instructions have been played, and the assessor has confirmed that the patient has understood, the patient is positioned at one end of the course. The speed at which the patient should walk is directed by an audio signal. There is a triple bleep indicating the test has started, at which point the patient commences walking and the timer is activated.
- Conduct during the test

The assessor should watch the patient and also keep count of the number of shuttles as the subject completes them, throughout the duration of the test. It is advisable to time the performance as an additional measure to confirm manual recording of the number of shuttles completed. As the speed of walking increases every minute, indicated by a triple bleep, advise the patient "you now need to increase your speed of walking". During the test only one verbal cue can be used to encourage the patient to pick up their speed: "you need to increase your speed to keep up with the test".

- Termination of the test

The test is terminated when either

1) the patient indicates that they are unable to continue,
2) if the operator determines that the patient is not fit to continue, or

3) the operator assesses that the patient was unable to sustain the speed and cover the distance to the cone prior to the beep sounding.

Operator termination of the test

- The operator stops the test if the patient fails to reach the cone/marker in the time allowed. This is defined as the patient being more than 0.5 m away from the cone when the bleep sounds on a second successive 10 m length. When the patient is just outside the 0.5 m marker, they are advised to increase their speed of walking; if the patient fails to do so then the test is terminated and the distance recorded.

- Immediately on test cessation:
  - record the oxygen saturation$_2$ and heart rate from the oximeter,
  - ask the patient to rate their dyspnoea and subjective fatigue on the modified BORG and RPE scales.

  It is important to understand the patient's perception of limitations to their performance, so patients should be asked why they could not walk any further. It is common for patients to report either dyspnoea or leg fatigue as the primary factor limiting their performance on the test.

Recording performance of the test

- Add up the number of lengths walked in metres (to the last 10 completed), and record on the form available online at http://erj.ersjournals.com/content/44/6/1428/suppl/DC2

  Monitor for adverse reactions and implement appropriate mitigation strategies as outlined in CTI D-WTS01 When to stop and outlined in Safety and quality: client above.
- At the conclusion of the task:
  - provide a summary comment to the client on performance, and
  - ensure the client is comfortable and safe.

5. Document

- On the 6 MSWT tool used by the health service,
  - document the outcomes as outlined above and
  - file the tool in the medical record as per local health service documentation guidelines.
- In the medical record document that
  - the MSWT has been administered and
  - the documented outcomes.
  - If oxygen used during walk note delivery system (e.g. nasal prongs) and liters per min used.

6. Report to delegating health professional

- Provide comprehensive feedback to the health professional who delegated the task, including:
  - outcomes of the MSWT
  - relevant observations of the client's performance
  - difficulties or questions reported by the client or carer/family.

References and supporting documents

- Queensland Health (2012) *Guide to Informed Decision Making in Healthcare*. http://www.health.qld.gov.au/consent/default.asp
- Effective Workforce Solutions (2012) *When to Stop (Precautions when working with clients).* http://qheps.health.qld.gov.au/ahwac/content/clinical-tasks-Q.htm
- Anne E. Holland, Martijn A. Spruit, Sally J. Singh; 2015;How to carry out a field walking test in chronic respiratory disease; http://breathe.ersjournals.com/content/11/2/128.

Administer a screening / assessment tool – MSWT

Queensland Government

Assessment: Performance Criteria Checklist (Delegated Task)

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
1. Demonstrates knowledge of fundamental concepts required to undertake the 6MWT.			
2. Obtains all required information from delegating health professional and seeks clarification if required.			
3. Completes preparation for task including obtains relevant form and equipment and ensures client and environment are prepared for the task (i.e. client has glasses or hearing aids, appropriate foot wear, oxygen, oximeter, other environmental modifications complete) as per the MSWT lists.			
4. Introduces self to client and checks client identity.			
5. Describes purpose of delegated task and seeks informed consent.			
6. Positions self and client appropriately to complete task and ensure safety.			
7. Delivers task effectively and safely as per delegated instructions and CTI procedure. a. Clearly explains the MSWT procedure using standardised instructions, checking client's understanding. b. Completes MSWT as per standard procedure (or deviates from standard procedure where appropriate to maintain safety). c. Records information from task accurately and appropriately as per standard procedure, and where relevant, obtains additional relevant information (observations, client comments or questions) for reporting to the delegating health professional and/or recording in the medical record. d. During task, maintains a safe clinical environment and manages risks appropriately. e. Provides feedback to client on performance during and at completion of task.			
8. Documents accurately and comprehensively in clinical notes.			
9. Provides accurate and comprehensive feedback to the delegating health professional.			
Comments:			

Record of assessment of competence		
Assessor name:	Assessor position:	Competence achieved: / /
Scheduled review		
Review date / /		

Learning Resource

General information / background knowledge

- Training package for delegation of 6 MWT to AHA : Heart Lung Institute (HLI), The Prince Charles Hospital, MNHHS. (2015) G:\Physiotherapy\General\PHYSIO\8. PTA\6MWT

- Anne E. Holland, Martijn A. Spruit, Sally J. Singh; 2015; How to carry out a field walking test in chronic respiratory disease; http://breathe.ersjournals.com/content/11/2/128.

- Skills Development Service Oxygen Therapy eLearning https://www.sdc.qld.edu.au/courses/122

Conditions relevant to task

Webpage; About Cystic Fibrosis: Australian Cystic Fibrosis Association : 2016 ; http://www.cysticfibrosis.org.au/all/learn/

Webpage: The basics of Cystic Fibrosis, Stanford University CF Centre, 2016; http://med.stanford.edu/cfcenter/education/english/BasicsOfCF.html

Factsheet: Bronchiectasis; Lung Foundation Australia; http://lungfoundation.com.au/wp-content/uploads/2013/12/Bronchiectasis-Sept-2014.pdf

Factsheet: COPD; Lung Foundation Australia http://lungfoundation.com.au/wp-content/uploads/2013/12/COPD-Chronic-Obstructive-Pulmonary-Disease.pdf

Factsheet: Pneumonia; Lung Foundation Australia; http://lungfoundation.com.au/wp-content/uploads/2014/04/Pneumonia-July-2014.pdf

Local physiotherapy department resources as required as part of local training requirements

Authors:

VERSION CONTROL

The Prince Charles Hospital
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Version date: 23.6.2016 V1.3 Author: Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS

Document custodian: Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS Review date:

Acknowledgements: Robyn Cobb, Rebecca Chambers, Trent Donnoley, Mark Roll ; Physiotherapy, TPCH, MNHHS

DELEGATED TASK WORK INSTRUCTION

The Prince Charles Hospital - Physiotherapy Department

Airway clearance – PEP and Oscillating PEP Devices

Scope and objectives of clinical task:

This local CTI/ WUG will enable the Allied Health Assistant (AHA) to safely and effectively supervise clients using PEP or OscillatingPEP to assist airway clearance including:

- explain the purpose of and procedure for the airway clearance device
- competently facilitate and monitor the use of airway clearance device, including correcting common errors or causes of ineffective performance, and
- provide clear and relevant feedback to improve a client's performance of the airway clearance device.

Requisite training, knowledge, skills and experience

Training

- Completion of the following CTIs:
  - D- CTI WTS01 When to stop
  - D-CM01 Pulse oximetry recording
  - D – Airway clearance – ACBT
  - D – Airway clearance: manual techniques
- Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this CTI (document).
- Achievement of the following competencies (which relate to HLT07 - Health Training Package qualifications which includes the HLTAH402C Certificate IV in Allied Health Assistance qualification) would be beneficial:
- Unit code: HLTAH402C: Assist with physiotherapy treatments and interventions

  Note: if above competencies have not been achieved by the AHA as part of a formal Certificate training program, the workplace may elect to implement workplace based training that encompasses these competencies and provides equivalence of knowledge and skills.

Clinical knowledge

The following content knowledge is required by an AHA delivering this task:

- knowledge sufficient to be able to understand and perform this supervisory role
  - of normal and abnormal airway clearance mechanisms including basic anatomy and physiology of the lungs and upper respiratory system and conditions relevant to the task including causes, presenting signs and impacts on the health and wellbeing of the client: COPD, Cystic Fibrosis, Bronchiectasis; other suppurative lung diseases.

- of the normal components of airway clearance techniques that require a PEP or oscillatingPEP device including use of the device, breathing control, thoracic expansion exercises and the forced expiration technique

- knowledge of equipment relevant to the devices, including patient self administration of inhaled medications, tubes to assist huffing

The knowledge requirements will be met by:

- completing training program
- reviewing the Learning Resource
- receiving instruction from allied health professional in training phase

Skills or experience

The following skills or experience are required by an AHA delivering this task:

- Experience and confidence in:
  - assisting with client movement and positioning
  - facilitating and supporting clients to achieve therapy goals

The following skills or experience are desirable for an AHA delivering this task:

- experience and confidence in communicating effectively with clients of a health service

Safety and quality

Client

The Allied Health Assistant will:

- apply CTI D-WTS01 When to stop at all times
- review the medical record and/or speak with members of the healthcare team prior to commencing the task and advise the delegating health professional if there are any recent changes which may impact on a client's capacity to participate in the task. Specifically, the AHA should note:
  - Recent / new haemoptysis
  - Increased shortness of breath
  - Increased supplemental oxygen requirements
  - Other sudden changes to bedside observations: heat rate, blood pressure
  - Changed consciousness that won't allow co-operation with AHA

Equipment, aids and appliances

- Specific airway clearance device as delegated for specific task
  - Pari PEP (Positive Expiratory pressure) device
  - Acapella
  - Aerobika
  - Flutter /Turboforte / Pari-O-PEP

Environment

- Setup up the environment for safe and efficient completion of the airway clearance using the device– usually in patients' room.
- Ensure Infection Control protocols for respiratory patients are adhered to at all times
  - Wear protective gowns
  - Hand washing
  - Minimal / no contact with sputum cups (patients handles these)
  - Position behind patient / to the side of patient

Performance of Clinical Task

1. Delegation instructions

- Receive the delegated task from the health professional.
- Clearly identify parameters for delivering the clinical task for the specific client including any variance from the usual task procedure.
  - specific positioning
  - specific equipment used (specific airway clearance device for that individual patient), including use of supplementary oxygen and /or use of patient self-administered medication such as Ventolin or hypertonic saline
  - number of repetitions or time treatment (where a number of cycles are required to be completed with the client)
  - expected outcome
  - risks and precautions for the individual client e.g. observation of sputum, signs of haemoptysis, increased breathlessness with technique, manual handling risks and management strategies
  - possible compensatory strategies / errors / problems, or variations permitted from normal task procedure specific for that patient

2. Preparation

- Obtain relevant equipment and an instruction sheet if relevant and as directed by delegating health professional.
- Review the medical record and/or speak with members of the healthcare team and client to determine if the client has experienced any change in health status since last reviewed by the delegating health professional. Changes potentially relevant to the client's capacity to participate in the task that were not discussed in the delegation instruction should be raised with the delegating health professional before commencing the task.

3. Introduce task and seek consent

- The AHA introduces him/herself to client
- The AHA checks three forms of client identification: full name, date of birth <u>plus one</u> of the following; hospital UR number, Medicare number, or address
- The AHA describes the task to the client. For example:

– "I have been asked by the (relevant health professional) to assist you to complete your airway clearance today using " X airway clearance device". This will help you clear your lungs of any sputum and help with your breathing in general.

- The AHA seeks informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare

4. Positioning

The client's position during the task should be:

- specified by the delegating health professional for the individual's airway clearance routine

The AHA's position during the task should be:

- specified by the delegating health professional for the individual's airway clearance routine including hand placements

5. Task procedure

- Explain and demonstrate (where applicable) the task to the client.
- Check client has understood the task and provide an opportunity to ask questions.
- Each airway clearance technique has a specific task sheet (patient instruction sheet) as outlined in the learning resources.

In general, each airway clearance sessions would consist of the following steps:

– Positioning the patient as delegated
– Breathing control
– Cycle of breathing through the device
– Forced expiration technique or Huffing

- A typical cycle of airway clearance with a device consists of:
  – breathing control (until the patient is settled and ready to commence)
  – breathing through the device – size of breath and number of breaths as delegated
  – breathing control (until patient returns to their normal resting breathing rate)
  – huffs – at the appropriate inspiratory volume, depending on the position of the sputum +/- cough
  – breathing control

  The flexibility of the regimen (the number of deep breaths, the number of huffs and the length of the periods of breathing control) and order of the components varies with the patients' condition and should be adapted to suit the individual as delegated by the physiotherapist. Each component plays a key role in the clearance of secretions.

  If required and as instructed by the physiotherapist the AHA may

  a) Explain how to perform the airway clearance cycle. See Learning Resource for detailed information on each device
  b) Demonstrate how to use the airway clearance device, including modifying huffing, using a 'huffing tube'. This includes highlighting potential errors.
  c) Follow the airway clearance session as described by the delegating health professional, which will provide guidance on positioning, risks and precautions and any other relevant considerations for the individual client.

- During the task:
  - provide feedback and correct errors in the performance of the task using the delegation instruction and knowledge from the competency training of common errors. This may include:
    - providing verbal prompting and encouragement,
    - providing verbal correction and/or manual guidance,
    - counting repetitions / noting time elapsed for the client and indicating when to rest, use breathing control
    - watching for signs of fatigue such as increased respiratory rate and increasing use of accessory muscles of breathing
    - monitor sputum produced – noting amount, colour and tenacity
  - monitor for adverse reactions and implement appropriate mitigation strategies as outlined in CTI D-WTS01 When to stop
- At the conclusion of the task:
  - provide summary feedback to client, emphasising positive aspects of the airway clearance session
  - provide instructions for independent practice of the task (including reinforcing safety considerations) if this was requested by delegating health professional
  - ensure the client is comfortable and safe

6. Document

- Clearly document the outcomes of the task in the client's notes

7. Report to delegating health professional

- Provide comprehensive feedback to the health professional who delegated the task. Include observations of client performance, expected outcomes that were and were not achieved, and difficulties encountered, or symptoms reported by the client during the task.

References and supporting documents

- Queensland Health (2012) *Guide to Informed Decision Making in Healthcare*. http://www.health.qld.gov.au/consent/default.asp
- Effective Workforce Solutions (2012) *When to Stop (Precautions when working with clients).* http://qheps.health.qld.gov.au/ahwac/content/clinical-tasks-Q.htm
- Nicolson C, Lee A. et al.,(2016) Bronchiectasis TOOLBOX : http://bronchiectasis.com.au/about-us

Airway clearance – PEP and Oscillating PEP Devices

Assessment: Performance Criteria Checklist (Delegated Task)

Queensland Government

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
1. Demonstrates knowledge of fundamental concepts required to undertake the task.			
2. Obtains all required information from delegating health professional and seeks clarification if required.			
3. Completes preparation for task including obtaining relevant instruction sheet/equipment, ensuring a safe and appropriate environment for completion of the task, and checking client functional and medical status.			
4. Introduces self to client and checks client identity.			
5. Describes purpose of delegated task and seeks informed consent.			
6. Positions self and client appropriately to complete task and ensure safety.			
7. Delivers task effectively and safely as per delegated instructions and CTI procedure. a. Clearly explains and demonstrates task, checking client's understanding. b. During task, maintains a safe clinical environment and manages risks appropriately. c. Supervises and facilitates ○ Positioning ○ Breathing control ○ Thoracic expansion exercises ○ Forced expiration technique or Huffing Equipment as delegated for individual patient: ○ Acapella ○ Aerobika ○ Flutter / Turboforte /PariOPEP ○ PariPEP			
8. Provides feedback to client on performance during and at completion of task.			

- 6 -

9. Documents accurately and comprehensively in clinical notes.			
10. Provides accurate and comprehensive feedback to the delegating health professional.			

Comments:		
Record of assessment of competence		
Assessor name:	Assessor position:	Competence achieved: / /
Scheduled review		
Review date / /		

Learning Resource

General information / background knowledge

- Reviewing online resource : Bronchiectasis Toolbox - Airway clearance in Normal Lung http://bronchiectasis.com.au/physiotherapy/principles-of-airway-clearance/airway-clearance-in-the-normal-lung
- Factsheet : The Lungs – An overview of how they work Lung Foundation Australia brochure; http://lungfoundation.com.au/wp-content/uploads/2013/12/The-Lungs-%E2%80%93-An-overview-of-how-they-work_july2013.pdf

Conditions relevant to task

Webpage; About Cystic Fibrosis: Australian Cystic Fibrosis Association: 2016 ; http://www.cysticfibrosis.org.au/all/learn/

The Basics of Cystic Fibrosis, Stanford University CF Centre, 2016; http://med.stanford.edu/cfcenter/education/english/BasicsOfCF.html

Factsheet: Bronchiectasis; Lung Foundation Australia; http://lungfoundation.com.au/wp-content/uploads/2013/12/Bronchiectasis-Sept-2014.pdf

Factsheet: COPD; Lung Foundation Australia http://lungfoundation.com.au/wp-content/uploads/2013/12/COPD-Chronic-Obstructive-Pulmonary-Disease.pdf

Factsheet: Pneumonia; Lung Foundation Australia; http://lungfoundation.com.au/wp-content/uploads/2014/04/Pneumonia-July-2014.pdf

Local physiotherapy department resources as required

Therapeutic approach and relevant terminology

- TPCH: Patient Instruction Guides
  - Acapella
  - Aerobika
  - Flutter /Turboforte
  - PariPEP
  - ACBT
  - Positioning for postural drainage and modified postural drainage

G:\Physiotherapy\General\Physio\Adop\Thoracic Patient Education Resources\

- Nicolson C, Lee A. et al.,(2016) ; **Airway clearance techniques explanations and handouts** : Bronchiectasis Toolbox ACBT: http://bronchiectasis.com.au/physiotherapy/techniques

  – The active cycle of breathing technique

– Forced Expiration Technique
– Positive Expiratory Pressure Therapy
– Oscillating Positive Expiratory Pressure Therapy

- Nicolson C, Lee A. et al.,(2016) ; Airway clearance techniques : Bronchiectasis Toolbox **: VIDEOS** : http://bronchiectasis.com.au/resources/videos
  – The active cycle of breathing technique
  – Forced Expiration Technique
  – Positive Expiratory Pressure Therapy
  – Oscillating Positive Expiratory Pressure Therapy

Authors:

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3139 4000

Version date: 23.6.2016	V1.3	Author:	Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS
Document custodian:	Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS	Review date:	

Acknowledgements: Robyn Cobb, Rebecca Chambers, Trent Donnoley, Mark Roll ; Physiotherapy, TPCH, MNHHS

Delegated Task - WORK INSTRUCTION

The Prince Charles Hospital PHYSIOTHERPY DEPARTMENT

Supervision of a gym exercise program – respiratory inpatients

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Scope and objectives of clinical task

This document will enable the Allied Health Assistant (AHA) to:

- safely and effectively supervise respiratory inpatients undertaking an exercise program in a gym area

Requisite training, knowledge, skills and experience

Training

Completion of

- CTI WTS01 When to stop
- D-CM01 Pulse oximetry recording
- D-CM02 Heart rate monitoring

Mandatory training requirements relevant to Queensland Health / HHS clinical roles are assumed knowledge for this guide.

Clinical knowledge

Exercise is an important part of hospital treatment for respiratory patients.
It is used to

- Maintain a patient's level of activity
- Prevents a patient's deterioration of muscle strength
- Can contribute to continued improvement in lung function plus general fitness levels

The aims of an exercise program can be

- To assist with airway clearance and everyday activities
- To encourage regular exercise in the long term
- To continue education and self management

Benefits include:

- Improved heart rate, blood pressure
- Improved functional capacity
- Improved strength and endurance
- assist secretion removal
- decreased feeling of breathlessness
- Assist weight control and improves bone density
- Improved quality of life

The following content knowledge is required by an AHA delivering this task:

- knowledge sufficient to be able to understand and perform this supervisory role

- understand the reasoning **why respiratory patients need to perform exercise** in the gym as previously listed
- have knowledge and understanding of **basic anatomy and physiology related to a normal and abnormal response to exercise.** This would include understanding of basic terminology such as increased / decreased shortness of breath, dysponea, oxygen saturations, blood pressure and heart rate.
- of normal and abnormal including **basic anatomy and physiology of the lungs and upper respiratory system and conditions relevant to the task** including causes, presenting signs and impacts on the health and wellbeing of the client: COPD, Cystic Fibrosis, Bronchiectasis; other suppurative lung diseases
- have knowledge and understanding of **how an exercise program is performed**, including an understanding of such terminology as high intensity interval training, circuit training
- have knowledge and understanding of the **basic exercise components of a circuit program,** including the various specific exercise performed by a patient (the common exercises that may be delegated)
- have knowledge and understanding of the **exercise equipment that patients could be suing as part of a gym session**
  - how the equipment operates
  - how to setup / adjust for individual patients
    - treadmill
    - stationary bikes
    - free weights
    - weight deck
- have knowledge and understanding of the **infection control process** for a gym including
  - Preparation and cleaning of the equipment
  - Preparation and procedures for the patient to follow before, during and after the gym session.

The knowledge requirements will be met by:

- Completing a training program
- reviewing the Learning Resource
- receiving instruction from allied health professional in training phase

Safety and quality

Client

The Allied Health Assistant will apply **CTI WTS01 When to stop** at all times

In addition, the following potential risks have been identified for this clinical task and should be monitored carefully by the Allied Health Assistant during the task:

- review the medical record, observation chart and/or speak with members of the healthcare team **prior to commencing the task** and **advise** the delegating health professional if there are any recent changes which may impact on a client's capacity to participate in the task e.g. recent deterioration.

- Patients should be assessed as stable during exercise by the delegating HP BEFORE being considered for supervision
- **All** patients will have an oxygen saturation and heart rate check prior to commencing the gym session and at the end of a gym sessions as routine practice by the AHA. If further monitoring is required DURING the session, this is determined and delegated on an individual level by the physiotherapist.
- Each patient can however determine the intensity of their exercise during a supervised session. Delegated supervision of an exercise program only occurs with stable patients (as determined by the delegating professional) however staff performing this supervision role should be experienced in assessing potential adverse symptoms such as
  - chest pain,
  - rapidly increased or intolerable shortness of breath,
  - dizziness,
  - staggering,
  - leg cramps,
  - excessive sweatiness,
  - pale or ashen appearance
- The AHA would also understand and know to stop an exercise if any of the symptoms above occur and immediate contact with the delegating health professional must occur. A predetermined emergency plan (determined by the local institution) is required to ensure this timely communication, close proximity of delegating professional to AHA and calling an emergency code if required.

Equipment, aids and appliances

Review any equipment to be used and ensure in safe working order

Environment

Setup up the environment for safe and efficient completion of the exercise program

Ensure Infection Control protocols are adhered to at all times

Performance of Clinical Task

1. Delegation instructions

Receive delegated task from allied health professional

Clearly identify parameters for delivering the clinical task for the specific client including any variance from the usual task procedure:

- check the specific requirements for that exercise session including
  - types of exercise
  - equipment used
  - number of repetitions, intervals, rest periods
  - requirement for oxygen during exercise as delegated

2. Preparation

Obtain relevant exercise instruction sheet as directed by delegating health professional if required

3. Introduce task and seek consent

The AHA introduces him/herself to client

The AHA checks three forms of client identification: full name, date of birth plus one of the following; hospital UR number, Medicare number, or address

The AHA describes the task to the client. For example:

- *"I've been asked to supervise your gym session today by (delegating health professional). Is there any reason why we can't start this session at this time?"*

The AHA seeks informed consent according to the Queensland Health Guide to Informed Decision Making in Healthcare

4. Positioning

The client's position during the task should be:

- specified by the delegating health professional for individual exercise

The AHA's position during the task should be:

- where monitoring of the patient can occur at all times
- specified by the delegating health professional for an individual exercise if required

5. Task procedure

Explain and demonstrate (where applicable) the exercises to the client

Check client has understood the task and provide opportunity to ask questions

The task comprises the following steps:

a) Explain how to perform each individual exercise including number of repetitions
b) Demonstrate how to perform each exercise
c) Ensure the client has an understanding of the goal of the exercise about to be undertaken
d) Follow the program documented by the delegating health professional, which will provide advice on positioning, repetitions, intervals and rest periods

During the task:

- provide feedback and correct errors in the performance of the task including
  - give the client verbal prompting and encouragement as required
  - provide correction when the exercise is not done correctly
  - count repetitions for the client and tell them when to rest
  - watch for signs of fatigue and compensatory movements
  - watch for signs of the client feeling unwell or being short of breath
- monitor for adverse reactions and implement appropriate mitigation strategies as outlined in "Safety and quality" section above

At the conclusion of the task:

– provide summary feedback to client, emphasising positive aspects of performance and areas to work on
– provide instructions for independent practice of the task (including reinforcing safety considerations) if this was requested by delegating health professional
– ensure client is comfortable and safe

6. Document

Clearly document the outcomes of the task in the client's notes

7. Report to delegating health professional

Provide comprehensive feedback to the health professional who delegated the task

Include observation of client performance, expected outcomes that were and were not achieved, and difficulties encountered, or symptoms reported by the client during the task.

References and supporting documents

Queensland Health (2012) *Guide to Informed Decision Making in Healthcare*. http://www.health.qld.gov.au/consent/default.asp

Effective Workforce Solutions (2012) *When to Stop (Precautions when working with clients).* http://qheps.health.qld.gov.au/ahwac/content/clinical-tasks-Q.htm

Supervising an exercise session in a gym (respiratory inpatients)

Assessment: Performance Criteria Checklist (Delegated Task)

Name: **Position:** **Work Unit:**

Performance Criteria	Knowledge acquired	Supervised task practice	Competency assessment
	Date and initials of supervising AHP	Date and initials of supervising AHP	Date and initials of supervising AHP
1. Demonstrates knowledge of fundamental concepts required to undertake the task.			
2. Obtains all required information from delegating health professional and seeks clarification if required.			
3. Completes preparation for task including obtaining relevant instruction sheet, ensuring appropriate environment for completion of the task, and monitoring client functional and medical status.			
4. Introduces self to client and checks client identity.			
5. Describes purpose of delegated task and seeks informed consent.			
6. Positions self and client appropriately to complete task and ensure safety.			
7. Delivers task effectively and safely as per delegated instructions and CTI procedure. a. Clearly explains and demonstrates exercise tasks, checking client's understanding. b. During task, maintains a safe clinical environment and manages risks appropriately. c. Provides feedback to client on performance during and at completion of task.			
8. Documents accurately and comprehensively in clinical notes.			
9. Provides accurate and comprehensive feedback to the delegating health professional.			
Comments:			
Record of assessment of competence			
Assessor name:	Assessor position:	Competence achieved: / /	
Scheduled review			
Review date / /			

Learning Resource

General information / background knowledge

Appendix 1Reviewing online resource : Bronchiectasis Toolbox - Airway clearance in Normal Lung http://bronchiectasis.com.au/physiotherapy/principles-of-airway-clearance/airway-clearance-in-the-normal-lung

Appendix 2Factsheet : The Lungs – An overview of how they work Lung Foundation Australia brochure; http://lungfoundation.com.au/wp-content/uploads/2013/12/The-Lungs-%E2%80%93-An-overview-of-how-they-work_july2013.pdf

Conditions relevant to task

- Webpage ; About Cystic Fibrosis : Australian Cystic Fibrosis Association : 2016 ; http://www.cysticfibrosis.org.au/all/learn/
- The Basics of Cystic Fibrosis, Stanford University CF Centre, 2016; http://med.stanford.edu/cfcenter/education/english/BasicsOfCF.html
- Factsheet : Bronchiectasis ; Lung Foundation Australia ; http://lungfoundation.com.au/wp-content/uploads/2013/12/Bronchiectasis-Sept-2014.pdf
- Factsheet : COPD; Lung Foundation Australia http://lungfoundation.com.au/wp-content/uploads/2013/12/COPD-Chronic-Obstructive-Pulmonary-Disease.pdf
- Factsheet: Pneumonia ; Lung Foundation Australia; http://lungfoundation.com.au/wp-content/uploads/2014/04/Pneumonia-July-2014.pdf

Local physiotherapy department resources as required

Authors:

VERSION CONTROL

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Document custodian: Kathleen Hall Senior Physiotherapist Adult Cystic Fibrosis Centre, TPCH, MNHHS Review date:

Acknowledgements: Robyn Cobb, Rebecca Chambers, Trent Donnoley, Mark Roll; Physiotherapy, TPCH, MNHHS

Appendix 2: Appendices to Chapter 7

Patient and Staff Surveys

2.1 Pre-implementation Patient Survey

Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

What is the survey about?

This survey is about your experiences of the physiotherapy services provided to you at TPCH. The survey relates physiotherapy care delivered between September – November 2015.

Benefits

Your participation in this survey is not likely to benefit you directly but may assist in the development of future physiotherapy re-sourcing for patients with cystic fibrosis over time.

Confidentiality and Privacy

Any information obtained from this survey will be treated with the utmost confidentiality. Any publications resulting from this survey will reveal the information in a manner which cannot identify any individual cystic fibrosis patient in any way. Your contribution to this survey is invaluable, however it is entirely voluntary.

Further Information

If you have any queries about the questionnaire, please contact the Quality and Safety department or Mr Mark Roll, Clinical Lead Thoracic Physiotherapist - TPCH on 3139 5290.

For each question please tick clearly inside one box if asked. Some questions will ask for comments. Please do not write your name or address anywhere on the survey.

Thank you for participating in our survey. Your feedback is very important.

Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 1 - The Basics

1. How old were you at your last birthday?

- ◯ 17 or younger
- ◯ 18 - 25
- ◯ 26 - 35
- ◯ 36 or older

2. Are you male or female?

Female

Male

3. How far do you travel to attend TPCH for outpatient or inpatient care?

- Less than one hours drive
- 1 -2 hours drive
- 2 - 6 hours drive
- Longer than 6 hours drive away

Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 2 - Inpatient Care

4. Have you been an inpatient over the last three months?

- Yes
- No

Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 2 - Inpatient care

2

5. Please answer the questions below about your inpatient experience in the last three months:

	Always	Usually	Unsure	Occasionally	Never
Was it easy to access the physiotherapy service?	◯	◯	◯	◯	◯
Was it easy to access supervised exercise sessions in the gym or your room?	◯	◯	◯	◯	◯
Overall, were your physiotherapy sessions long enough for you to feel your treatment was effective?	◯	◯	◯	◯	◯
Did you have access to the apparatus and equipment you needed for your physiotherapy care (as far as you could tell)?	◯	◯	◯	◯	◯
As far as you could tell did the members of the physiotherapy team delivering your care work well together?	◯	◯	◯	◯	◯
Did you have opportunities to participate in the physiotherapy decisions that applied to your care?	◯	◯	◯	◯	◯
Were you given detailed instructions regarding your home physiotherapy programs before discharge?	◯	◯	◯	◯	◯
Overall, did you have confidence and trust in the staff delivering your physiotherapy care?	◯	◯	◯	◯	◯

Any comments about the answers above?

6. Please also answer these questions about your inpatient experience.

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
Overall, the staff delivering your physiotherapy care have a good understanding of cystic fibrosis.	○	○	○	○	○
Overall, if you had any concerns about your physiotherapy management, these were addressed appropriately.	○	○	○	○	○
The physiotherapy service you received during your admission helped you to deal more effectively with your cystic fibrosis.	○	○	○	○	○

Any comments about the answers above?

7. Did the physiotherapist treating you offer anything new or different with your physiotherapy care during your admission?

○ Yes

○ No

If yes - please describe

8. How would you rate the overall quality of the physiotherapy care you receive as an inpatient?

Excellent	Good	Adequate	Poor	Very poor
○	○	○	○	○

9. Did you have more than one person treating or supervising your physiotherapy and/or exercise sessions during your inpatient stay?

○ Yes

○ No

How many? and any other comments

10. Did you have a physiotherapy assistant treating or supervising your physiotherapy and/or exercise sessions at any stage during your inpatient stay?

◯ Yes

◯ No ◯

unsure

Any comments

11. Did you feel your physiotherapy care varied if different staff were involved in your care?

◯ Yes

◯ No

Please describe

12. Would you agree you received effective physiotherapy care even if there were different staff involved in your care across an admission.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
◯	◯	◯	◯	◯

Do you have any further comments?

Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 3 - Outpatient Care

13. Have you attended an outpatient clinic review over the last three months?

◯ Yes

◯ No

14. Did you see a physiotherapist at the outpatient clinic review in last three months?

◯ Yes

◯ No

Section 3 - Outpatient care

15. Please answer the questions below about your outpatient clinic visits over the last three months

	Always	Sometimes	Unsure	Occasionally	Never
Do you find it easy to access physiotherapy service at the clinic?	○	○	○	○	○
If you see a physiotherapist, do you have enough time to discuss your physiotherapy related health problems?	○	○	○	○	○

16. Have you completed any of the following PHYSIOTHERAPY tests as an outpatient in the last year (tick all that apply) at TPCH ?

- ☐ Six minute walk test
- ☐ Shuttle walk test
- ☐ Examination of your posture, back or neck?
- ☐ Other physiotherapy tests

Please list other physiotherapy related tests you have had

17. Please answer the questions below about your outpatient experience in the last three months:

	Always	Usually	Unsure	Occasionally	Never
Could you access any physiotherapy equipment you needed for your physiotherapy care at home (as far as you could tell) through the outpatient physiotherapists?	◯	◯	◯	◯	◯
Did you have opportunities to participate in the physiotherapy decisions that applied to your outpatient care?	◯	◯	◯	◯	◯
Were you given detailed instructions regarding your home physiotherapy programs if required?	◯	◯	◯	◯	◯
Overall, did you have confidence and trust in the staff delivering your physiotherapy care?	◯	◯	◯	◯	◯

Any comments about the answers above?

18. Please also answer these questions about your outpatient experience.

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
Overall, the staff delivering your physiotherapy care have a good understanding of cystic fibrosis.	○	○	○	○	○
Overall, if you had any concerns about your physiotherapy management, these were addressed appropriately.	○	○	○	○	○
The physiotherapy service you received during your outpatient consultation helped you to deal more effectively with your cystic fibrosis.	○	○	○	○	○

Any comments about the answers above?

19. How would you rate the overall quality of the physiotherapy care you receive as an outpatient?

Excellent	Good	Adequate	Poor	Very poor
○	○	○	○	○

Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Final Section

20. Overall, as either an inpatient or outpatient, you are treated with respect and dignity by members of the physiotherapy team delivering your care.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
○	○	○	○	○

21. Overall, how satisfied are you with the service you receive from staff delivering your physiotherapy care?

Very satisfied	Mostly satisfied	Neutral	Mostly dissatisfied	Very dissatisfied
○	○	○	○	○

22. What do you find particularly good/like about the physiotherapy service at TPCH?

23. What improvements could be made to the physiotherapy service at TPCH?

24. Are there any other comments about the physiotherapy service at TPCH you would like to make?

Thankyou for taking the time to complete this survey.

2.2 Post-implementation Patient Survey

Review of Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

What is the survey about?
Last year we asked for your comments and experiences about the physiotherapy services provided to you at TPCH. We have worked towards some changes and hope to continue this care into the future. We are now keen to re-survey our patients for your views about the physiotherapy care you receive. The survey relates physiotherapy care delivered between April – June 2016.

Benefits
Your participation in this survey is not likely to benefit you directly but may assist in the continued development of future physiotherapy re-sourcing for patients with cystic fibrosis over time.

Confidentiality and Privacy
Any information obtained from this survey will be treated with the utmost confidentiality. Any publications resulting from this survey will reveal the information in a manner which cannot identify any individual cystic fibrosis patient in any way. Your contribution to this survey is invaluable, however it is entirely voluntary.

Further Information
If you have any queries about the questionnaire, please contact the Quality and Safety department or Mr Mark Roll, Clinical Lead Thoracic Physiotherapist - TPCH on 3139 5290.

For each question please tick clearly inside one box if asked. Some questions will ask for comments. Please do not write your name or address anywhere on the survey.

Thank you for participating in our survey. Your feedback on this survey is very important.

Review of Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 1 - The Basics

1. How old were you at your last birthday?

- ◯ 17 or younger
- ◯ 18 - 25
- ◯ 26 - 35
- ◯ 36 or older

2. Are you male or female?

Female

Male

3. How far do you travel to attend TPCH for outpatient or inpatient care?

- Less than one hours drive
- 1 -2 hours drive
- 2 - 6 hours drive
- Longer than 6 hours drive away

Review of Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 2 - Inpatient Care

4. Have you been an inpatient over the last three months?

- Yes
- No

Review of Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 2 - Inpatient care

5. Please answer the questions below about your inpatient experience in the last three months:

	Always	Usually	Unsure	Occasionally	Never
Was it easy to access the physiotherapy service?	◯	◯	◯	◯	◯
Was it easy to access supervised exercise sessions in the gym or your room?	◯	◯	◯	◯	◯
Overall, were your physiotherapy sessions long enough for you to feel your treatment was effective?	◯	◯	◯	◯	◯
Did you have access to the apparatus and equipment you needed for your physiotherapy care (as far as you could tell)?	◯	◯	◯	◯	◯
As far as you could tell did the members of the physiotherapy team delivering your care work well together ?	◯	◯	◯	◯	◯
Did you have opportunities to participate in the physiotherapy decisions that applied to your care?	◯	◯	◯	◯	◯
Were you given detailed instructions regarding your home physiotherapy programs before discharge?	◯	◯	◯	◯	◯
Overall, did you have confidence and trust in the staff delivering your physiotherapy care?	◯	◯	◯	◯	◯

Any comments about the answers above?

6. Please also answer these questions about your inpatient experience.

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
Overall, the staff delivering your physiotherapy care have a good understanding of cystic fibrosis.	○	○	○	○	○
Overall, if you had any concerns about your physiotherapy management, these were addressed appropriately.	○	○	○	○	○
The physiotherapy service you received during your admission helped you to deal more effectively with your cystic fibrosis.	○	○	○	○	○

Any comments about the answers above?

7. Did the physiotherapist treating you offer anything new or different with your physiotherapy care during your admission?

○ Yes

○ No

If yes - please describe

8. How would you rate the overall quality of the physiotherapy care you receive as an inpatient?

Excellent	Good	Adequate	Poor	Very poor
○	○	○	○	○

9. Did you have more than one person treating or supervising your physiotherapy and/or exercise sessions during your inpatient stay?

○ Yes

○ No

How many? and any other comments

10. Did you have a physiotherapy assistant treating or supervising your physiotherapy and/or exercise sessions at any stage during your inpatient stay?

- ◯ Yes
- ◯ No ◯ unsure

Any comments

11. Did you feel your physiotherapy care varied if different staff were involved in your care?

- ◯ Yes
- ◯ No

Please describe

12. Did you feel your physiotherapy care varied if an allied health assistant was involved in your care?

- ◯ yes
- ◯ No ◯ other

Please comment on why you chose your response above.

13. Would you agree you received effective physiotherapy care even if there were different staff involved in your care across an admission.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
◯	◯	◯	◯	◯

Do you have any further comments?

14. If you were treated by or underwent exercise testing with an allied health assistant would you like to comment specifically on the care you received?

Review of Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 3 - Outpatient Care

15. Have you attended an outpatient clinic review over the last three months?

◯ Yes

◯ No

16. Did you see a physiotherapist at the outpatient clinic review in last three months?

◯ Yes

◯ No

Review of Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Section 3 - Outpatient care

17. Please answer the questions below about your outpatient clinic visits over the last three months

	Always	Sometimes	Unsure	Occasionally	Never
Do you find it easy to access physiotherapy service at the clinic?	◯	◯	◯	◯	◯
If you see a physiotherapist, do you have enough time to discuss your physiotherapy related health problems?	◯	◯	◯	◯	◯

18. Have you completed any of the following PHYSIOTHERAPY tests as an outpatient in the last year (tick all that apply) at TPCH ?

☐ Six minute walk test

☐ Shuttle walk test

☐ Examination of your posture, back or neck?

☐ Other physiotherapy tests

Please list other physiotherapy related tests you have had

6

19. Please answer the questions below about your outpatient experience in the last three months:

	Always	Usually	Unsure	Occasionally	Never
Could you access any physiotherapy equipment you needed for your physiotherapy care at home (as far as you could tell) through the outpatient physiotherapists?	○	○	○	○	○
Did you have opportunities to participate in the physiotherapy decisions that applied to your outpatient care?	○	○	○	○	○
Were you given detailed instructions regarding your home physiotherapy programs if required?	○	○	○	○	○
Overall, did you have confidence and trust in the staff delivering your physiotherapy care?	○	○	○	○	○

Any comments about the answers above?

20. Please also answer these questions about your outpatient experience.

	Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
Overall, the staff delivering your physiotherapy care have a good understanding of cystic fibrosis.	○	○	○	○	○
Overall, if you had any concerns about your physiotherapy management, these were addressed appropriately.	○	○	○	○	○
The physiotherapy service you received during your outpatient consultation helped you to deal more effectively with your cystic fibrosis.	○	○	○	○	○

Any comments about the answers above?

21. How would you rate the overall quality of the physiotherapy care you receive as an outpatient?

Excellent	Good	Adequate	Poor	Very poor
○	○	○	○	○

Review of Physiotherapy Services at the Adult Cystic Fibrosis Centre TPCH

Final Section

22. Overall, as either an inpatient or outpatient, you are treated with respect and dignity by members of the physiotherapy team delivering your care.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
○	○	○	○	○

23. Overall, how satisfied are you with the service you receive from staff delivering your physiotherapy care?

Very satisfied	Mostly satisfied	Neutral	Mostly dissatisfied	Very dissatisfied
○	○	○	○	○

24. What do you find particularly good/like about the physiotherapy service at TPCH?

25. What improvements could be made to the physiotherapy service at TPCH?

26. Are there any other comments about the physiotherapy service at TPCH you would like to make?

Thankyou for taking the time to complete this survey.

2.3 Pre-implementation Multidisciplinary Team Staff Survey

ACFC Physiotherapy - MDT Survey

The Basics

What is the survey about?

We are seeking your comments and views about the current physiotherapy service within the ACFC at TPCH.

This survey is asking about the current care delivery, so related to the last 3 months (September – November

2015). Taking part in this survey is voluntary. Your answers will be treated in confidence.

For each question, please tick clearly inside one box if asked. Some questions will ask for comments. Please do not write your name or address anywhere on the survey.

Questions or help?

If you have any queries about the questionnaire, please contact Mark Roll - Clinical Lead Thoracic Physiotherapy

1. Which professional group do you belong to?

- ◯ Allied Health
- ◯ Nursing
- ◯ Medical
- ◯ Rather not say

* 2. These questions relate to your perceptions, as a member of the ACFC multidisciplinary team, of the *current* physiotherapy service (September - November 2015).

	Always	Mostly	Half the time	Rarely	Never	N/A
As an **inpatient,** clients find it easy to access physiotherapy care.	○	○	○	○	○	○
As an **inpatient,** clients can access physiotherapy care in a timely way.	○	○	○	○	○	○
As an **outpatient,** clients find it easy to access physiotherapy care.	○	○	○	○	○	○
As an **outpatient,** clients can access physiotherapy care in a timely way.	○	○	○	○	○	○
Clients receive benefits from physiotherapy care.	○	○	○	○	○	○
Referrers (e.g. doctors, other AHP's) can easily access the physiotherapy service.	○	○	○	○	○	○
Physiotherapists in the team work to their full scope of practice.	○	○	○	○	○	○

3. What are the three most valuable aspects of the current physiotherapy service at TPCH?

1.

2.

3.

4. What could be improved in the current physiotherapy service at TPCH?

5. Are there any other comments about the current physiotherapy service at TPCH you would like to make?

Thank you for taking the time to complete this survey. Your feedback is appreciated.

2.4 Post-implementation Multidisciplinary Team Staff Survey

Review of ACFC Physiotherapy - MDT Survey

The Basics

What is the survey about?

This survey is a follow-up to the 2015 review of physiotherapy services within the ACFC.

We would value your comments and views about the physiotherapy service as it currently operates within the ACFC at TPCH and relates to current care delivery, over the last 3 months (April, May, June 2016).

Taking part in this survey is voluntary. Your answers will be treated in confidence.

For each question please tick clearly inside one box if asked. Some questions will ask for comments. Please do not write your name or address anywhere on the survey.

Questions or help?

If you have any queries about the questionnaire, please contact Mark Roll - Clinical Lead Thoracic Physiotherapy 3139 5920.

1. Which professional group do you belong to?

- ◯ Allied Health
- ◯ Nursing
- ◯ Medical
- ◯ Rather not say

* 2. These questions relate to your perceptions, as a member of the ACFC multidisciplinary team, of the *current* physiotherapy service (April - June 2016).

	Always	Mostly	Half the time	Rarely	Never	N/A
As an **inpatient,** clients find it easy to access physiotherapy care.	◯	◯	◯	◯	◯	◯
As an **inpatient,** clients can access physiotherapy care in a timely way.	◯	◯	◯	◯	◯	◯
As an **outpatient,** clients find it easy to access physiotherapy care.	◯	◯	◯	◯	◯	◯
As an **outpatient,** clients can access physiotherapy care in a timely way.	◯	◯	◯	◯	◯	◯
Clients receive benefits from physiotherapy care.	◯	◯	◯	◯	◯	◯
Referrers (e.g. doctors, other AHP's) can easily access the physiotherapy service.	◯	◯	◯	◯	◯	◯
Physiotherapists in the team work to their full scope of practice.	◯	◯	◯	◯	◯	◯

3. Are you aware there has been an allied health assistant working within the physiotherapy team since February 2016?

◯ Yes

◯ No

◯ Unsure

4. Did you have any professional contact with the allied health assistant, or were aware of the specific care they were delivering to patients as part of your role in the ACFC?

◯ Yes

◯ No

◯ Unsure

5. Has the overall physiotherapy care delivered to the patients varied in any way since February 2016?

- ◯ Yes
- ◯ No
- ◯ Unsure
- ◯ Can't comment

6. Can you comment on any changes you have observed to physiotherapy care delivery since February 2016?

7. What are the three most valuable aspects of the current physiotherapy service at TPCH?

1.

2.

3.

8. What could be improved in the current physiotherapy service at TPCH?

9. Are there any other comments about the current physiotherapy service at TPCH you would like to make?

Thank you for taking the time to complete this survey. Your feedback is appreciated.

Appendix 3: Ethics Approval and Amendments

Enquiries to: R&ETPCH@health.qld.gov.au
Anne.Carle@health.qld.gov.au
Office Ph: (07) 3139 4198
(07) 3139 4500
Our Ref: AC/JL/Exemption

Queensland Government

1 April 2015

Human Research Ethics Committee
Metro North Hospital and Health Service
The Prince Charles Hospital
Building 14
Rode Road, Chermside QLD 4032

Ms Kathleen Hall
Physiotherapist
Adult Cystic Fibrosis Centre
The Prince Charles Hospital

Dear Ms Hall

Re: HREC/15/QPCH/68: Evaluation of the utilization of an allied health assistant within an adult Cystic Fibrosis Centre: their role and scope of practice and benefits to improved patient related physiotherapy outcomes.

I am pleased to advise that The Prince Charles Hospital Human Research Ethics Committee reviewed the above project submitted on 18 March 2015.

This is to confirm that this project meets the National Statement definition of a project that is exempt from full ethical review on the basis that this is an audit/quality assurance project.

The documents reviewed and approved for the above mentioned project include:

- Proposal Version 1 dated 16 March 2015.

This exemption is subject to the following conditions:

- The project must be carried out in accordance with the National Statement on Ethical Conduct in Human Research 2007.
- Please provide an annual report on the outcomes of this project.
- If the results of your project are to be published, please include an appropriate acknowledgement of the relevant department/s who have supported this project.
- The HREC may audit the conduct of any project reviewed under NHMRC guidelines. This may include consultation with the Principal Investigator

-----Original Message-----

From: Pratigya Pozniak On Behalf Of Res Ethics

Sent: Monday, 20 March 2017, 2:05 PM

To: Suzanne Kuys; Kathleen Hall; Lyndal Maxwell

Cc: Res Ethics

Subject: 2017-51N Ethics Review Exemption

Dear Applicant,

Principal Investigator: Dr Suzanne Kuys

Co-Investigator: Ms Kathleen Hall, Dr Lyndal Maxwell Ethics Register Number: 2017-51N Project Title: Evaluation of the utilization of an allied health assistant within an Adult Cystic Fibrosis Centre: their role and scope of practice and benefits to improved patient-related physiotherapy outcomes.

Risk Level: Deidentified Data

Date Approved: 20/03/2017

Ethics Clearance End Date: 31/12/2017

This email is to advise that your application for has been reviewed by the Australian Catholic University's Human Research Ethics Committee, and it has been noted that this application has received an exemption from ethics review (audit/quality assurance project) from The Prince Charles Hospital, QLD [Reference: HREC/15/QPCH/68].

This is to confirm that this project meets the National Statement definition of a project that is exempt from full ethical review on the basis that this is an audit/quality assurance project.

Researchers must immediately report to HREC any matter that might affect the ethical acceptability of the protocol eg: changes to protocols or unforeseen circumstances or adverse effects on participants.

For our record-keeping purposes, we deem that this activity will be in progress until 31/12/2017, unless we hear from you to the contrary. It will be registered as completed.

Please do not hesitate to contact the office if you have any queries.

Kind regards,
Kylie Pashley
on behalf of ACU HREC Chair, Dr Nadia Crittenden
Ethics Officer | Research Services
Office of the Deputy Vice-Chancellor (Research) Australian Catholic University

Appendix 5: Study 3 and 4 Publication

Original paper

Chronic Respiratory Disease

Chronic Respiratory Disease
Volume 18: 1–10

DOI: 10.1177/14799731211017895
journals.sagepub.com/home/crd
SAGE

Physiotherapy service provision in a specialist adult cystic fibrosis service: A pre-post design study with the inclusion of an allied health assistant

Kathleen Hall[1,2,3], Lyndal Maxwell[1], Robyn Cobb[2,3], Michael Steele[1,4], Rebecca Chambers[2,3], Mark Roll[3], Scott Cameron Bell[3,5,6] and Suzanne Kuys[1]

Abstract

What is the impact of including an allied health assistant (AHA) role on physiotherapy service delivery in an acute respiratory service? A pragmatic pre-post design study examined physiotherapy services across two 3-month periods: current service delivery [P1] and current service delivery plus AHA [P2]. Clinical and non-clinical activity quantified as number, type and duration (per day) of all staff activity categorised for skill level (AHA, junior, senior). Physiotherapy service delivery increased in P2 compared to P1 ($n = 4730$ vs $n = 3048$). Physiotherapists undertook fewer respiratory ($p < 0.001$) and exercise treatments ($p < 0.001$) but increased reviews for inpatients ($p < 0.001$) and at multidisciplinary clinics in P2 (56% vs 76%, $p < 0.01$). The AHA accounted for 20% of all service provision. AHA activity comprised mainly non-direct clinical care including oversight of respiratory equipment use (e.g. supply, set-up, cleaning, loan audits) and other patient-related administrative tasks associated with delegation handovers, supervision and clinical documentation (72%), delegated supervision of established respiratory (5%) and exercise treatments (10%) and delegated exercise tests (3%). The AHA completed most of the exercise tests ($n = 25$). AHA non-direct clinical tasks included departmental management activities (11%). No adverse events were reported. AHA inclusion in an acute respiratory care service changed physiotherapy service provision. The AHA completed delegated routine clinical and non-clinical tasks. Physiotherapists increased clinic activity and annual reviews. Including an AHA role offers sustainable options for enhancing physiotherapy service provision in acute respiratory care.

Keywords

Allied health assistants, cystic fibrosis, physiotherapy, skill mix, scope of practice, delivery of healthcare

Date received: 12 February 2021; accepted: 23 April 2021

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[2] Physiotherapy, The Prince Charles Hospital, Chermside, Queensland, Australia
[3] Adult Cystic Fibrosis Centre, The Prince Charles Hospital, Chermside, Queensland, Australia
[4] Nursing Research and Practice Development Centre, The Prince Charles Hospital, Chermside, Queensland, Australia
[5] Translational Research Institute, Woolloongabba, Queensland, Australia
[6] Children's Health Research Centre, The University of Queensland, Herston, Queensland, Australia

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Kathleen Hall, School of Allied Health, Faculty of Health Sciences, Australian Catholic University, 1100 Nudgee Road, Banyo, Queensland 4014, Australia.
Email: kathleen.hall@acu.edu.au

Introduction

People with cystic fibrosis (CF) are living longer, thereby increasing both patient numbers and complexity of care.[1,2] Demand for services will likely increase, with forecasts suggesting adults living with CF will increase by 75% between 2015 and 2025.[3,4] Notably these estimates don't incorporate predicted increases in survival associated with cystic fibrosis transmembrane conductance regulator modulator therapies.[1] Multidisciplinary and expert care is recommended by international guidelines for people with CF.[5,6] Previously we demonstrated the effect of limited physiotherapy staffing numbers and skill mix in a large tertiary CF centre, where current demand exceeded supply.[7] Key aspects of CF physiotherapy treatment (respiratory and exercise treatments) met recommended guidelines.[7,8] However, aspects of care such as exercise testing and detailed clinical care review did not.[7,8] Other adult CF services appear similarly under resourced to deliver adult CF care[4] and likely facing challenges to provide ongoing physiotherapy service delivery and future sustainability of care.[1,4]

Innovative strategies to manage increased service demand such as remodelling care delivery using allied health assistants (AHAs) have been recommended but not for people with CF.[9–11] AHAs are identified as potential cost-effective resources for health care delivery yet appear underutilised.[12] AHAs are well received by patients and can perform both clinical and non-clinical tasks,[13,14] thereby enabling allied health professionals to spend more time performing clinical care or other duties.[15,16] Comprehensive information about establishing AHA roles and changes to physiotherapy practice associated with such roles in an acute respiratory clinical setting has not been reported.[17]

We aimed to determine the impact of the inclusion of an AHA role on physiotherapy service delivery in an acute respiratory care setting (adult CF centre) in terms of service provision, scope of practice and skill mix changes.

Materials and method

Design

A pragmatic pre-post design study was conducted at an adult CF centre to examine the delivery of physiotherapy services across two 3-month periods: phase one (P1) [September–November 2015] and phase two (P2) [April–June 2016]. Data collection periods were chosen to avoid peak holiday (December to January) and clinical demand (July to August) to minimise variations in patient demand and complexity between phases. Physiotherapy staffing in both phases comprised two full time equivalent permanent senior CF physiotherapists and two full time equivalent junior rotational physiotherapists. A full time equivalent AHA role was included in phase two staffing. A workforce redesign tool, the Calderdale Framework, was used for the development of the AHA role.[17,18]

The Calderdale framework engages staff in a staged systematic approach to reviewing skill mix and developing new roles.[18,19] A Calderdale Framework trainer used process tools[18,20] to facilitate seven 50-minute sessions during team meetings. AHAs and physiotherapists worked together to determine the clinical and non-clinical tasks to be included in the new AHA role. Detailed training resources for tasks identified as appropriate for delegation outlined competencies to be met by the AHA to deliver these tasks. Comprehensive AHA training was conducted by senior CF physiotherapists over a 2-month period following a taught, modelled, competent methodology.[21] Training covered direct and non-direct clinical tasks (Supplement 1 Table A). Clinical tasks included delegated 6-minute walk tests, and supervision of established inhalation therapy, airway clearance and routine exercise treatments for stable inpatients. Non-direct clinical tasks included oversight of respiratory equipment use (including supply, cleaning, audit of loans) and general administrative duties. Competency assessment, clinical governance processes, and procedures for delegation documentation and communication were developed.

All CF physiotherapy staff and the AHA completed a structured delegation training process, conducted during two team meetings using an online package.[20] Training outlined accountability and responsibility levels for both physiotherapists and AHAs when supervising and handing over clinical tasks to AHAs.[15] Once the AHA had demonstrated competency in the clinical tasks these were delegated to the AHA by physiotherapy staff.[20,22]

Data collection

Physiotherapy services for adults with CF, both inpatient and outpatient, were quantified during weekdays (usual business hours). Staff recorded all direct and non-direct clinical and non-clinical activity to quantify physiotherapy service delivery using a portable scanning system (Chappell Dean Pty Limited). Data included date, time, location (ward, clinics), activity type using a predetermined code list,[7] number and duration of each activity, and staffing level (junior, senior, AHA).

Clinical data were collected for all patients with CF admitted to the hospital across both phases. The number of admissions and number of people with CF attending multidisciplinary outpatient clinics were recorded over each phase. Number and details of documented clinical incidents or adverse events during any physiotherapy or AHA intervention were recorded using the hospital incident recording system[23] for each phase.

Staff and patient perceptions of the physiotherapy service during both phases were sought from all members of the specialist CF multidisciplinary team and all patients receiving physiotherapy care during both phases. Purpose designed surveys were developed and pilot tested with both participant groups. Patient surveys comprised[24] questions and staff surveys nine questions (Supplement 2). The surveys sought perceptions of the quality, effectiveness and accessibility of the physiotherapy service. A five-point Likert scale was used with open-ended response options to provide additional information. Surveys were distributed via email using a Survey Monkey link. All responses were anonymous.

Outcome measures

The primary outcome was all clinical and non-clinical activity that contributed to the delivery of physiotherapy services. Physiotherapy services were described under three categories: service provision, scope of practice and skill level. Service provision was quantified as the numbers of inpatient admissions and outpatient attendances at multidisciplinary clinics. Scope of practice activity was quantified as number, type and duration (per day) of all staff activity, further categorised for skill level (AHA, junior, senior).[7] Adverse events were described in terms of type and number.

Data analysis

Demographic, service provision, scope of practice and skill mix data were analysed descriptively. Fisher's exact tests were used to determine differences in service delivery, staff numbers and types of activities across phases. Independent t-tests were conducted to compare the number of activities per day and duration of activity type on the days these activities occurred between phases for all staff and between junior and senior staff. Clinical and demographic information from surveys were analysed descriptively. Mann-Whitney U tests were conducted to compare survey responses between phases. Open-ended responses were collated. Significance was defined as p-value <0.05. SPSS v25 (IBM Corp., NY, USA) was used for all analyses.

Results

Service provision

In P1, there were 113 inpatient admissions and 385 patient attendances at multidisciplinary outpatient clinics (henceforth called clinics). In P2, there were 111 inpatient admissions and 352 patient attendances at clinics. All inpatients across both phases received direct clinical care by the physiotherapy service. Physiotherapists saw a higher proportion of attendees at clinics in P2 (268 (76%) vs 215 (56%), absolute risk difference 20% (95% confidence interval 13 to 27).

Scope of practice

Physiotherapy service activity (n, %) for all staff across the phases is described in Table 1. Overall, the physiotherapy service undertook more activity in P2 ($n = 4730$) compared to P1 ($n = 3048$).

Physiotherapist activity

Activity undertaken by physiotherapists and AHA for both phases is presented in Table 2. Overall, the number and percentage of clinical care activities undertaken by physiotherapists across the two phases was similar (85 vs 81%) with some differences between phases for specific activities (Table 2). In P2, physiotherapists undertook fewer respiratory and exercise treatments and patient reviews increased from 79 to 342. Patient-related clinical administrative tasks such as documentation, handovers, attendance at ward rounds and discussions within the multidisciplinary team increased from 25% in P1 to 36% in P2. Activity associated with managing patients' equipment needs by the physiotherapists reduced in P2. Non-clinical care activities of research and management increased from P1 to P2. Teaching and training remained unchanged (Table 2).

Table 1. Number (% total activity) of clinical and non-clinical care activities by all staff (physiotherapists and AHAs) across phase one and two. Comparisons between phases for all staff (number (%).

	All Staff		
Activity	Phase 1 n (%)	Phase 2 n (%)	Fishers exact test (p)
Clinical care: Direct			
Respiratory Treatment	1058 (35)	830 (18)	<0.001
Exercise Treatment	338 (11)	350 (7)	<0.001
Exercise Test	20 (1)	40 (1)	0.426
Multidisciplinary team clinics	215 (7)	268 (6)	0.01
Reviews	79 (3)	342 (7)	<0.001
Other Treatment##	29 (1)	20 (0)	<0.01
Total direct clinical care	*1739 (57)*	*1850 (39)*	
Clinical care: Non-direct			
Patient-related documentation, communication and management###	749 (25)	1796 (38)	<0.001
Equipment management####	102 (3)	273 (6)	<0.001
Total non-direct clinical care	*851 (28)*	*2069 (44)*	
Total clinical care	*2590 (85)*	*3919 (83)*	
Non-Clinical care			
Management	326 (11)	587 (12)	0.037
Teaching & training	128 (4)	187 (4)	0.56
Research	4 (0)	37 (1)	<0.001
Total non-clinical care	*458 (15)*	*811 (17)*	
Total Activity	*3048*	*4730*	

Reviews include physiotherapy annual review assessment and/or detailed reviews of specific management; ##Other includes routine musculoskeletal and incontinence management and other clinical care activity not covered in other categories; ###Patient-related documentation and communication includes documentation of clinical care related to patients and all other clinical documentation related to patient care administration and other patient-related clinical activities (handovers, weekly patient review meetings) not covered in other categories;####Equipment management includes time taken to manage (supply/setup/clean/order) patients respiratory/oxygen therapy equipment. Please refer to Hall K et al.[7] for a full description of activity code inclusions.

AHA activity

The AHA completed 960 activities in P2, representing 20% of all physiotherapy service provision (Table 2). The majority was non-direct clinical care (n = 687, 72%), however delegated direct clinical activity including respiratory (n = 52, 5%) and exercise treatments (n = 93, 10%) occurred, contributing to the overall increase in numbers of exercise treatments undertaken by all staff in P2 (Table 2). The AHA completed 25 (3%) delegated exercise tests (Table 2).

Time taken per activity by staff

Mean duration of each episode of activity per day for P1 and P2 for all staff is presented in Table 3. Time spent on respiratory treatments increased by 4 minutes per episode in P2. Less time was spent on documentation, management and communication activities per episode in P2 (Table 3). Time spent on remaining activity episodes didn't change ($p > 0.05$).

Skill mix

Overall junior physiotherapists undertook similar number (Table 4) and duration (Supplement 1 Table B) of direct clinical care activities in both phases. Direct clinical care activity increased for the number of reviews, and junior physiotherapists commenced non-clinical teaching and training activity in P2. No research activity for junior physiotherapists occurred in either phase (Table 4).

Differences in most clinical care activities were observed for senior physiotherapists between phases (Table 4). In P2, senior physiotherapists completed fewer respiratory and exercise treatments, however spent longer time per episode compared to P1 (Supplement 1 Table B). Senior physiotherapists completed the same number of exercise tests in P2 (Table 4), though approximately 16 minutes longer was spent completing each test (Supplement 1 Table B). Senior physiotherapists increased the number of inpatient reviews completed per day from 1.0 (SD1.3)

Table 2. Number (% total activity) of clinical and non-clinical care activities undertaken by physiotherapists and AHA for each phase.

Activity	Phase 1 Physiotherapists n (%)	Phase 2 Physiotherapists n (%)	Phase 2 AHA n (%)
Clinical care: Direct			
Respiratory Treatment	1058 (35)	778 (21) ***	52 (5)
Exercise Treatment	338 (11)	257 (7) ***	93 (10)
Exercise Test	20 (1)	15 (0)	25 (3)
Multidisciplinary team clinics	215 (7)	268 (7) **	0
Reviews	79 (3)	342 (9) ***	0
Other Treatment	29 (1)	19 (1) *	1 (0)
Total direct clinical care	1739 (57)	1679 (45)	171 (18)
Clinical care: Non-direct			
Patient-related documentation, communication and management	749 (25)	1363 (36) ***	433 (45)
Equipment management	102 (3)	19 (1) ***	254 (26)
Total non-direct clinical care	851 (28)	1382 (37)	687 (72)
Total clinical care	2590 (85)	3061 (81)	858 (90)
Non-Clinical care			
Management	326 (11)	485 (13) *	102 (11)
Teaching & training	128 (4)	187 (5)	0
Research	4 (0)	37 (1) ***	0
Total non-clinical care	458 (15)	709 (19)	102 (11)
Total Activity	3048	3770	960

* $p < 0.05$; ** $p = 0.01$; *** $p < 0.001$, p values based on Fisher's exact t test of the difference between phases.

in P1 to 3.7 (SD2.9) in P2 (Table 4). There was no difference in number or duration of non-clinical care activities for teaching and training and management for senior physiotherapists. Senior physiotherapists undertook more research activity in P2 (Table 4).

Safety

No clinical incidents or adverse events associated with any physiotherapy or AHA patient intervention were reported to the investigators nor through the hospital clinical incidents system (PRIME)[23] across P1 or P2.

Perceptions of staff and patients

Eighteen (51%) and 17 (49%) staff responded to surveys during P1 and P2 respectively; 40% were allied health staff, 23% nursing and 29% medical staff. Sixty-three (35%) and 62 (36%) CF patients (53% male, 39% aged 36 years or older) receiving physiotherapy responded during P1 and P2 respectively. Staff (88%) were aware of the AHA working within the physiotherapy team during P2 reporting improved access to physiotherapy services for patients ($p = 0.05$) and greater ability of senior physiotherapy staff to engage in clinical care discussions and research ($p < 0.05$). The AHA was involved in the care for approximately two-thirds (62%) of patients in P2, with 87% of respondents rating their physiotherapy care as good to excellent (Supplement 1 Figure A). In P1, 76% agreed or strongly agreed their physiotherapy care was effective with different staff involved in their care, which increased to 88% of respondents in P2 (Figure 1). Overall, written responses were few with no negative comments associated with the AHA delivering provision of care. Respondents indicated that the care was '*still a high standard*' (participant X) and perceived the AHA as a '*good resource, interested and knowledgeable*' (participant Y).

Discussion

This study describes the successful development and incorporation of an AHA role in an acute CF physiotherapy service. This redesign was an innovative approach to address service provision challenges[7] associated with increasing age, numbers and complexity of care for adults with CF.[1] Redesigning health service delivery, where change is directed towards skill mix reconfiguration and optimising healthcare team

Table 3. Duration in minutes (mean (SD)) of each episode of activity per day of clinical and non-clinical care activities by all staff for each phase. Mean difference (95% confidence interval (CI)) between the two phases.

	Duration of each episode of activity per day (mins)		
Activity	**Phase 1 Mean (SD)**	**Phase 2 Mean (SD)**	**Mean difference (95% CI) P2 minus P1**
Clinical care: Direct			
Respiratory Treatment	34 (8)	38 (4)	4 (2 to 6)
Exercise Treatment	41 (7)	39 (6)	− 2 (−4 to 0)
Exercise Test	32 (9)	35 (7)	3 (−2 to 8)
Multidisciplinary team clinics	51 (29)	53 (31)	2 (−11 to 14)
Reviews	42 (10)	41 (11)	−1 (−5 to 4)
Other Treatment	24 (6)	32 (13)	8 (1 to 16)
Clinical care: Non-direct			
Patient-related documentation, communication and management	25 (14)	10 (5)	−15 (−18 to −11)
Equipment management	27 (12)	36 (15)	9 (3 to 14)
Non-Clinical care			
Management	50 (37)	48 (12)	−2 (−12 to 8)
Teaching & training	49 (17)	40 (12)	−9 (−15 to −3)
Research	65 (17)	69 (65)	4 (−62 to 71)

Table 4. Number (mean (SD)) of clinical and non-clinical care activities per day undertaken by junior and senior physiotherapists across each phase.

	Junior physiotherapists			Senior physiotherapists		
Activity	**Phase 1 Mean (SD)**	**Phase 2 Mean (SD)**	**Mean difference (95% CI) P2 minus P1**	**Phase 1 Mean (SD)**	**Phase 2 Mean (SD)**	**Mean difference (95% CI) P2 minus P1**
Clinical care: Direct						
Respiratory treatment	8.3 (4.5)	9.5 (3.3)	1.3 (−0.1 to 2.7)	8.3 (8.5)	3.0 (2.8)	−5.3 (−7.5 to −3.0)
Exercise treatment	4.4 (2.1)	3.6 (2.0)	−0.8 (−1.5 to −0.1)	0.9 (1.2)	0.6 (0.7)	−0.3 (−0.7 to 0.0)
Exercise testing	0.2 (0.5)	0.2 (0.4)	0.0 (−0.2 to −0.1)	0.1 (0.4)	0.1 (0.2)	0.0 (−0.2 to 0.1)
Multidisciplinary team clinics	0.2 (0.9)	0.0 (0.1)	−0.2 (0.5 to −0.0)	3.1 (3.2)	4.3 (4.3)	1.2 (−0.2 to 2.5)
Reviews	0.2 (0.5)	1.9 (1.7)	1.6 (1.2 to 2.1)	1.0 (1.3)	3.7 (2.9)	2.8 (1.9 to 3.6)
Other treatment	0.4 (1.1)	0.3 (0.5)	−0.1 (−0.4 to −0.2)	0.1 (0.3)	0.0 (0.2)	0.0 (−0.1 to −0.1)
Clinical care: Non-direct						
Patient documentation/ communication/management	3.0 (3.7)	8.0 (4.5)	5.0 (3.8 to 6.2)	2.9 (5.5)	14.4 (10.1)	11.5 (8.7 to 14.3)
Equipment management	0.3 (0.6)	0.2 (0.5)	−0.2 (−0.4 to −0.0)	1.3 (2.7)	0.1 (0.4)	−1.1 (−1.8 to −0.4)
Non-clinical care						
Management	2.5 (2.0)	4.7 (1.7)	2.2 (1.5 to 2.8)	2.6 (2.1)	3.2 (1.7)	0.6 (−0.1 to 1.2)
Teaching and training	0*	1.1 (1.5)	1.1 (0.7 to 1.5)	2.0 (1.5)	1.9 (1.2)	−0.1 (−0.6 to −0.4)
Research	0*	0	[a]	0.1 (0.2)	0.6 (0.6)	0.5 (0.4 to 0.7)

[a]t cannot be computed because there were no data for at least one of the groups.
*Represents nil activity.

capabilities to increase workforce capacity and patient outcomes is well recognised.[9,11,12,17,25]

Overall access to physiotherapy services improved according to the multidisciplinary team. Additionally, more patients reported their care was effective in the second phase of the study. Physiotherapists scope of practice incorporated more advanced skills such as patient reviews and research. In conjunction with delegation of suitable tasks to the AHA, physiotherapy service delivery moved

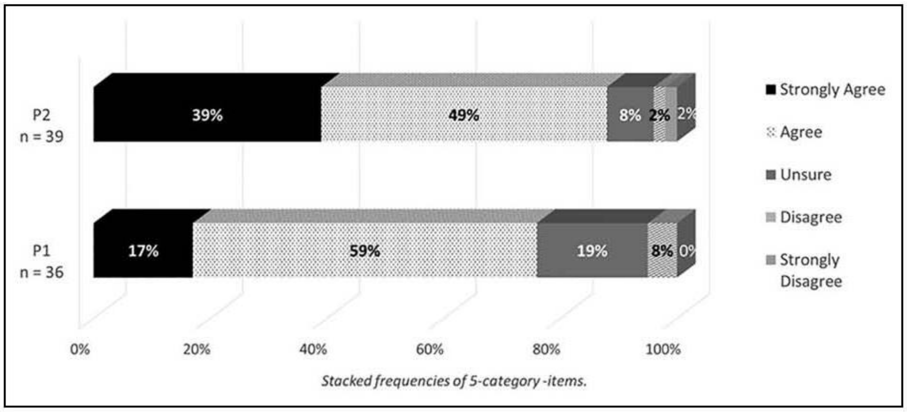

Figure 1. Perceived effectiveness of the physiotherapy care delivery in each phase of the study, rated on a five-category Likert-type scale. Mean ranks: 43 for P1 and 33 for P2, Mann-Whitney U = 508, p = 0.024.

closer to benchmarking standards recommended in clinical practice guidelines, with increased exercise testing and physiotherapy activity in clinics.[7,8] These findings describe a redesigned acute care respiratory physiotherapy service with increased capability, comprising a new skill mix of an AHA and junior and senior physiotherapists. Similar service delivery models have been shown to improve patient outcomes.[13,14,25]

The AHA contributed 20% of overall physiotherapy service delivery with approximately 90% of their work providing direct and non-direct clinical care activity. Direct care included delegated respiratory and exercise treatments. In fact, most of the exercise tests in the P2 were completed by the AHA. Previous reports of AHAs providing acute hospital ward-based physiotherapy care include delegated strengthening and balance exercises and mobilisation occurring on rehabilitation, orthopaedic and general medical wards[11,23] and mobilisation of patients post abdominal surgery.[26] This is the first time AHA workloads have been quantified for specific acute respiratory physiotherapy treatments to our knowledge. Of note, no patients reported their quality of care was compromised.

As a likely consequence of the new AHA role, changes to physiotherapists' scope of practice occurred. Some exercise treatments and management of equipment appeared to shift to the AHA. Senior physiotherapists completed more patient reviews, increased activity within the clinics and for research. Junior physiotherapists undertook more advanced roles, including teaching and training, and patient reviews. All physiotherapists increased their engagement in patient communication and management activity. Multidisciplinary team members felt the physiotherapy staff contributed more to clinical care discussions. Clinical guidelines endorse the importance of physiotherapists contributing to multidisciplinary team clinic and inpatient case meetings, research and education [1,5,8,27] thus an AHA role is a possible strategy to optimise this practice for physiotherapists.

Barriers to the successful implementation of an AHA role were considered in service redesign planning, particularly safety aspects associated with delivering respiratory care. Well documented barriers to successful AHA role development include pre-existing perceptions of both physiotherapists and AHAs about these roles.[14,17] Other barriers include lack of clarity regarding tasks being delegated, need for preparation and training, and an understanding by all staff about accountability and responsibility levels for treatments undertaken by the AHA, requiring supervision and delegation training for all staff.[11,14,15,17,25] To address these issues the Calderdale Framework[19] was used to develop the AHA role, with a focus on supporting skill mix redesign and mitigating potential risk. This workforce redesign tool has been successfully used in the implementation of AHA roles,[28] is patient-focused and engaged both AHAs and physiotherapists in developing the AHA role.[19]

It is likely therefore, that the positive implementation and practice outcomes reported can be attributed to the use of a comprehensive workforce development tool. All staff appeared to be engaged in activity at appropriate scope, which included new delegated practices for the AHA and physiotherapy staff undertaking more advanced scope of practice activities required to deliver care to this complex patient group.[11,17,19]

An important aim of using the redesign tool was to mitigate potential risk. This appears to have been achieved. The delegated clinical treatments undertaken by the AHA in this study appear to be safe, with no major adverse clinical events reported in the hospital's clinical incident documentation system. Previous safety outcomes in acute care settings are only available for delegated exercise and mobility treatments for patients.[26,29] A recent systematic review supports our findings, reporting no increased risk of harm to patients associated with a broad range of delegated AHA treatments occurring in hospital and community centres.[11] We were unable to collect more extensive safety data (e.g. intermittent desaturation with exercise), and this should be included in future research.

Generalisability of our findings should be considered. Using the Calderdale Framework to inform the inclusion of the AHA role was a deliberate strategy to optimise outcomes for the new AHA role and overall service delivery. Other studies developing AHA roles have been less successful[14,22] and this may be due to insufficient planning and training for all team members. Findings from this study suggest that delegated clinical and non-clinical roles could be established in other centres with similar education and training strategies.

It is possible that some changes observed in physiotherapist activity for inpatients could be attributed to variations in the complexity of patients admitted to the CF centre across the two phases. There was no capacity to quantify patient complexity during each phase of the study. Variations in patient demand and complexity were minimised with data collection periods deliberately chosen to avoid peak holiday (December to January) and clinical demand (July to August). Additionally, data collection over a 3-month period may not have been long enough to fully account for changes to service delivery and physiotherapists scope of practice.

Finally, we acknowledge rapid changes to service delivery to adults with CF with the development of modulator therapies.[1] These changes were unlikely to impact workloads for physiotherapists at this centre during the study period. Modulator therapies are demonstrating marked reductions in pulmonary exacerbations and consequent need for hospitalisation.[30,31] The incidence of obesity and metabolic syndrome are increasing.[32,33] This represents another role for delegated exercise testing and treatments. The COVID-19 pandemic has also affected models of care,[34] with increased use of virtual platforms to deliver physiotherapy and other services.[35] Care is being refocused to outpatient and virtual models.[33,34] Establishing an AHA role that can perform safely delegated clinical tasks and potentially, many of the administrative tasks associated with virtual and face to face appointments, suggests even greater opportunity for this role to support current CF physiotherapy service provision.

This study describes the scope of practice undertaken by an AHA and the resultant changes to physiotherapy service provision within an adult CF centre. The AHA completed delegated clinical tasks such respiratory and exercise treatments and most of the exercise tests. AHA non-direct clinical care included managing equipment and patient-related administration activities. Physiotherapist activity and scope of practice changed, associated with provision of increased complex clinical care, including increased activity in the clinics and undertaking annual reviews. Physiotherapists also increased patient communication, management and research activity. Importantly, there were no safety issues reported. Critical to the successful establishment of the AHA role was the use of a workforce redesign tool to engage, develop, and train both the physiotherapists and the AHA in appropriate and safe delegation practices. There is potential for an AHA to enhance service delivery in other acute respiratory physiotherapy services.

Contribution of the paper

- A dedicated allied health assistant can complete routine delegated clinical and non-clinical tasks in an acute respiratory care setting.
- Consequently, physiotherapy scope of practice can shift towards the provision of increased complex clinical care and communication, management and research activity.
- Critical to establishing an AHA role is the use of a comprehensive process to engage, develop, train and educate both physiotherapists and AHA's in effective and safe delegation activity.

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The Prince Charles Hospital Human Research Ethics Committee, Metro North Hospital and Health Service (HREC/25/QPCH/68) and Australian Catholic University's Human Research Ethics Committee(s) (2017-51N) approved this study.

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Supplemental material

Supplemental material for this article is available online.

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