Exploration of embedding registered Clinical Exercise Physiologists into clinical exercise service provision in the UK

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Abstract

There is overwhelming research evidence that targeted regular exercise is vital for the successful management of chronic disease. In the UK, the NHS long-term plan advocates exercise as a key component of clinical exercise services but there was no defined workforce to deliver the services. Recently, Clinical Exercise Physiologists (CEPs) have been recognized and established as a registered health professional in the UK who have the requisite knowledge, skills and experience to deliver clinical exercise services. The overarching aim of this thesis was to explore clinical exercise service provision prior to and following the introduction of CEPs and provide insight and best practice into how to embed CEPs into clinical practice in the UK.

Study one (chapter 3) aimed to map clinical exercise provision, prior to the regulation of CEPs, with a focus on who was delivering the services in terms of job titles, roles, and qualifications across services for 5 clinical conditions. An electronic audit was conducted between May 2020 and September 2020. Data were obtained for 731 of 890 eligible clinical services (216 cardiac, 162 respiratory, 129 stroke, 117 falls, 107 cancer). Cardiac rehabilitation services were delivered by physiotherapists, exercise physiologists (exercise specific BSc/MSc) and exercise instructors (vocationally qualified with or without BSc/MSc). Respiratory, stroke and falls services were delivered by physiotherapists and occupational therapists. Cancer services in community exercise service were delivered by vocationally qualified exercise instructors. These findings reinforced the requirement for regulation of exercise job titles and roles for consistent and sustainable provision of exercise in clinical settings.

Studies two (chapter 5) and three (chapter 6) used a multi-method qualitative approach (semi-structured interviews, focus groups, face-to-face and virtual observation and field notes) with The Consolidated Framework for Implementation Research as an overarching guide to explore two unique clinical exercise services, that are recognized as successful, over 12-weeks in each service. The first clinical exercise service explored was a cancer service delivered within a community setting and observed between January – March 2022 (applications to become a registered CEPs opened December 2021). This service employed exercise specialists that were educated to a minimum of undergraduate degree level with extensive cancer-specific knowledge and skills, equivalent to that of a registered CEP. Workplace experience and peer learning was essential for staff development. Proficiency in behaviour change and communications skills, including empathy and active listening, were integral to patient-centred care. The second clinical exercise service explored was a cardiac clinical exercise service delivered with secondary care, observed between April - August 2022, and employed registered CEPs. Registered CEPs, through active participation in research, delivered innovative exercise prescription based on

real-world findings. Exposure to the roles of a multidisciplinary team (MDT) of health care professionals allowed skill and competency transfer in areas such as clinical assessments. Behaviour change education appeared more effective during less formal conversations than specific education sessions.

Study four (chapter 7) compared both clinical exercise services (study two and study three) with the aim of generating common themes that could translate into consistent, evidence-based, and actionable recommendations for both current/new clinical exercise services and universities providing education for CEPs. Registered CEPs with the capacity to deliver highly specialised and individualised exercise prescription based on real-world research were vital. Impactful behaviour change was optimal during informal patient conversations. Supervised peer learning across the MDT, including clinical placements, enhanced CEP knowledge, skills and competencies.

In conclusion, exercise specialists delivering clinical exercise service provision in the UK should be educated to a level comparable to a Registration Council for Clinical Physiologist (RCCP) Clinical Exercise Physiologist. The minimum standards for registration include experience/workplace exposure, knowledge of the research evidence base for exercise prescription and behaviour change skills across different complex and clinical conditions.

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No portion of the work referenced in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or institute of learning.

This research was supervised by members of the academic staff but is essentially the work of the author. Views expressed are those of the author and are not necessarily those of any other member of the Research Institute of Sport and Exercise Sciences.

Declaration

I declare that the work contained in this thesis is my own.

Publications resulting from this PhD work:

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Crozier, A., Watson, P.M., Graves, L.E., George, K., Naylor, L., Green, D.J., Rosenberg, M. and Jones, H., (Under revision) Insights and recommendations into service model structure, staff roles and qualifications in a UK cancer specific clinical exercise service: a multi-method case study.

Other publications completed by the candidate during PhD tenure:

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Bannell, D.J., France, M.V.K., Buckley, B.J.R., **Crozier, A.,** Davies, A.P., Hesketh, K.L., Jones, H., Cocks, M. and Sprung, V.S. (Under revision). reAdherence to Unsupervised Exercise in Sedentary Individuals: A Randomised Feasibility Trial of Two mHealth Interventions.

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List of Abbreviations

ACSM (American College of Sports Medicine)

AEP (Accredited Exercise Physiologist)

BACPR (British Association for Cardiovascular Prevention and Rehabilitation)

BASA (Biokinetics Association of South Africa)

BHF (British Heart Foundation)

CCG (Clinical Commissioning Group)

CEP (Clinical Exercise Physiologist)

CEPA (Clinical Exercise Physiology Association)

CEPNZ (Clinical Exercise Physiology New Zealand)

CEP-UK (Clinical Exercise Physiology UK)

CFIR (Consolidated Framework for Implementation Research)

CIMSPA (Chartered Institute for the Management of Sport and Physical Activity)

CNS (Clinical Nurse Specialist)

CPET (Cardiopulmonary Exercise Test)

CPRB (Clinical Exercise Physiology Board of New Zealand)

ECG (Electrocardiogram)

ERAS (Enhanced Recovery After Surgery)

ERS (Exercise Referral Scheme)

ESSA (Exercise and Sports Science Australia)

ETT (Exercise Tolerance Test)

HCPC (Health and Care Professions Council)

HPCSA (Health Professions Council of South Africa)

HRR (Heart Rate Reserve)

LTC (Long-Term Condition)

MDT (Multi-Disciplinary Team)

NACR (National Audit for Cardiac Rehabilitation)

NCD (Non-Communicable Disease)

NHS (National Health Service)

NICE (National Institute for Care and Health Excellence)

OHID (Office for Health Improvement and Disparities)

ONS (Office for National Statistics)

OT (Occupational Therapist)

PA (Physical Activity)

PARS (Physical Activity Referral Scheme)

PHE (Public Health England)

REPS (Register of Exercise Professionals)

RCCP (Registration Council for Clinical Physiologists)

RCT (Randomised Controlled Trial)

RPE (Rate of Perceived Exertion)

1 INTRODUCTION

1.1 GENERAL INTRODUCTION

In the UK, 26 million people live with a long-term medical condition making it one of the largest financial burdens on the public healthcare system (ONS, 2021). The economic strain on the National Health Service (NHS) is predicated to continue over the next two decades through a quadrupling of those with four or more illnesses (multi-morbidities) across an ageing population (ONS, 2021). In addition to an ageing population, surgical waiting times for the treatment of chronic disease have increased and hospital bed availability has decreased, making it vital that preventative therapies such as exercise are utilised (NHS, 2019, OFID, 2023). The NHS "Long-Term Plan" acknowledged that 14,000 premature deaths per year could be avoided via specifically designed exercise programmes for those at increased risk of developing cardiovascular disease alone (NHS, 2019). Additional to prevention strategies, clinical exercise services delivered within acute settings provide exercise interventions that support the treatment and management of diagnosed conditions, including aiding patient post-operative recovery (McCarthy et al., 2015, Powell et al., 2018, Squires et al., 2018, Sherrington et al., 2019, van Rooijen et al., 2019, West et al., 2019, Zylstra et al., 2022).

Although clinical exercise services exist across a small number of clinical conditions in the UK, they have been developed independently, with little known about how they are delivered, and by whom (Jones et al., 2021). The standardisation or professionalisation of an exercise specialist profession to deliver clinical exercise provision is not uncommon internationally (Zhou et al., 2019, Jones et al., 2021). Countries such as Australia recognise tertiary qualified exercise specialists as allied

health professionals (Accredited Exercise Physiologists, (AEP)), who are identified as being best placed in providing exercise prescription and delivery, within their private and public healthcare systems (Cheema et al., 2014, Smart et al., 2016). Internationally, Exercise Physiologists as a health professional are underpinned by rigid, accredited education pathways, including clinical placements during postgraduate study (Zhou et al., 2019). Therefore, for optimisation of clinical exercise provision in the UK and alignment with international peers, it is important that all clinical exercise services employ specialists in the field of exercise prescription and delivery, including physiological assessment and behaviour change (Jones et al., 2021). Consequently, a knowledge of current clinical exercise service provision in the UK is required to understand what is available, how it is delivered, and by whom. An understanding of who is providing clinical exercise provision alone is, however, insufficient for the creation of standardised services. An understanding of exercise delivering staff roles and responsibilities, including levels of training, qualifications and experience of the exercise delivering staff is also required. Moreover, a detailed real-world understanding of the exercise prescription knowledge, skills and competencies, from both exercise staff and service user perspectives is required for effective clinical exercise service provision and individualised patient-centred care. Collation of such information can be used to generate recommendations for best practice for both current/new services and education providers. Moreover, such recommendations can be used to standardise the UK clinical exercise service provision in areas such as staff employment, as the most suitably qualified exercise specialists with the optimal levels of knowledge, skills and competencies are needed in these services.

Since the beginning of this PhD journey in February 2020, Clinical Exercise Physiologists (CEPs) have been recognized and established as a registered health professionals in the UK (see chapter 2, section 2.3.5 for detailed insight into this process). Akin to international peers, registered CEP's in the UK have the requisite knowledge, skills and experience to deliver clinical exercise services. The overarching aim of this thesis was to explore clinical exercise service provision prior to and following the introduction of CEPs and provide insight and best practice into how to embed CEPs into clinical practice in the UK.

1.2 AIMS

The specific aims of this research are:

1. To collate exercise service delivery information across the five most prevalent clinical exercise services in the UK (cardiovascular, respiratory, stroke, falls and cancer), focusing on understanding staff job titles, roles and qualifications. (chapter 3).
2. To employ a multi-methods approach to explore (i) how staff knowledge, skills and competencies contribute to the provision of an effective clinical exercise service, (ii) how these components assist in creating effective service teams, and (iii) to identify existing challenges from staff and service user perspectives. (chapter 5).
3. To explore how registered CEP staff knowledge, skills and competencies contribute to the provision of a cardiac-based clinical exercise service, how these components assist in creating effective service teams, how they differ to

previously explored services, and to identify what challenges currently exist from staff and service user perspectives (chapter 6).

4. To compare and contrast the common themes across each clinical exercise service that could translate into consistent, evidence-based, and actionable recommendations for both current/new services and universities providing education for CEPs. (chapter 7).

1.3 OBJECTIVES

The aims outlined above will be achieved through the following objectives:

In line with **Aim 1:**

- Conduct a national audit of publicly available information (e.g., online resources, calls with key stakeholders) to identify what clinical services exist and for which long-term conditions.

-Map clinical exercise services against an established taxonomy to identify which services exist, for which conditions and the mode of delivery.

- Extract relevant information about staff qualifications, experiences, roles, and responsibilities to determine the current knowledge and skills of delivery staff within each setting.

In line with **Aim 2:**

- Over a 12-week period, to observe, discuss and record field notes with both exercise staff and service users regarding the knowledge, skills and competencies that are perceived to be important for exercise staff in the effective delivery of a cancer-specific clinical exercise service.

- At week 6 onwards, to conduct interviews and focus groups with cancer-specific clinical exercise service staff and service users, either in person or via video conferencing, exploring clinical exercise service provision
- Discuss service effectiveness, including limitations, with exercise staff and service users.

In line with **Aim 3:**

- Over a 12-week period, observe, discuss and record field notes with both exercise staff and service users regarding the knowledge, skills and competencies that are perceived to be important for registered CEPs in the delivery of an effective cardiac-specific clinical exercise service.
- At week 6 onwards, to conduct interviews in person with clinical exercise service staff and service users exploring clinical exercise service provision.
- Discuss service effectiveness, including limitations, with exercise staff and service users.

In line with **Aim 4:**

- Synthesise the data and generate common and contrasting themes from the cancer (study 2) and cardiac-specific (study 3) services regarding clinical exercise service provision.
- Create an understanding of the staff knowledge, skills and competencies needed to deliver exercise within clinical exercise services.
- Provide recommendations for best practice regarding clinical exercise service delivery in new/existing clinical exercise services.

- Provide recommendations for education providers regarding the content, both theoretical and practical, that is required within master`s courses for students to optimally work within clinical exercise services.

2 LITERATURE REVIEW

2.1 INTRODUCTION

First, this literature review provides an overview of the UK health landscape, the risk of physical inactivity for non-communicable disease development, and how physical activity (PA) and exercise can be used in the treatment and management of chronic or complex medical conditions. Second, the review focuses on the exercise services that are available to the general public who are at risk of or have been diagnosed with a long-term medical condition. Third, the review highlights what is known about clinical exercise services in the UK, including the staff that have previously been identified as delivering exercise within them. Fourth, the literature explores the international clinical exercise service landscape, specifically Clinical Exercise Physiologists (CEPs) or equivalent, including the education pathways undertaken by students. Finally, the review summarises the current state of clinical exercise provision in the UK and what information is needed to standardise provision and enhance service effectiveness.

2.2 UK HEALTH LANDSCAPE

Non-communicable diseases remain prevalent in the UK, with coronary heart disease, stroke, respiratory disease, metabolic disease and certain cancers remaining among the top 10 leading causes of death (ONS, 2021). Yet, an increase in life expectancy rates over the past 40 years (albeit reduced in the last 10 years) has led to noticeable changes in the UK health demographic, specifically relating to an ageing population which has led to increased financial stress on the NHS (ONS, 2021). A shift in population age has seen an increase in chronic disease development in less prevalent conditions, and even though the number of deaths attributed to cardiovascular-related disease remain

high, age-associated conditions such as dementia and Alzheimer's disease are now on the rise (ONS, 2021). On a global scale, physical inactivity has been identified a leading risk factor in the prevalence of non-communicable disease (Katzmarzyk et al., 2022, WHO, 2023). Sport England (2023) in accordance with the 2019 UK Chief Medical Officer`s (CMO) guidelines, identify physical inactivity as a failure to achieve 30-minutes of PA per week (England, 2022). Being physically inactive is acknowledged as having a 20-30% increased risk of all-cause mortality compared to those engaging in the current PA guidelines of at least 150+ minutes of moderate intensity PA per week, or equivalent (Lee et al., 2012, Katzmarzyk et al., 2022, England, 2022). Yet, in 2021, 27.2% of adults in the UK were identified as inactive (England, 2022).

2.2.1 PHYSICAL ACTIVITY / EXERCISE AND CHRONIC DISEASE

PA is defined as any bodily movement produced by the skeletal muscles that results in energy expenditure (Caspersen et al., 1985). It is widely acknowledged that regular PA is effective in preventing and managing chronic diseases and conditions, including cardiovascular (e.g., coronary heart disease, hypertension, stroke), cancer (e.g., breast and colon), metabolic (e.g., type 2 diabetes), mental health, dementia, obesity, frailty, and general well-being (Lee et al., 2012, Sallis et al., 2012, McCarthy et al., 2015, Rosenbaum et al., 2015, Dibben et al., 2018, CDC, 2021, Zylstra et al., 2022). For example, cancer studies have shown that PA (such as walking) can improve pre-operative functional capacity, leading to improved physical fitness levels post-operatively compared to inactive peers (Gillis et al., 2014). Further, recent scientific evidence identified that PA could assist in augmenting tumour regression across specific cancers (e.g., colorectal) when combined with neoadjuvant chemotherapy (Gillis et al., 2014, West et al., 2019).

Increased PA has also demonstrated a reduced prevalence of stroke in older adults by 11-15% (Wannamethee and Shaper, 1999, Diep et al., 2010) alongside a 28% reduced risk of developing dementia (Blondell et al., 2014). Additionally, falls prevalence is reduced by 23% when physically active, alongside reductions in risk for obesity, cardiovascular disease and type 2 diabetes development, all of which increase mortality rates by 20-30% (Haskell et al., 2009, Bauman et al., 2016, Sherrington et al., 2020).

Exercise (a subset of PA that is planned, structured, repetitive, and has an objective to maintain or improve an aspect of physical fitness) has been shown to reduce all-cause risk of mortality (Sallis, 2015). In patients with respiratory conditions such as COPD, scientific research has shown that structured walking sessions can lead to an increase in 6-minute walking distance by 10-25% from baseline, leading to improved maximal exercise capacity and endurance capacity, alongside quality of life benefits such as reduced dyspnoea and fatigue (Goldstein et al., 1994, Troosters et al., 2000). A recent cancer study found that an exercise intervention for patients undergoing neoadjuvant chemotherapy improved tumour regression and downstaging, with increases in skeletal muscle and decreases in visceral and subcutaneous fat areas compared with baseline scans, while remaining weight stable (Zylstra et al., 2022). One of the largest and most significant diabetes randomised control trials (RCTs) demonstrated that exercise, in conjunction with education sessions, could reduce diabetes onset in pre-diabetic patients by 58% compared to those undertaking pharmacology treatments alone (31%) (Knowler et al., 2009). A meta-analyses of cardiovascular disease RCTs highlighted that exercise reduces systolic blood pressure in those at risk of cardiovascular disease (Whelton et al., 2002, Cornelissen and Smart, 2013), with exercise interventions found to be as

equally effective as several frequently used medications in terms of their mortality benefits in the secondary prevention of coronary heart disease (Naci et al., 2019). Although the evidence suggests that exercise should be recommended for inclusion within clinical exercise interventions as part of the prevention and treatment options for most long-term medical conditions, it is however, frequently underutilised by healthcare professionals and not part of the routine care pathways in the UK (Silver et al., 2015, Thornton et al., 2016, Tremblay et al., 2017, Bourke et al., 2018, Sheill et al., 2018).

PA and exercise in the UK can be accessed across primary and secondary care pathways (Rowley et al., 2021). Primary care services provide the first point of contact in the healthcare system (NHS, 2023). Healthcare professionals (e.g., General Practitioners (GPs)) working in primary care can refer patients in need of increasing their PA levels or those at risk of chronic disease to PA and exercise interventions (Pavey et al., 2011, Morgan et al., 2016, Rowley, 2019). These interventions are often provided by local authority or third sector organisations and frequently known as Exercise Referral Schemes (ERS) (Pavey et al., 2011, Rowley, 2019). Local authorities and third sector organisations can also refer people into services under the umbrella of social prescribing or community referral (Fund, 2020). Social prescribers support people in the community with a wide range of social, emotional or practical needs, focusing on signposting them into interventions that aim to improve mental health and physical wellbeing (Fund, 2020). This support ranges from providing brief advice in line with the Department of Health Making Every Contact Count (MECC) initiative or referring individuals to local ERSs (Fund, 2020). Secondary care pathways involve healthcare professionals that are specialists within specific health fields (e.g., Oncologist). Referrals into secondary care often

come through a primary care professional and can lead to more acute care or tertiary care if elective surgery or hospitalisation is required (NHS, 2023). Secondary care PA and exercise interventions often include pre or post-surgical rehabilitation services such as cardiac rehabilitation and feature a wide range of healthcare professionals (NHS, 2023).

2.2.2 EXERCISE REFERRAL SCHEMES IN THE UK

There are various public health strategies in the UK, supported by a variety of stakeholders such as the newly formed Office for Health Improvement and Disparities (formerly Public Health England) and Sport England (OFID, 2023). Health promotion campaigns aimed at increasing exercise and PA levels across the general population are frequently directly at healthy, but often inactive individuals in need of increasing or maintaining their PA levels, specifically targeting demographics with known inequalities (e.g., `This Girl Can', 'Everybody active, everyday`, `A sporting Future`) (PHE, 2014, Trost et al., 2014, OFID, 2023). These self-initiated interventions are accessed by those who proactively choose to take part and frequently take place at fitness centres (private and public) or sports clubs (PHE, 2014, Trost et al., 2014). More specific advice and support for older adults or individuals with chronic medical conditions is usually facilitated by a healthcare professional (primarily a GP) and can involve generating a referral into a local ERS (Figure 2.1) (Williams et al., 2007, Pavey et al., 2011, Morgan et al., 2016, Rowley, 2019). ERSs were established as a direct approach for increasing structured exercise in those at risk of cardiovascular disease in the early 1990`s (Williams et al., 2007, Pavey et al., 2011). ERS referrals originate from primary care services and are a low/moderate-risk exercise provision aligned with a prevention model, which

excludes unstable or high-risk individuals who would be better suited in more specialist clinical exercise pathways (Henderson et al., 2018).

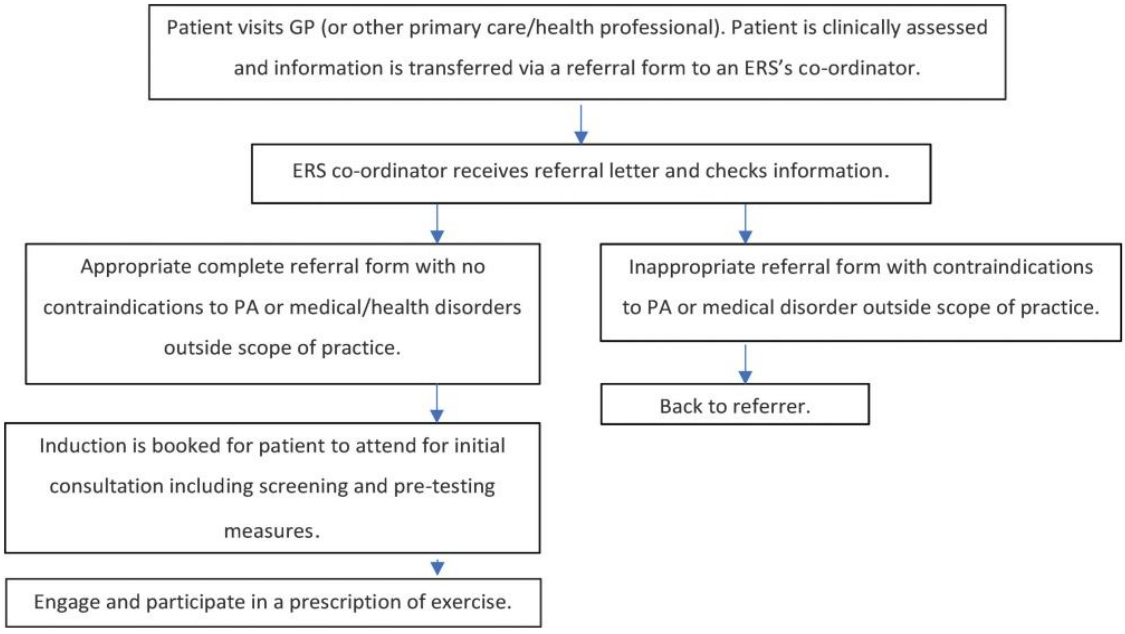


Figure 2.1: ERS referral pathway (Rowley, 2019)

Multiple guidance documents exist for UK ERSs concerning the development, delivery, evaluation, and commissioning of these programmes (e.g., British Heart Foundation ERS toolkit and NICE) (BHF, 2010, NICE, 2014). Yet, with an estimated ~600 ERS in operation in the UK, implementation of these guidelines is unregulated, highlighted by scientific research evidence identified that ERS effectiveness is ambiguous (Campbell et al., 2015, Rowley, 2019). Although typically 8-12 weeks in duration and delivered within leisure centres, ERSs remain highly heterogeneous in terms of duration, delivery environment, eligibility criteria, funding, and local demographic (Pavey et al., 2011, Morgan et al., 2016, Henderson et al., 2018, Rowley, 2019). A recent systematic review of 13 studies highlighted promising evidence of ERSs impact on cardiovascular and mental health outcomes

(Rowley et al., 2018) though limited evidence for musculoskeletal disorders (Steele et al., 2017). Barriers to exercise uptake, however, are prevalent within primary care referrals into ERS, with systematic review data reporting wide-ranging uptake and adherence rates between 28-100% and 12-93%, respectively (Pavey et al., 2012). Unstandardised referral protocols exist, alongside a low level of importance given to exercise within the treatment pathway by healthcare professionals such as GPs (Graham et al., 2005, Bourke et al., 2018, Humphreys et al., 2022). Specific barriers for patient referral to exercise cited by healthcare professionals are patient safety (exacerbation of condition), poor knowledge of condition-specific exercise guidelines, perceived physiological risk (e.g., falls), prioritising of other treatments, lack of time for referral completion, poor understanding of behaviour change, poor understanding of the referral process and a lack of awareness of services (Graham et al., 2005, Dalal et al., 2015, Silver et al., 2015, Lederman et al., 2016, Morgan et al., 2016, Sheill et al., 2018, Kleemann et al., 2020, Weller et al., 2021, Hurst et al., 2022). An example of these misguided beliefs has been found in cancer care where until recent scientific evidence recognised that suitable exercise prescription was safe for patients diagnosed with bone metastases, the fear of fracture and spinal compression frequently negated a referral, even when patients were willing to engage in an exercise intervention (Delrieu et al., 2020, Ten Tusscher et al., 2020, Weller et al., 2021). Likewise, barriers to referral exist from patient perspectives with issues such as a lack of support and difficulty attaining information about services key barriers to becoming active (Humphreys et al., 2022). Previous research indicates that for exercise referral pathway success, numerous factors should be evident such as accessibility (service and facility), tailored support, social interaction, affordability and competence of exercise delivery staff (Morgan et al.,

2016, Humphreys et al., 2022). Therefore, education, including behaviour change, for both healthcare professionals and patients in the value of exercise as part of patient-centred care is required (Bourke et al., 2018, Humphreys et al., 2022). Yet, due to the extortionate costs associated with GP patient contact time (£242 per hour), compared to the cost for a patient to undergo a 12-week exercise intervention (£225), ERSs remain a viable financial option in the treatment and management of low to moderate risk medical conditions (NICE, 2014).

ERSs deliver personalized exercise programmes made up of both aerobic and resistance exercise in a safe environment and are usually overseen by fitness professionals (advanced exercise instructors) with vocational qualifications (De Lyon et al., 2017, Rowley, 2019). Yet, due to the unregulated nature of ERSs, each individual ERS workforce may or may not have condition-specific vocational qualifications depending on service parameters, therefore staff might only be qualified to work with generic, low-risk medical conditions (De Lyon et al., 2017). Moreover, previous research, cites a lack of uniformity regarding staff qualifications and experience within ERSs, notably regarding depth of knowledge in exercise science and personalized behaviour change interventions (Buckley et al., 2018). This lack of standardisation has led to scepticism from referring healthcare professionals who deem fitness professionals as unsuitable for working with chronic medical conditions due to a lack of trust in the education pathways they have undertaken and the non-regulation of the fitness industry (Warburton et al., 2011, De Lyon et al., 2017). Not only can this impact primary care referrals into ERS, it can impact the alternative route into ERS which exists through the secondary care pathway (Rowley, 2019). Clinical exercise services are specialist exercise interventions that sit within secondary care (e.g., cardiac, pulmonary and cancer pre/rehabilitation

programmes) and can form part of the patient care pathway regarding exercise provision depending on the nature or severity of the patient condition (Taylor et al., 2022). For example, within cancer care (Figure 2.2) the targeted and specialist care would include patients with more complex conditions or additional co-morbidities (Moore et al., 2021). These individuals would usually be referred into secondary care by clinical nurse specialists at point of diagnosis or post-surgical intervention (Moore et al., 2021). Due to the complex needs and higher risk associated with these patient groups, a more specialist level of care is required, thus those prescribing exercise should be qualified to a higher level, with an in-depth knowledge of pathophysiology, knowledge and skills of condition specific exercise assessment and prescription and behaviour change (Warburton et al., 2011, Jones et al., 2021). Typically, once a patient has completed the more specialised clinical exercise intervention and is deemed safe to exercise under a reduced level of supervision, referral into an ERS is the optimal step for continued exercise and behaviour change support, however, these pathways are currently inconsistent and frequently underdeveloped (Jones et al., 2021, Rowley et al., 2021). If referred, the patient can continue to exercise within the ERS, usually under the supervision of advanced exercise instructors who also work with patients that are referred directly into the ERS from primary care as they are stratified as a low/moderate risk (also known as universal), i.e., without existing co-morbidities or complex needs (Moore et al., 2021). Therefore, ERSs can obtain direct referrals from primary care, or follow-on referrals from secondary care (Rowley et al., 2021).

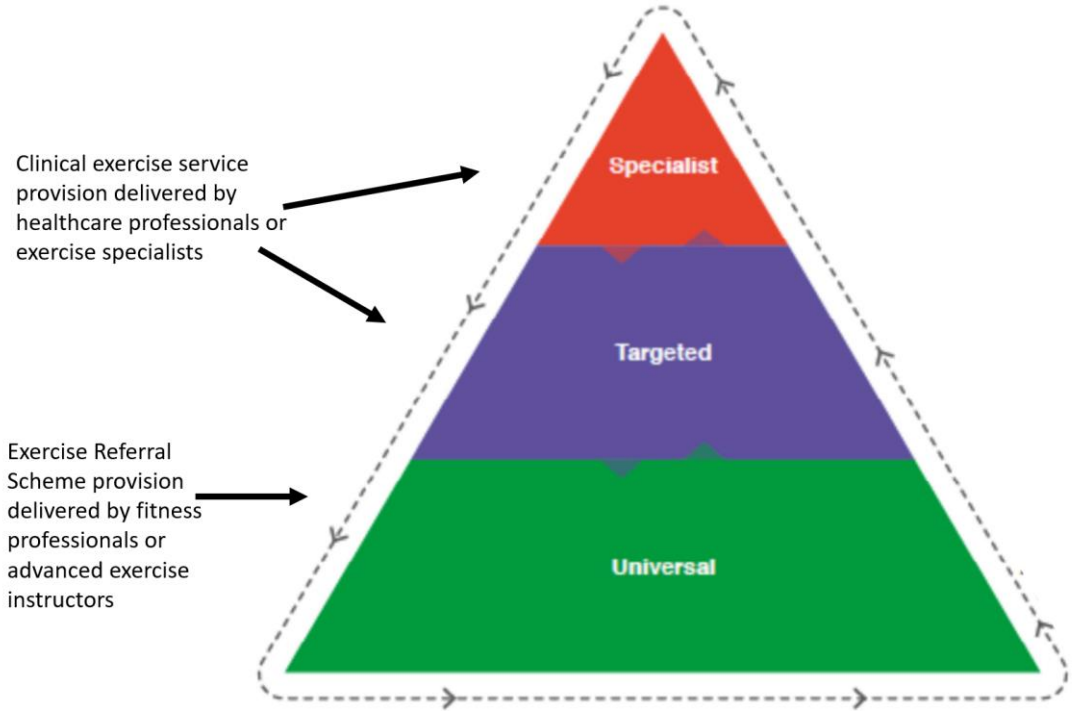


Figure 2.2: Cancer treatment categories **(Moore et al., 2021)**

In summary, in the UK the exercise provision in the health services ranges from general health promotion for apparently healthy people in need of increasing their PA levels, ERS in primary care and general health promotion and clinical exercise services in secondary care.

2.3 CLINICAL EXERCISE SERVICES IN THE UK

In the UK, clinical exercise provision is conducted in secondary care and delivered by a range of health care professionals in areas such as cardiac, pulmonary, cancer, stroke and falls pre/rehabilitation (Taylor et al., 2010, Munro and Swartzman, 2013, Jones et al., 2021). These services deliver exercise interventions to patients with chronic and complex medical conditions usually post-event or treatment, but more recently for some conditions pre-operatively (Moore et al., 2021, Taylor et al., 2022).

2.3.1 CARDIAC REHABILITATION

Developed initially in the 1960s, cardiac rehabilitation was one of the first forms of clinical exercise provision and is delivered usually following acute myocardial infarction (Taylor et al., 2022). In the UK, around 110,000 men and 65,000 women have an acute myocardial infarction every year, equivalent to one every three minutes (BHF, 2017). Cardiac rehabilitation, often considered as the `gold standard` exercise provision due to longevity and consistent funding model, is a complex intervention that includes exercise prescription, external PA promotion, behaviour change education and cardiovascular disease risk management (Richardson et al., 2019, NACR, 2022b, Taylor et al., 2022). Each component requires input from various health care professionals (e.g., clinical nurse specialists and exercise specialists) and should be individualised to the needs of each patient with diagnosed coronary heart disease (Figure 2.3) (Richardson et al., 2019).

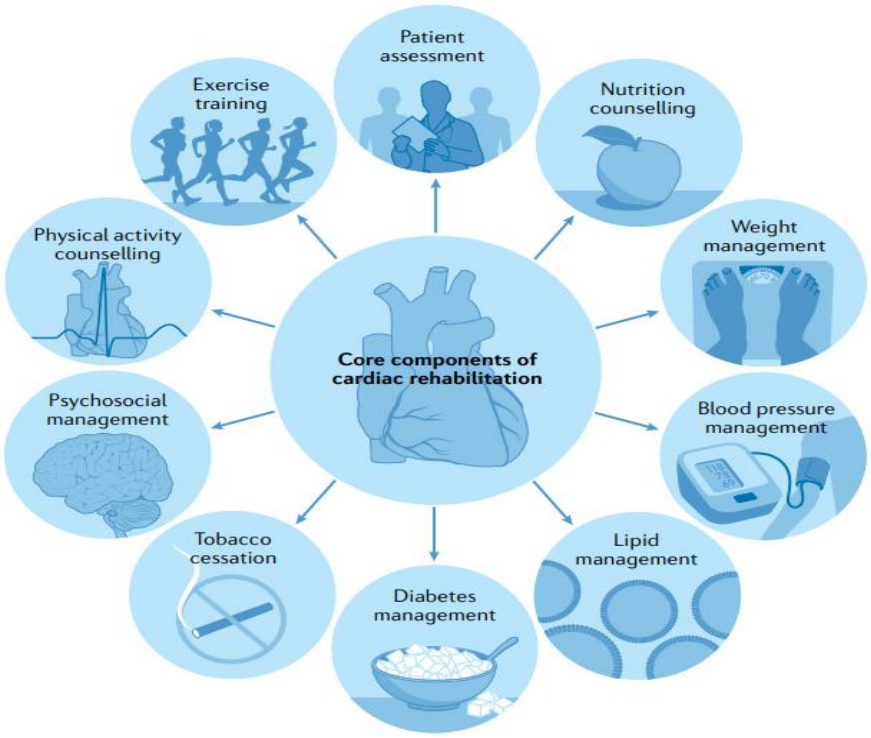


Figure 2.3: A schematic summary of the major components of comprehensive cardiac rehabilitation (Richardson et al., 2019)

Cardiac rehabilitation can be split into stages of care, for example, cardiac rehabilitation is made up of six stages (NICE, 2013a). Stages 1-3 relate to the first 24-72 hours of recovery post-cardiac event or procedure (NICE, 2013a). Stage 4 is the first exercise rehabilitation intervention that prioritises exercise assessment and prescription in clinical settings (NACR, 2020). The exercise component varies depending on the individual services, but often equates to 1-2 sessions per week for one hour, for 8-12 weeks (NACR, 2022b). Once completed patients can opt into stages 5-6 community-led exercise sessions in isolation or as part of an ERS (NICE, 2013). In the UK, some of the first clinical exercise prescription guidelines were developed by The British Association for Cardiovascular Prevention and Rehabilitation (BACPR) in 2007 after its formation in 1993 (BACPR, 2023a). The purpose of these standards were to identify core components for the assurance of quality of care (Cowie et al., 2019). Developed by BACPR members, healthcare professionals such as physiotherapists and exercise scientists, with a background in cardiac rehabilitation, the BACPR standards and core components have been established using current evidence and examples of best practice from globally recognised organisations such as NICE, the Scottish Intercollegiate Guidelines Network (SIGN), the Association of Chartered Physiotherapists in Cardiovascular Rehabilitation (ACPICR), and the European Society of Cardiology (ESC) (BACPR, 2023b). Now on its 4th edition, the guidelines provide recommendations for how cardiovascular disease prevention and rehabilitation programmes should be delivered in the UK and the standards they should expect to achieve (BACPR, 2023b). Further, since 2018 the National Audit of Cardiac Rehabilitation (NACR), in conjunction with BACPR and the British Heart Foundation (BHF), monitor cardiac rehabilitation programme standards across England, Northern Ireland and Wales, certifying those

that adhere to the BACPR core standards and the quality assurance framework (NACR, 2022b).

Cardiac rehabilitation services usually consist of a multidisciplinary team (MDT) (as recommended by BACPR standards) in the NHS, but can be externally commissioned and operated by local authorities, third sector or private sector organisations as individual exercise services which can operate in conjunction with NHS staff (De Lyon et al., 2017, BACPR, 2023b). Lasting for roughly 8-16 weeks in duration, cardiac rehabilitation services have historically demonstrated success in increasing exercise levels in coronary heart disease patients (Dalal et al., 2015). Exercise-based cardiac rehabilitation reduces recurrent myocardial infarction within 10 years and hospital admissions within 2 years, however, only 49% of eligible patients were enrolled onto exercise programmes between 2012 – 2015 (Sumner et al., 2016, Abell et al., 2017, Dalal et al., 2019, Taylor et al., 2019). In 2019, NHS England identified that a 16% increase in uptake in cardiac rehabilitation would confer 21,000 fewer hospital admissions and 8500 fewer deaths over the a 10-year period (NHS, 2019). Therefore, the NHS long-term plan outlined a cardiac rehabilitation uptake target of 85% by 2029 (NHS, 2019, Hinde et al., 2019). Nearly two years later however, cardiac rehabilitation patient uptake figures remain at 50% (Nikolov and Hubbard, 2021). The principal causes cited for poor uptake by patients include living in a rural area and lack of transport, returned to work or career commitments, lack of choice in location, social economic constraints, and dislike of group exercise participation (Nikolov and Hubbard, 2021). Moreover, recent evidence suggests a lack of meaningful change in effectiveness regarding objective health outcomes (Powell et al., 2018, Dibben et al., 2021). In 2016, a Cochrane systematic review and meta-analysis identified that the current approach to exercise-

based cardiac rehabilitation found no effect on all-cause mortality or cardiovascular mortality compared to a no-exercise control (Anderson et al., 2016). These findings remained consistent in 2018 and 2021 when further systematic reviews and meta-analyses were completed (Powell et al., 2018, Dibben et al., 2021). Conversely, health-related quality of life benefits were noted in multiple reviews of cardiac rehabilitation (McGregor et al., 2020, Dibben et al., 2021). McGregor et al., (2016) identified that individualised exercise prescription, specifically relating to sufficient dosage and intensity, is required to generate meaningful health improvements. Yet, cardiac rehabilitation in the UK is largely delivered in a group-based format, acknowledged by the national cardiac rehabilitation audit whereby 75% of services reported this as their primary delivery method (NACR, 2020). While the use of group formats is acceptable according to BACPR guidelines, individualisation of exercise prescription requires prioritisation, a recommendation that appears to have been understated during guideline inception, therefore, ineffective regarding translation into practice in previous years (McGregor et al., 2016). Furthermore, in the UK, exercise prescription and delivery within cardiac rehabilitation is associated with an assortment of healthcare professionals, some of whom are professionally regulated but not specialists in the field of exercise prescription (e.g., physiotherapists and clinical nurse specialists) and others who may or may not have such regulation, but are identified as exercise specialists (e.g., advanced exercise specialists and exercise physiologists) (MacFarlane et al., 2019, NACR, 2022b). Moreover, upon conception a large volume of cardiac rehabilitation services relied on clinical nurse specialists for exercise prescription and delivery (Dalal et al., 2015). Such diversity could contribute to the limited effectiveness of interventions, with no definitive information available regarding which healthcare professionals

lead the exercise components, including their qualifications or roles and responsibilities within services. For example, exercise specialists (as defined by NACR) can possess a range of qualifications from vocational (e.g., advanced exercise instructors in cardiac rehabilitation) to undergraduate and postgraduate degrees (e.g., physiotherapy or exercise science) (Warburton et al., 2011, De Lyon et al., 2017, Jones et al., 2021). Therefore, a comprehensive audit across cardiac rehabilitation to identify who is prescribing and delivering exercise within cardiac services in the UK is needed to ensure exercise prescription and delivery best practice is observed.

2.3.2 PULMONARY REHABILITATION

There are 11 million people in the UK with a diagnosis of lung disease, of which 1.3 million have chronic obstructive pulmonary disease (COPD), a condition responsible for considerable morbidity and mortality (BLF, 2016). As a common cause of hospitalisation, COPD was identified in the NHS long-term plan as a priority, with acute care services recommended to include exercise as part of the patient care pathway (NHS, 2019). The Royal College of Physicians (RCP), however, identify substantial deficiencies across the healthcare system, including marked under-provision of pulmonary rehabilitation (RCP, 2017). The British Thoracic Society (BTS) was established over 30 years ago and has since been at the forefront of quality assurance and pulmonary rehabilitation standard development (BTS, 2014). In conjunction with NICE, who developed quality assurance frameworks since 2004, BTS have developed and updated NICE-approved pulmonary rehabilitation guidelines since 2010, the most recent of which act as markers of high-quality, cost-effective patient care across a pathway or clinical service, covering treatment or prevention (BTS, 2014, NICE, 2016). The latest guidelines focus on the management

of stable COPD, recognising that effective COPD management pathways require an integrated approach across primary and secondary care and involve an MDT (Hopkinson et al., 2019). Pulmonary rehabilitation programmes, similar to cardiac rehabilitation, are usually found in secondary care and are recommended to last at least 6 weeks in duration (not including assessment days) with a minimum of twice weekly supervised sessions that focus on individually tailored and prescribed, progressive aerobic and resistance-based training (BTS, 2014). Within both BTS and NICE guidelines, there is, however, no identification of which healthcare professional (or what level of qualification) is needed for the delivery of the exercise component, other than stating they must be `adequately trained/experienced in prescribing and supervising exercise training and have relevant competencies to perform assessments` (BTS, 2014) [p.14]. Moreover, upon completion of the exercise programme it is recommended that exercise prescription should be provided to encourage ongoing, self-managed activity, in conjunction with information about local gyms and walking clubs, but little mention of a transition between secondary to primary care services (e.g., ERS) as seen in cardiac rehabilitation is made (BTS, 2014). A Cochrane systematic review identified that pulmonary rehabilitation in the UK relives dyspnoea and fatigue, enhances patient self-management and provides emotional support, yet, an acknowledgement was made that more research is needed regarding optimal exercise intensity and session supervision levels (McCarthy et al., 2015). In an attempt to track pulmonary rehabilitation services in the UK, a recently developed National Asthma and COPD Audit Programme (NACAP) now exists and identifies services that adhere to current guidance, however, participation by services in the audit is optional, and it currently lacks data concerning specific job roles and qualifications within individual services (NACAP, 2022). Therefore, a

comprehensive audit across pulmonary rehabilitation is required to identify who is prescribing and delivering exercise within UK services.

2.3.3 CANCER PRE/REHABILITATION

There has been a rapid increase in the number of rehabilitation services in cancer care over the past decade in the UK, some of which (but not all) offer prehabilitation pathways for specific cancer types (e.g., colorectal) (West et al., 2019, Moore et al., 2021). Until recently, however, there has been a lack of guidance or regulation for UK cancer services when setting up pre/rehabilitation programmes, leading to the sporadic provision of supervised and individualised exercise prescription and delivery for those requiring support (Jones et al., 2021). MacMillan, in conjunction with various partners such as Royal College of Anaesthetists, the National Institute for Health Research Cancer and Nutrition Collaboration and the National Cancer Action Team, have since created guidance documents for cancer service pathways and exercise prehabilitation (MacMillan Cancer Support, 2019, MacMillan, 2020). These guidelines attempt to standardise and quality assure new and existing services, provide recommendations for personalised care plans as outlined in the NHS long-term plan, outline effective treatment pathways and identify how exercise can be integrated into the patient journey (MacMillan Cancer Support, 2019, MacMillan, 2020). Cancer pre/rehabilitation is a central element of cancer care and enables patients to maximise their treatment outcomes of their treatment, while minimising the consequences of treatment and symptoms such as fatigue, breathlessness and lymphoedema (MacMillan Cancer Support, 2019). Globally, scientific research has outlined that exercise prehabilitation services can improve post-operative outcomes such as reduced intra-abdominal complications e.g., reduction in rate and duration of continence in prostatectomy patients (Singh et al., 2013, Crandall et al., 2014). In the

UK (and globally), however, exercise pre/rehabilitation services frequently only cater for patients on curative pathways, i.e., there is limited access to clinical exercise services for palliative care patients, even though research evidence demonstrates physical (maintained function and independence) and psychosocial (peer support) quality of life benefits (Oliver, 2002, McCarthy et al., 2015, Malcolm et al., 2016, Moore et al., 2021). UK guidelines, however, do reference palliative rehabilitation for patients in the terminal stage, with emphasis on maintaining a high quality of life physically, psychologically and socially, while respecting their wishes and relieving symptoms, such as pain, dyspnoea and oedema (MacMillan Cancer Support, 2019). This rehabilitation focuses on low-frequency therapy, positioning, breathing assistance, relaxation or the use of assistive devices, rather than exercise *per se* (MacMillan Cancer Support, 2019). Further, global discrepancies also exist across post-transplant exercise provision and for patients experiencing prolonged hospital stay (Hickman et al., 2019).

Current UK guidelines outline essential pre/rehabilitation service assessment tools, PA advice and structured exercise advice (MacMillan Cancer Support, 2019). Conversely, internationally recognised UK education providers (e.g., CanRehab) reference exercise guidance from the American College of Sports Medicine (ACSM) within their qualifications as it outlines more specific duration and intensity dosages for both aerobic and resistance training (CanRehab, 2023). Additionally, UK guidance recommends that the exercise pre/rehabilitation workforce is made up of physiotherapists, specialised exercise physiologists, rehabilitation/therapy support workers and cancer exercise instructors, all of whom are advocated to prescribe and deliver exercise in the specialist and targeted care pathways (MacMillan Cancer Support, 2019). Like other chronic conditions, however, there are no data regarding

which healthcare professionals are currently delivering the exercise components within each individual service, nor is there information regarding their roles and qualifications, all of which requires further exploration. Finally, there is a lack of guidance regarding the transition from secondary care into primary care exercise services, including responsibilities for this type of referral.

2.3.4 STROKE REHABILITATION

Stroke rehabilitation guidelines in the UK have been developed by RCP and are endorsed by NICE (RCP, 2016, NICE, 2019). Additionally, stroke rehabilitation services in the UK are currently audited by the Sentinel Stroke National Audit Programme, which started collecting data in 2013 (RCP, 2016). Global scientific research over the past decade has led to an improved understanding of stroke rehabilitation services, leading to changes within the UK guidance regarding exercise prescription and delivery (RCP, 2016). Exercise, PA and movement therapy are now frequently mentioned within RCP guidelines with a large volume of international evidence acknowledging that task-specific, repetitive, intensive exercises or activities will increase strength across the body, improve walking gait and enhance vascular responses (Cabanas-Valdés et al., 2013, Pollock et al., 2014, Veerbeek et al., 2014, Saunders et al., 2020). Moreover, an international systematic review of stroke rehabilitation programmes found that balance and co-ordination exercises improved functional capacity for stroke patients, however, it did not recommend type, repetition, or duration or intensity of training (Marquer et al., 2014). This lack of specific exercise prescription dosage, including duration and intensity, is also absent from UK guidance (RCP, 2016). Moreover, a recent international study recognised that unified, long-term exercise-based stroke

rehabilitation guidelines do not exist across Europe (Mameletzi et al., 2021). The workforce landscape within UK stroke rehabilitation also remains unclear, with only physiotherapists identified for movement and exercise therapy in the latest guidelines (RCP, 2016). Moreover, there is a lack of information regarding exercise referral pathways and the generation of referrals between secondary and primary care services. Therefore, an understanding of who is delivering stroke rehabilitation in the UK is required to ensure standardisation across clinical exercise services.

2.3.5 FALLS PREVENTION

In the UK, the long-term consequences of falls and falls-related injuries such as fragility fractures have increased to £4.4 billion per annum, placing an increased financial burden on the NHS (OHID, 2022). An ageing population and an increase in age-related conditions such as sarcopenia (reduced skeletal muscle strength and mass) has made the need for falls prevention programmes more prevalent (PHE, 2017, Hurst et al., 2022). Current UK guidelines for falls prevention awareness having been developed by the National Falls Prevention Coordination Group (NFPCG) in conjunction with organisations such as the British Geriatric Society (BGS), the Centre for Better ageing and NICE (NICE, 2013b, PHE, 2017). The global scientific evidence for exercise-based falls prevention programmes is overwhelming, with structured exercise prescription, that includes strength and balance training at appropriate dosage, delivering a 24% reduced rate of falls (Sherrington et al., 2019, Sherrington et al., 2020, Hurst et al., 2022). Moreover, a Cochrane systematic review found that supervised group exercise programmes, as part of a multi-factorial risk assessment, could reduce falls by 29% and the risk of falling by 19%, with home-based exercise reducing falls by 32% and risk of falling by 22% (Gillespie et al., 2012). UK guidelines outline integrated working between primary care services (e.g., ERS) and secondary

care services such as falls prevention programmes, yet no specific information is included concerning which healthcare professionals should do this or when (NICE, 2013b). Falls-specific exercise recommendations such as strength training twice a week are noted in all older adult-related government documents such as the CMO guidelines (2019) and UK Office for Health Improvement and Disparities guidance (OHID, 2022). Information on dosage, including duration and intensity of exercise interventions, however, is limited, and therefore contradicts the scientific research that outlines a need for specific intensities to be prescribed for health benefits such as leg strength to be achieved (CMO, 2019, Hurst et al., 2022). Similar to other condition-specific exercise guidelines, there is a lack of detail regarding the workforce required for effective delivery of falls prevention exercise interventions. Although, individual healthcare professionals such as Occupational Therapists do have occupation-specific guidelines for working in a falls prevention remit, so it could be assumed that they are part of the falls workforce (RCOT, 2020).

2.3.6 SUMMARY

There are wide range of clinical exercise services with nationally recognised exercise intervention guidelines. These guidelines, however, frequently lack specific exercise dosage information and fail to identify which healthcare professionals should lead the exercise component within clinical exercise services, including when referrals should be made, how and to whom.

2.4 HEALTHCARE PROFESSIONALS DELIVERING CLINICAL EXERCISE SERVICES

Healthcare professionals have long been associated with the promotion of PA and involvement in exercise rehabilitation services (Barton et al., 2021). The following is an overview of the occupations that have previously been identified within UK guidance documents in delivery of clinical exercise services (De Lyon et al., 2017, NACR, 2022a).

2.4.1 PHYSIOTHERAPIST

The Chartered Society of Physiotherapy (CSP) define physiotherapy as "a science-based profession that takes a 'whole person' approach to health and wellbeing, which includes the patient's general lifestyle" (CSP, 2023). Physiotherapists are specialists in the domain of human movement, focusing on therapeutic goals such as reducing musculoskeletal pain and improving function across all age groups in clinical settings (Barton et al., 2021, West et al., 2021). Physiotherapists in the UK are regulated by the Professional Standards Authority (PSA) via The Health and Care Professions Council (HCPC), with educational standards set by the CSP (CSP, 2023). Yet, recent global scientific literature has been critical of the knowledge and skills of physiotherapists regarding the implementation of PA, and exercise prescription and delivery in accordance with recommended guidelines (O'Donoghue et al., 2011, Lowe et al., 2018, Yona et al., 2019, Zadro et al., 2019, Barton et al., 2021). Moreover, results from a multi-national survey highlighted that despite acknowledging their role as prescribers of exercise, only 38% of physiotherapists believed they had been trained to prescribe and progress aerobic exercise and resistance training following accepted guidelines (Barton et al., 2021). Furthermore, a limited number of physiotherapists stated that they were aware of accepted aerobic

exercise and resistance training guidelines (31%), and fewer were able to name accepted guidelines (21%). Likewise, an Australian survey acknowledged only 10% of participants correctly cited the recommended PA guidelines with inconsistencies potentially due to a lack of awareness, knowledge and competency in exercise prescription for physical health (Freene et al., 2017). These studies highlighted a self-acknowledged training and education gap within the physiotherapy degree pathway regarding PA, exercise prescription and delivery (Freene et al., 2017, Barton et al., 2021). Physiotherapists in the UK undergo an undergraduate degree in physiotherapy with a minimum requirement of 1000 practice-based hours and assessment against the HCPC standards of proficiency (CSP, 2023). Yet, in accordance with CSP guidelines, within a 3-year course it is not unusual to see only one compulsory 15 credit module focusing on PA and exercise (Liverpool, 2023). Moreover, a physiotherapy postgraduate master`s degree is equally lacking in specific exercise prescription and delivery content (Liverpool, 2023). The CSP, however, are aware that collaborative working within clinical exercise services is optimal, and in 2022 highlighted that physiotherapists should work with exercise specialists such as Clinical Exercise Physiologists (CEPs) to enhance patient care within exercise interventions (CSP, 2022). Based on this evidence, physiotherapists do not undergo sufficient exercise prescription and delivery training within the current education pathway, making it essential that exercise specialists are employed within clinical exercise services.

2.4.2 OCCUPATIONAL THERAPIST (OT)

Like physiotherapists, OTs are regulated by the PSA via The Health and Care Professions Council (HCPC), with educational standards set by the Royal College of Occupational Therapists (RCOT) (RCOT, 2023). OTs provide person-centred care to

aid maximum physical and psychological function irrespective of disease trajectory or life expectancy (Morikawa and Amanat, 2022). Frequently found across most clinical services, but specifically found in neurological (e.g., stroke) or musculoskeletal services in an exercise-based capacity, the primary goal of an OT is to enable patients to participate in activities of daily living without unnecessary disruption by improving physical capacity or adapting the activity, the environment, or both to better suit the person`s needs (Hammond, 2004, Rijpkema et al., 2018). The RCOT define the role of OTs as *"helping people of all ages overcome challenges completing everyday tasks or activities – what we call 'occupations`"* (RCOT, 2023). During treatment, the OT aims to influence the physical, behavioural or contextual factors that are most likely to improve occupational performance (Rijpkema et al., 2018). Within an MDT, specifically a rehabilitation setting, an OT will attempt to empower patients by identifying adaptations that can be made to improve their occupational performance (i.e., a balanced lifestyle) even when increased capacity is unattainable or insufficient (Hammond, 2004, Rijpkema et al., 2018, Morikawa and Amanat, 2022). For example, OTs can create a plan of goals and adjustments targeted at achieving a specific set of activities (e.g., improving self-care) by rebuilding a morning routine through regular walks or learning to cook healthy evening meals (RCOT, 2023).

2.4.3 CLINCIAL NURSE SPECIALISTS

Clinical nurse specialists are regulated by the Nursing and Midwifery Council (NMC) who also devise the educational standards for this industry (NMC, 2023). A clinical nurse specialist is an advanced practice nurse with experience and knowledge in specific medical conditions that allows them to assess and diagnose patient problems autonomously (e.g., cancer) (NMC, 2023). The role of a clinical

nurse specialist can alternate between hospitals, hospice and community settings (Cantwell et al., 2018, Schmitz et al., 2021). They are prominent across clinical exercise services (e.g., cardiac, cancer and pulmonary) and usually form part of the MDT, providing support in areas such as treatment information, patient monitoring, medications and health education (Coletta et al., 2020). In the UK, during the early development of clinical exercise services, clinical nurse specialists were used in an exercise prescription and delivery capacity, primarily through completion of the BACPR exercise instructor qualification, which at the time, adhered to BACPR guidelines (BACPR, 2012, Dalal et al., 2015). Although involved in generic PA promotion, most clinical nurse specialists do not have the qualifications, knowledge and skills, time or confidence required to prescribe exercise, yet in some cardiac rehabilitation services a nurse-led model of exercise delivery still exists (NACR, 2022b). Conversely, across some conditions (e.g., cancer) a lack of exercise-specific knowledge by clinical nurse specialists can lead to misperceptions regarding the inclusion of exercise within the treatment pathway (Schmitz et al., 2021). Common barriers acknowledged are that patients are too frail for exercise alongside a perception that the strength of the evidence linking exercise with primary and secondary prevention is not definitive, specifically in the case of cancer pre/rehabilitation (Schmitz et al., 2021). Although clinical nurse specialists are a vital part of the MDT for medical support and monitoring, their limited exercise prescription knowledge and experience, alongside the evolution of exercise specialists within clinical exercise services, means that exercise delivery should no longer be part of their role.

2.4.4 ADVANCED EXERCISE INSTRUCTORS

Previously known as `Level 4 instructors`, the highest level of qualification acknowledged within the fitness industry, now advanced exercise instructors, these exercise specialists have been identified as working across a range of clinical services (e.g., cardiac rehabilitation) and ERS (De Lyon et al., 2017). In the early 1990`s, at a similar time as the formation of ERS, private fitness-based training providers developed advanced qualifications in specific medical conditions (e.g., cardiac) that aligned with National Occupational Standards (De Lyon et al., 2017). These training providers (e.g., BACPR, Later Life Training (falls) and CanRehab) attempted to upskill personal trainers from the fitness industry to bridge the gap in clinical exercise services as healthcare professionals had no experience or qualifications in exercise prescription and delivery (De Lyon et al., 2017). Unregulated, lacking unification and having no central governing body until recently, the UK fitness industry used self-regulation as a quality mark when legitimizing the certification of those operating within it (e.g., fitness professionals) (MacFarlane et al., 2019). Tiers of vocational qualifications, (a legacy of the Register of Exercise Professionals) although outdated, remains prevalent when considering the workforce that feature in clinical exercise services (Figure 2.4) (REPs, 2018).

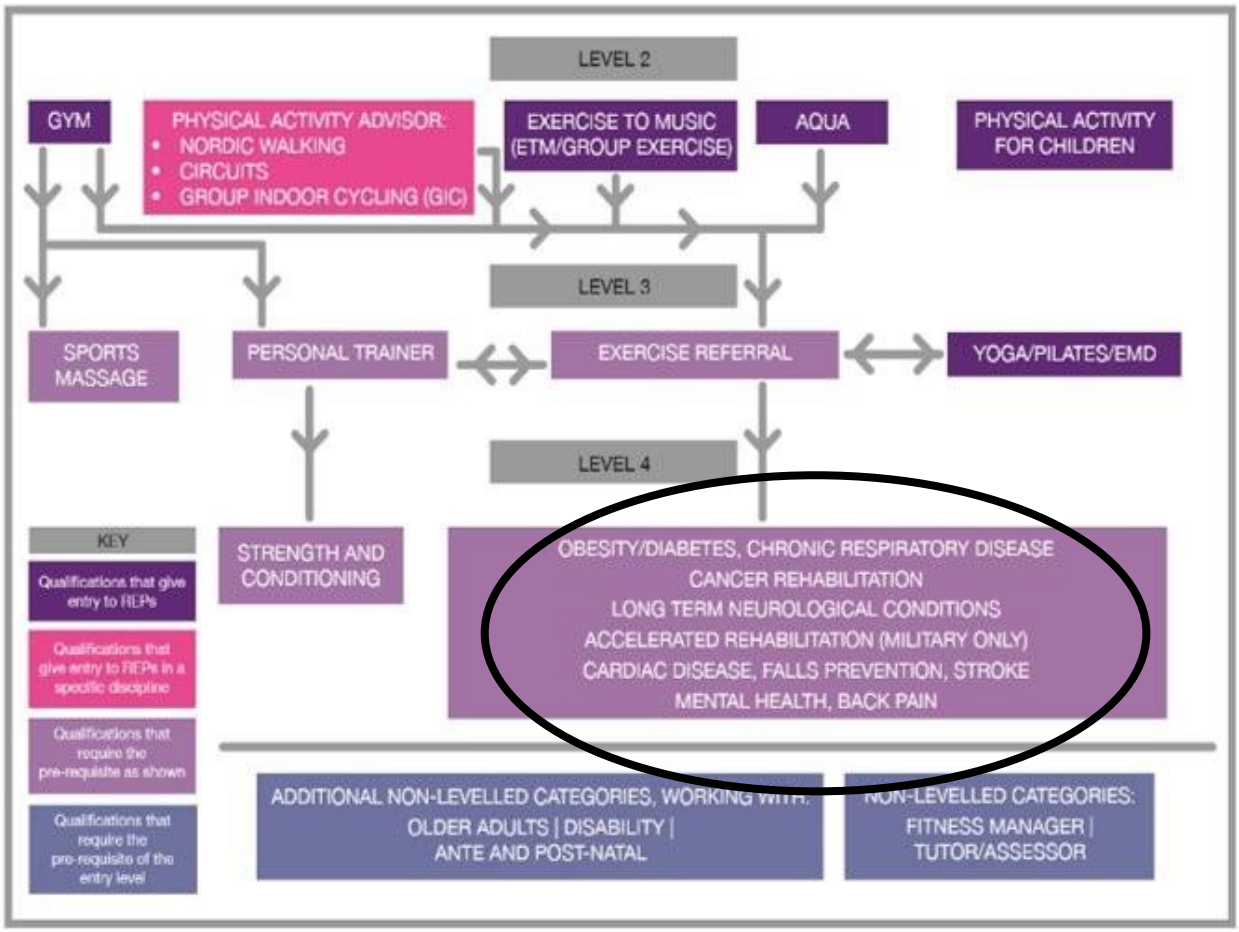


Figure 2.4: Register of Exercise Professionals qualification matrix (REPs, 2018)

Although the fitness industry is now regulated by the Chartered Institute for the Management of Sport and Physical Activity, fitness qualification standards and specifications remain limited, lacking the rigour and depth of knowledge of that of an undergraduate or postgraduate degree in a sport science-related subject (De Lyon et al., 2017, Jones et al., 2021). Previous research identified that advanced exercise instructor qualifications do not provide sufficient condition-specific knowledge and skills in exercise prescription and delivery, alongside minimal levels of behaviour change and communication training to work in clinical exercise services with higher risk patients (De Lyon et al., 2017, Jones et al., 2021). Further, advanced exercise instructors lack the clinical skills required (e.g., Exercise Tolerance Testing) to effectively assess patients and frequently have little/no interaction with patients prior

to completing any assessments, i.e., they are not involved in the initial screening process (Jones et al., 2021). Moreover, only two of the vocational qualifications (cardiac and respiratory) include a small element of clinical service observation within the course structure, therefore, workplace experience is lacking in those completing such qualifications prior to entering a clinical exercise job role (De Lyon et al., 2017). Therefore, advanced exercise instructors, although more qualified than a personal trainer, are considerably less qualified than undergraduate educated exercise scientists and lack the level of competency to work in higher risk clinical exercise services.

2.4.5 EXERCISE PHYSIOLOGISTS – THE `OLD` SYSTEM

Exercise physiologists working within clinical exercise services have existed in the UK for over 25 years, working across both public and private sectors (Leslie et al., 2022). These professionals have been known by various names, for example exercise physiologists, exercise scientists, sport and exercise scientists, exercise specialists and advanced exercise instructors (see section 2.3.4) (Leslie et al., 2022). Unregulated and unaffiliated to an organisation recognised by the professional standards authority (PSA), who regulate all medical professions in the UK, exercise physiologists would have completed a sport and exercise science-related degree or postgraduate master`s degree (De Lyon et al., 2017). A lack of clinical focus or emphasis on complex medical conditions, however, meant that exercise physiologists or similar found themselves working across the fitness industry (e.g., ERS), in sporting environments (e.g., sport rehabilitation) and within clinical exercise services (De Lyon et al., 2017). Ensuring that students could apply wide-ranging theoretical knowledge, however, was identified as extremely difficult given the lack of specialism (Lane and Whyte, 2006). This led to an increase in vocational

qualifications (e.g., BACPR) being undertaken to enable upskilling in relevant clinical populations (De Lyon et al., 2017). This hybrid version of undergraduate degree and vocationally qualified exercise physiologist remains evident in the current clinical exercise service workforce and requires exploration concerning exercise prescription knowledge, skills and competency. Such diversity led to a call to action by Jones et al., (2021) who recognised that exercise specialist training for those working in clinical exercise services in the UK should be standardised regarding exercise testing and interpretation, and knowledge and skills in exercise prescription and behaviour change, akin to international peers. Notably, other countries (e.g., Australia, USA, South Africa, New Zealand and Canada) employ standardised approaches to clinical exercise service provision regarding service structures and exercise specialist training in the prescription and delivery of exercise interventions (Santa Mina and Burr, 2013, Smart et al., 2016, Berry et al., 2020, Jones et al., 2021, Pearce and Longhurst, 2021). Further, Jones et al., (2021) identified;

"…to meet the complex needs of patients with multiple diseases and conditions, and to promote long-term exercise adherence, a specialist workforce is required containing exercise specialists who are trained in the pathophysiology of disease, screening and risk stratification for exercise, exercise prescription and delivery, and behaviour change for patients with multiple comorbidities"

2.5 CLINICAL EXERCISE SERVICES – THE INTERNATIONAL LANDSCAPE

The following sections outline the education pathway, job roles and clinical exercise services that a recognised and professional role of Clinical Exercise Physiologist (or equivalent) provide across various countries.

2.5.1 AUSTRALIA – ACCREDITED EXERCISE PHYSIOLOGIST

In 1991, in Australia, the Australia Association of Exercise and Sports Science (AAESS) (later known as Exercise and Sport Science Australia (ESSA) from 2009) was created due to an increased interest in the use of exercise in health, fitness and sporting contexts (Cheema et al., 2014) In 1996, ESSA developed a framework for the clinical profession of exercise physiology based on increasing scientific evidence regarding the efficacy of exercise in the treatment of long-term conditions (Cheema et al., 2014, ESSA, 2019b). Further, a need for qualified exercise specialists to assess patients, prescribe and deliver suitable exercise interventions was identified (Cheema et al., 2014). In 2005/6, the title of an Accredited Exercise Physiologist (AEP) was accepted by the Australian government under the banner of `Allied Health Professional` (Smart et al., 2016). This development was attributed to the rising levels of cardio-metabolic and associated chronic disease throughout Australia, with AEPs joining the established allied health professionals (e.g., physiotherapists, dieticians) in the management of largely preventable, non-communicable disease (Cheema et al., 2014, Smart et al., 2016). This recognition allowed AEPs to provide services under the national tax-payer funded universal healthcare system `Medicare` which permitted patients to claim rebates for healthcare appointments with AEP's (Smart et al., 2016, Zhou et al., 2019).

ESSA is the self-regulating professional body responsible for producing minimum professional standards, recognising qualifications, code of conduct and investigating complaints for AEPs (Cheema et al., 2014, Zhou et al., 2019). In 2022, 32 of the 40 national universities offered a course in clinical exercise physiology (ESSAb, 2022). There are two university models of training to become an AEP; a 3-year undergraduate exercise science degree followed by a 1-2 year master degree in

clinical exercise physiology, or a 4-year degree which is underpinned by exercise science and clinical exercise physiology (ESSA, 2019b). Core pathologies within the degree programmes include, but are not limited to, cancer, cardiovascular, kidney, mental-illness, metabolic, musculoskeletal, neurological and neuromuscular, and respiratory/pulmonary diseases and conditions (ESSA, 2019b). AEPs conduct health screening including risk stratification, movement analysis and functional assessments, using the results to devise safe and effective exercise interventions (either following acute injury, surgical intervention or during recovery phases of illness) that target the specific needs of individuals with chronic disease (Franklin et al., 2009, Soan et al., 2014, Smart et al., 2016, ESSA, 2019b, Stanton and Rosenbaum, 2019). Additionally, AEP-led interventions feature health education, advice and support to enhance patient health and wellbeing through behaviour change interventions (Franklin et al., 2009, Soan et al., 2014, Stanton and Rosenbaum, 2019). Such interventions can occur at any level of primary, secondary or tertiary healthcare for individuals or groups depending on employment type (Smart et al., 2016).

Currently, ~7000 registered AEPs work across healthcare services such as public or private hospitals, community-based primary care including veterans and aged health, and medical specialist clinics (Economics, 2015, Smart et al., 2016, Stanton and Rosenbaum, 2019, Zhou et al., 2019). Services are delivered from dedicated exercise physiology clinics or dual use facilities such as community fitness centres, dedicated rehabilitation centres or physiotherapy clinics (Stanton and Rosenbaum, 2019, Zhou et al., 2019). The inclusion of AEPs in public sector multidisciplinary teams (MDTs), alongside other allied health professionals such as physiotherapists, is acknowledged to provide more complete and effective care in

addition to improved adherence to exercise (Soan et al., 2014, Gillam, 2015, Rosenbaum et al., 2016, Jackson et al., 2018). AEPs frequently feature within cardiac rehabilitation and are increasingly being used in other core pathologies such as cancer, diabetes and mental health services (Soan et al., 2014, Rosenbaum et al., 2016, Jackson et al., 2018, Coletta et al., 2020, Furzer et al., 2021). The addition of AEPs in the Australian healthcare system has provided significant economic benefit across multiple long-term conditions (Economics, 2015, Ewald et al., 2018). Annual wellbeing gains of $11,847 and $7,967 per person have been estimated across cardiovascular disease and pre-diabetes/type 2 diabetes, with benefit-cost ratios of 6:1 and 9:1 respectively (Economics, 2015). One of the largest areas of evidence in the effectiveness of AEPs relates to mental health treatment (Furness et al., 2018, Furzer et al., 2021). AEP-led exercise interventions for depression demonstrated benefits of $2,239 per person and a 3:1 benefit-cost ratio, plus increased exercise enjoyment, reduced drop-outs in cohorts with depression and schizophrenia, and improved cardio-respiratory measures have been acknowledged (Economics, 2015, Stubbs et al., 2016, Lederman et al., 2016, Vancampfort et al., 2016, Lederman et al., 2017, Fibbins et al., 2019). Moreover, patients with dementia demonstrated improvements in physical function and a dose-response relationship, with AEP involvement reducing the workload burden on other health professionals (e.g., mental health nurses) allowing increased specialism focus (Happell et al., 2011, Furness et al., 2018, Parfitt et al., 2020, Raynor et al., 2020).

2.5.2 USA – CERTIFIED CLINICAL EXERCISE PHYSIOLOGIST

Clinical exercise physiology at university level in the United States (US) began in the 1860`s, however it failed to become an allied health profession until the late 1960`s some forty years after physical therapy (Clinical Exercise Physiology

Association (CEPA), 2020). Recognition of clinical exercise physiology as a profession coincided with the emergence of nationwide cardiac rehabilitation programmes, leading to the American College of Sports Medicine (ACSM) developing an exercise specialist certification in 1974 (now the Certified Clinical Exercise physiologist (ACSM-CEP) qualification) (Berry et al., 2020). Universities were encouraged to create accredited programmes of study for exercise science, including master, bachelor and baccalaureate (4-year undergraduate) degrees in clinical exercise physiology (Berry et al., 2020). These programmes varied in the volume of practical clinical experience (600 hours at undergraduate compared to 1200 hours at master), often including either an internship or research project, and a national credentialing exam (ACSM-CEP) in an attempt to regulate the quality of students moving into industry (Berry et al., 2020). There are, however, only nine accredited master programmes in the US currently, indicative of the struggle to impress upon colleges, universities, employers and perspective students the importance of the clinical accreditation (Berry et al., 2020). In 2008, ACSM established an affiliate society (CEPA). CEPA is an autonomous, independent and self-sufficient professional organisation providing registration options for allied health professionals with a primary purpose of advancing the profession of clinical exercise physiology through advocacy, networking, career development and education (CEPA, 2020). Membership with CEPA, however, is not compulsory for CEPs and is only obtained through the completion of an accredited university program or an equivalence process for members that completed non-accredited programmes but have successfully completed sufficient clinical practice hours (CEPA, 2020). Whichever route is taken, accreditation is only obtained through the successful completion of the ACSM-CEP exam (CEPA, 2020).

In 2015, there were ~6000 registered ACSM-CEPs in the US (CEPA, 2020). ACSM-CEPs are described as: `a certified health professional who utilizes scientific evidence to design, implement and supervise exercise testing and programming for people with chronic diseases, conditions and / or physical shortcomings" (CEPA, 2020). These conditions include, but are not limited to cardiovascular, pulmonary, metabolic, neuromuscular, hematologic and musculoskeletal diseases (Gallo, 2020). ACSM-CEPs work across a wide range of environments, but the majority occupy roles within MDTs in hospital or physician-based programmes such as cardiac rehabilitation (43%), with payments billed through health care providers (Kerrigan et al., 2017). Variants of private practice make up the other settings with payment made directly by patients (Kerrigan et al., 2017).

2.5.3 SOUTH AFRICA - BIOKINETICISTS

Deriving from the South African Physical Education Programme in the 1920s, biokinetics became known as a specialist clinical exercise science profession and was duly accepted by the Health Professions Council of South Africa (HPCSA) in 1983 (Strydom, 2005, HPCSA, 2022). Compulsory annual registration with HPSCA ensured the regulation of Biokineticists in line with other health professionals in South Africa, without which criminal charges would be brought against any practicing biokineticist (Ellapen et al., 2018, HPCSA, 2022). In 1987, due to the growing recognition of the biokinetics profession, the Biokinetics Association of South Africa (BASA) was formed as a professional body acting on behalf of biokineticists, intern-biokineticists and biokineticists-in-training (Nel, 2014, BASA, 2022). Currently there are ~1600 BASA members, but unlike HPSCA, membership is non-compulsory for fully qualified biokineticists as BASA are the professional body rather than the regulator (Ellapen et al., 2018, BASA, 2022). Currently, there

are 13 academic institutions that offer accredited biokineticist qualifications, seven of which offer the long-standing model of a 3-year undergraduate degree in human movement science (or equivalent) followed by 1-year postgraduate study in clinical biokinetics and a further 1-year practical internship (work-integrated learning) (Swanepoel and Ellapen, 2017, Grobler et al., 2021, BASA, 2022). A further six universities offer a newer model; a 4-year professional degree in clinical biokinetics (Ellapen et al., 2018, Grobler et al., 2021, BASA, 2022). Although both routes have similar taught content and can lead to biokineticist accreditation, the new model is solely for the edification of biokinetics, whereas the older 3+1 model allows for specialisation across other areas dependant on the postgraduate study option (Swanepoel and Ellapen, 2017, Grobler et al., 2021). The 4-year model is similar to the degrees completed by physiotherapists and occupational therapists, both of whom form part of the public healthcare system in South Africa (Grobler et al., 2021).

There are currently ~2000 fully qualified biokineticists and a further ~300 interns registered in south Africa working in private health services such as corporate wellness, private schools, sports clubs and multidisciplinary teams in clinical practices (McIntyre et al., 2009, Moss and Lubbe, 2011, Paul et al., 2021, BASA, 2022). Biokineticists and CEPs have similarities in the educational curricula due to a broad scope of practice, focusing on both the management of non-communicable diseases (NCDs) and the rehabilitation of clinical pathologies and orthopaedic injuries through evidence based assessment and exercise prescription (Ellapen et al., 2017). Biokineticist-led interventions have shown to be effective in improving non-communicable disease-related patient profiles, alongside improvements in chronic orthopaedic conditions and increased patient adherence to exercise (Evans et al.,

2016, Paul et al., 2021). Yet, resistance regarding the eligibility of biokineticists to function in public healthcare settings originates from health professional perceptions regarding the limited hours of clinical practice and a poor understanding of the public healthcare paradigm (specifically scope of practice of other professionals) (Evans et al., 2016, Ellapen et al., 2018). There are, however, recommendations for biokineticists to be integrated into the public healthcare system due to emerging evidence regarding the efficacy of their practice (Evans et al., 2016, Grobler et al., 2021).

2.5.4 NEW ZEALAND – CLINCIAL EXERCISE PHYSIOLOGISTS

CEPs in New Zealand (NZ) are recognised as allied health professionals that provide specialised exercise interventions for those suffering acute, sub-acute or chronic medical conditions akin to the Australia AEP (Pearce and Longhurst, 2021). Clinical Exercise Physiology New Zealand (CEPNZ) is the professional society for CEPs in NZ (CEPNZ, 2022). Formed in 2013, they developed professional standards for CEPs in 2015 underpinned by the Health Practitioner Competence Assurance Act (2003) (CEPNZ, 2022). Membership of CEPNZ requires an applicant to hold a minimum of a 3-year undergraduate degree in science and a postgraduate diploma or 2-year master degree (including 500 hours clinical experience) in clinical exercise physiology (CEPNZ, 2022). Upon registration applicants can complete the Clinical Exercise Physiology Board of New Zealand (CPRB) exam and obtain registration with the CPRB (CEPNZ, 2022). Although registration is voluntary, only those on the CPRB register can obtain the Annual Practicing Certificate required to work as a CEP (CEPNZ, 2022, CPRB, 2022). There are currently ~500 CPRB-registered CEPs in NZ, primarily working in CEP/physiotherapist-led cardiac rehabilitation services and private clinics (Elliott et al., 2016). Outcomes from CEP-led services in NZ have

acknowledged positive results; improved quality of life, increased cardio-respiratory fitness (7.5± 2.1 to 8.1 ± 2.3 METs), improved body composition and reduced hospital anxiety depression scores (2.8 ± 2.7 to 1.8 ± 1.8) (Allen and Longhurst, 2016, Elliott et al., 2016, Pearce and Longhurst, 2021). As both Australia and NZ use similar healthcare models, there is scope for CEPs to merge into the NZ health strategy in a similar format as Medicare services in Australia (Pearce & Longhurst, 2021).

2.5.5 CANADA – CLINICAL EXERCISE PHYSIOLOGIST

In Canada the `gold standard` exercise professional qualifications are provided by a voluntary membership organisation called the Canadian Society for Exercise Physiology (CSEP) (Warburton and Bredin, 2009, Ryan, 2019). Originally founded in 1967, CSEP devised the Health and Fitness Program and Fitness Appraisal Certification and Accreditation program in 1983 in an attempt to provide quality assurance and standardization across the fitness industry (Warburton and Bredin, 2009, CSEP, 2021). In 2007, updated versions of the CSEP qualifications were released, namely CSEP Certified Personal Trainer (CSEP-CPT) and CSEP Certified Exercise Physiologist (CSEP-CEP) (known as Clinical Exercise Physiologist as of November 2019), which are now the mainstay of the CSEP Professional Standards Program (CSEP,2021). Certification for CEPs includes completion of a university undergraduate program that covers the eight core competencies and a minimum of 100 hours practical experience (although 250 hours is recommended) prior to undertaking CSEP theory and practical exams (CSEP, 2021). There is, however, no requirement to have studied exercise physiology at master level (CSEP, 2021). In 2018, there were ~1000 CSEP-CEPs working across Canada with individuals or populations with medical conditions, functional limitations or disabilities related to

cardiopulmonary, metabolic, neuromuscular, musculoskeletal and ageing conditions (CSEP, 2021). Similar to their ESSA and ACSM counterparts, CSEP-CEPs screen, assess and prescribe evidence-based exercise interventions to those with long-term medical conditions in settings such as hospitals and specialist clinics, however, they are not recognised as allied health professionals (Warburton and Bredin, 2009). In addition, ~4000 CSEP-CPTs that have completed accredited college diplomas are able to work with apparently healthy individuals or those with a singular, stable health condition across private and public funded fitness facilities in Canada (CSEP, 2021). Recognition of CSEP-CEPs is growing, primarily due to their prevalence within cardiac rehabilitation teams for ~30 years (Jattan and Kvern, 2018). Yet, they remain underutilized in Canadian healthcare settings even though evidence acknowledges that they support, instruct and provide PA counselling more effectively for long-term adherence then physician-led guidance (Warburton et al., 2013, Thornton et al., 2016, Jattan and Kvern, 2018, Ryan, 2019).

2.5.6 REGISTERED CLINCIAL EXERCISE PHYSIOLOGISTS IN THE UK

An exercise professional akin to a CEP has existed in the UK for over 25 years, working across both public and private clinical exercise services. The `call to action` charter paper by Jones *et al.*, (2021), however, acknowledged a need for PSA regulated and registered CEPs in the UK healthcare system to increase patient safety and align with other allied health professions. A group of UK and international academics identified the Australian system for AEP accreditation as a benchmark/roadmap for the UK, leading to the creation of a professional body called Clinical Exercise Physiology UK (CEP-UK) (CEP-UK, 2021b). CEP-UK then collaborated with the Registration Council of Clinical Physiologists (RCCP) (now the Academy of Healthcare Scientists (AHCS)) due to their regulation of other health professionals in

the UK that follow equivalent training and standards as HCPC accredited professionals. CEP-UK used the ESSA AEP scope of practice (e.g., knowledge and skills) as a framework to devise an equivalent scope of practice for registrants in the UK (CEP-UK, 2021b). The CEP-UK (2021) scope of practice identifies that a registered CEP should be able to:

- Understand the physiological, psychological, social, behavioural and cultural factors that influence health status, including its management using exercise and PA interventions.
- Understand the effect of disease, disorder and dysfunction and their prescribed medicines, on acute exercise response and chronic adaptation to exercise and PA interventions.
- Undertake appropriate health status screening including evidence-based risk stratification.
- Select, conduct and interpret appropriate evidence-based tools for the assessment and monitoring of clinical status and functional capacity, including problem solving and goal setting.
- Plan, design, prescribe, deliver and monitor personalised evidence-based exercise and PA interventions in one-to-one or group format, based on health status, functional capacity and aetiology.
- Provide evidence-based education and advice to support behaviour change including self-management of long-term exercise, PA engagement, and nutritional status.

Once the scope of practice had been defined, an equivalence pathway was developed to allow current practicing CEPs and academics to become registered (Figure 2.5) (CEP-UK, 2021b). To gain registration, an applicant would need to demonstrate that they had a minimum of six years education and experience in experience prescription and delivery within clinical exercise interventions across a range of pathologies (e.g., cancer, cardiac, respiratory, falls and frailty, stroke and neurological) (CEP-UK, 2021b). That pathway opened in December 2021, meaning that CEP was a recognised health profession in the UK from that point onwards.

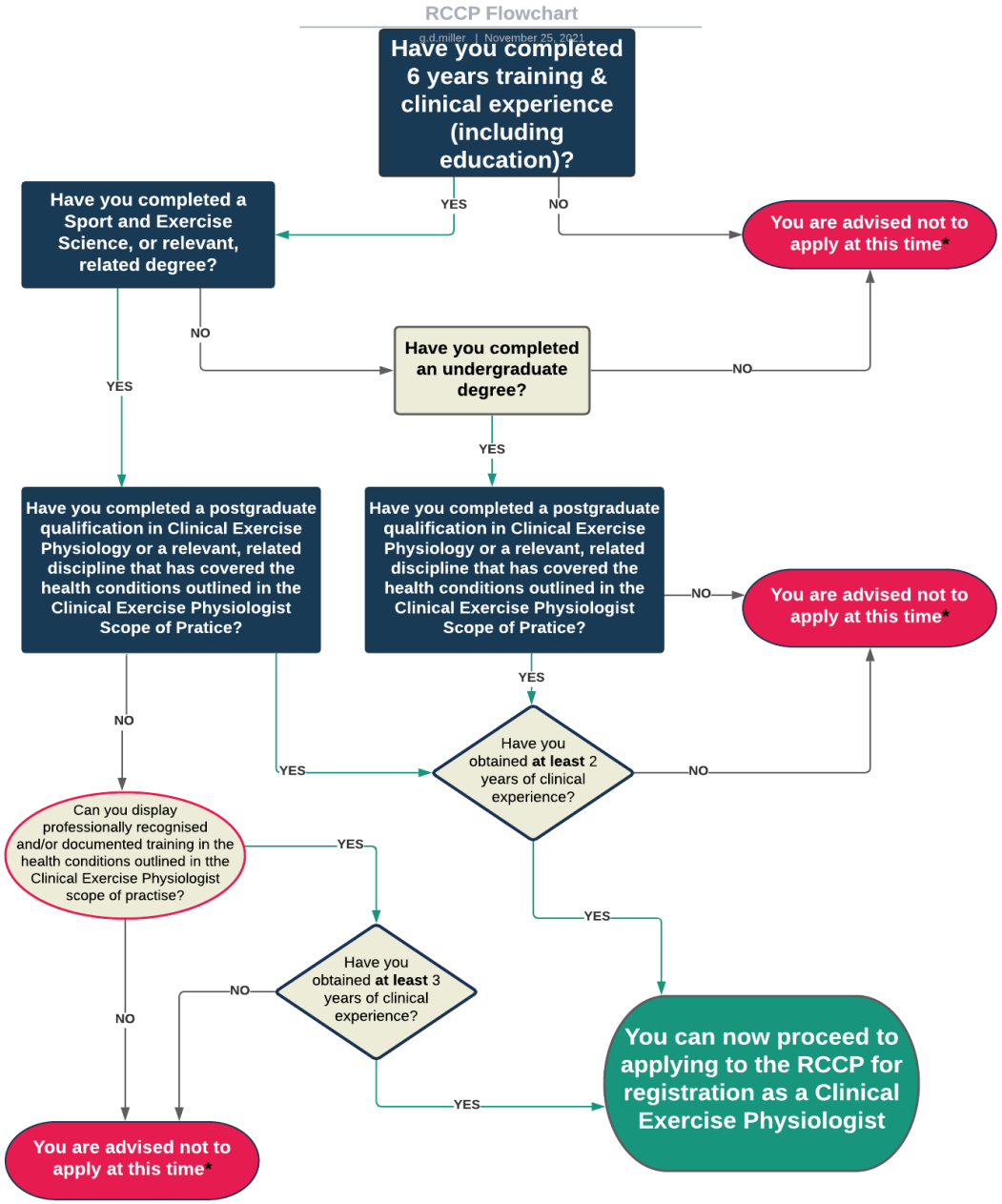


Figure 2.5: RCCP equivalence pathway for individuals (CEP-UK, 2021b)

Once the equivalence pathway had become available to applicants, CEP-UK devised a curriculum framework and developed a graduate pathway with RCCP/AHCS which opens for university postgraduate master`s programmes to be accredited from

January 2023 (CEP-UK, 2021a). Upon completion of an RCCP accredited master's degree an applicant will have met the new CEP-UK scope of practice, including completing 250 hours of practice-based learning, of which 140 hours would have been situated in a clinical placement (CEP-UK, 2021b).

RCCP registered CEPs are self-regulating like Australia, meaning that registration is voluntary unlike other professions in UK (e.g., physiotherapy) (CEP-UK, 2021b). The main reason for this is that UK CEPs are not regulated by law and are not as yet part of the allied health professional title (PSA, 2023). Regulatory bodies, such as RCCP/ACHS, ensure that the public is protected when choosing and using healthcare care services by working with professional bodies such as CEP-UK to assess the knowledge, skills and competency levels of CEPs working within and outside the NHS (PSA, 2023). RCCP abide by the quality checks made by the PSA to retain PSA registration status, in turn, CEP-UK, must meet the quality assurance processes set out by the RCCP to retain accreditation under the umbrella of the RCCP (PSA, 2023). CEP-UK, the organisation responsible for assessing and regulating individual applicants and educational institutions, then use their scope of practice and curriculum framework to assess potential members (CEP-UK, 2021b). Finally, upon application and during ongoing membership, it is the responsibility of a member (either individual or institution) to maintain the quality standards required for membership, e.g., individuals are required to achieve continued professional development over a specific period and education providers need to abide by curriculum requirements (CEP-UK, 2021b). This self-regulation aims to help the general public obtain a higher quality of healthcare by ensuring that the CEPs on the register are competent and trustworthy (CEP-UK, 2021b, PSA, 2023). Registers also

provide the general public with a point of contact to discuss malpractice, making CEPs accountable for any negligence (PSA, 2023).

A registered CEP in the UK is defined as *`a health professional displaying a diverse range of appropriate knowledge, skills and competencies who can work autonomously across a variety of areas and targeted long-term conditions`* (CEP-UK, 2021b). CEPs are now recognised as specialising in functional assessment and interpretation, exercise prescription design and delivery, and evaluation of evidence-based exercise interventions in apparently healthy individuals and those with long-term conditions in in primary, secondary and tertiary care (CEP-UK, 2021b). Currently, there are 50 RCCP-registered CEPs in the UK (RCCP, 2023). An exploration of a service that employs registered CEPs can be used to understand and share best practice regarding what works, and the rationale for why and how.

2.5.7 SUMMARY AND RATIONALE

Currently, in the UK a hybrid system exists within clinical exercise provision as exercise services are being delivered by different professions, both registered and unregistered (De Lyon et al., 2017, Jones et al., 2021). This system is in transition moving towards exercise provision in clinical exercise services being delivered by (i) only registered health professionals, and (ii) those that are appropriately trained to prescribe and deliver exercise. The financial burden of chronic disease on the NHS is rising, highlighting the unequivocal need for more clinical exercise services as identified by the NHS long-term plan (NHS, 2019). In addition, increased life expectancy, and therefore age-related healthcare support, leading to increased NHS surgical waiting times and reduced hospital bed availability, means that preventative or rehabilitation-based exercise is essential (OFID, 2023). Registered CEPs are a

workforce solution to exercise prescription and delivery in NHS services (Jones et al., 2021). Moreover, some clinical exercise services have already advocated that all clinical exercise physiologists in the NHS become registered (Leslie et al., 2022). During this time of transition within clinical exercise provision in the UK, research work is required to understand what delivery of service works and best, delivered by who, and what knowledge and skills these professionals need to deliver safe and effective exercise services. An identification of services recognised for outstanding clinical exercise provision can be used to explore and share best practice. Such exploration will aid current services effectiveness and promote new clinical exercise services for different conditions. The knowledge and skills identified as essential for working in clinical exercise services can be acquired from this research and feed into the teaching of future graduate CEPs from accredited master's courses. This thesis will aim to provide a roadmap of recommendations outlining best practice for clinical exercise service and education providers.

3 Study 1:

Clinical exercise provision in the UK: comparison of staff job titles, roles and qualifications across five specialised exercise services

3.1 INTRODUCTION

Long-term chronic and complex medical conditions are the largest financial burden on public healthcare (NHS, 2019). In 2019, in the UK, 38% of the adult population had a long-term condition, with 50% of all GP consultations, 65% of outpatient visits, and 70% of in-patient bed days attributed to long-term conditions (ONS, 2021). Ageing exacerbates the healthcare burden, as ageing is associated with an accumulation of long-term conditions, which leads to a decline in physical function linked to physical inactivity (Ryan et al., 2015). Furthermore, healthcare expenditures in the UK have traditionally increased more than inflation resulting in consistent budget deficits (Lafond et al., 2016). There is, however, overwhelming evidence of the efficacy of targeted exercise interventions for the prevention and management of ageing long-term conditions (Scott et al., 2018, Long et al., 2019, Sherrington et al., 2019, Buckley et al., 2021). Thus, embedding exercise into clinical services in acute settings is essential for managing ageing and long-term conditions and reducing long-term healthcare utilisation (NHS, 2019).

Exercise provision as part of clinical services for ageing and medical conditions is highly inconsistent and piecemeal, i.e., it has emerged separately for different conditions. In the UK, education and exercise programmes are most common in cardiac rehabilitation. The British Association of Cardiovascular Prevention and Rehabilitation (BACPR) have been instrumental in promoting and attempting to standardise delivery of exercise provision for secondary prevention for

cardiac patients (BHF, 2017). The National Institute for Health and Care Excellence (NICE) identifies six stages of cardiac rehabilitation in the UK (NICE, 2013a). These stages have recently replaced the more commonly recognised terminology (internationally and in the UK) of service "phases" (NICE, 2013a). Stages 1-3 (phases I and II) focus on acute recovery from an event or procedure, eligible patient identification and referral to cardiac rehabilitation programmes within 24 – 72 hours of hospital discharge (NICE, 2013a). The waiting times in the UK for integration into stage 4 (phase III) exercise rehabilitation varies but usually occurs within 21 days (non-surgical patients) or 33 days (surgical patients) (NACR, 2020). Stage 4 (phase III) is frequently delivered in clinical settings, incorporating specialised exercise assessment, prescription and education sessions using a multi-disciplinary team for 6-12 weeks (NACR, 2020). Upon completion, patients are re-assessed and discharged for long-term management into stages 5-6 (phase IV) community-led exercise (NICE, 2013a). Exercise provision at phases III and IV is delivered by staff with a minimum of the BACPR exercise instructor qualification, including physiotherapists, nurses and exercise instructors (BACPR, 2019). This standardised exercise provision in the UK is consistent with its international peers (e.g., Australia) and is acknowledged as covering the core components of clinical care, including assessment, exercise prescription, education, behaviour change support and evaluation (NICE, 2013a, Woodruffe et al., 2015, Jackson et al., 2018). In contrast to this approach for cardiac patients, exercise services for patients with other conditions are less well defined in terms of structure and, importantly, with delivery by a range of individuals with varying qualifications and skills (De Lyon et al., 2017, NACR, 2020). Previous audits of condition-specific clinical exercise provision in the UK (e.g., National Audit for Cardiac Rehabilitation (NACR, 2020) and Sentinel Stroke

National Audit Programme (SSNAP, 2019)) have not attempted to distinguish between exercise staff job titles, roles or qualifications, nor have these been compared across conditions. This is important to consider since long-term health conditions, especially in older individuals, rarely occur in isolation (i.e., individuals have multi-morbidity) (Ryan et al., 2015). If the NHS is to achieve its priority of providing standardised, effective and cost-efficient exercise services for long-term health conditions, a system-wide understanding of what is currently being offered, to whom, and by whom is required.

Research studies from several countries have identified the need for specialist exercise staff within clinical settings (Malek et al., 2002, Franklin et al., 2009, Warburton et al., 2011, Vancampfort et al., 2016, Cantwell et al., 2018, Zhou et al., 2019). Indeed, in some countries (e.g., Australia, USA and Canada), established routes exist for accreditation of tertiary qualified exercise specialists (e.g., Accredited Exercise Physiologists, Certified Clinical Exercise Physiologist and Clinical Exercise Physiologist, respectively), who are recognised as allied health professionals with knowledge and skills to deliver exercise assessment, prescription, delivery, supervision and optimisation for individuals within specific scopes of practice that include ageing and long-term conditions (Cheema et al., 2014, Smart et al., 2016). There is evidence from Australia that Accredited Exercise Physiologists (AEPs) provide a substantial economic benefit which translates to an annual well-being gain of $11,847 per person and a benefit-cost ratio of 6:1 across cardiovascular disease (Economics, 2015). In addition, AEP specific services have increased physical fitness and improved physical well-being and mood (Forsyth et al., 2009, Wynaden et al., 2012). There is no such accredited exercise specialist in the UK, and there is minimal guidance on staff competencies or standardised education required

to deliver quality assured exercise testing and programming for clinical populations. Consequently, UK clinical exercise services are diverse in terms of staff qualifications, expertise and training. In contrast to the situation in comparable countries, physiotherapists often undertake clinical exercise delivery in a dual-capacity rather than a specialised and accredited graduate exercise healthcare professional (physiologist) (Cheema et al., 2014, De Lyon et al., 2017). Whilst, this could be viewed as a cost-effective approach, physiotherapists` implementation and knowledge of exercise prescription and PA guidelines has previously come under scrutiny in other countries (O'Donoghue et al., 2011, Yona et al., 2019, Barton et al., 2021) with exercise physiologists recognised as the specialist healthcare professionals in this area (Franklin et al., 2009, Vancampfort et al., 2016).

In the UK, no current best practice model for all long-term conditions exists for how services should be structured to achieve clinical exercise outcomes. Even if cardiac rehabilitation is viewed as best practice, this is not employed for other specialised services. In the example of cancer (a priority in the NHS long-term plan), a UK strategy founded on an evidence-based platform has been introduced utilising both pre/rehabilitation exercise interventions to help reduce the potentially negative side effects of treatment and to improve survival (van Rooijen et al., 2019, West et al., 2019). In this case, an appropriately trained exercise workforce is essential in the exercise assessment, prescription, delivery, supervision and optimisation of physiological outcomes and behaviour change (Renouf et al., 2022). A recent study identified that the exercise provision for long-term conditions (including cancer) has previously focused on exercise referral schemes (ERS) (De Lyon et al., 2017). Such services rarely employ staff with the knowledge, skills, and competencies of other health professionals within clinical settings (Morgan et al., 2016, De Lyon et al.,

2017). ERS were, however, designed for apparently healthy individuals with risk factors, and different skills and competencies might be required when delivering *specialised* clinical exercise services designed for those with long-term complex medical conditions (Morgan et al., 2016). Therefore, a better understanding of the job titles, roles and qualifications of those delivering specialised clinical exercise services is required to provide a basis for comparison (Aicken et al., 2010). This study aimed to collate delivery information across the five most prevalent clinical exercise services in the UK (cardiovascular, respiratory, stroke, falls, and cancer), focusing on understanding staff job titles, roles and qualifications. A coherent understanding of extant service provision can inform recommendations for systematic and consistent exercise provision in clinical settings, a key priority in the NHS long-term plan (NHS, 2019).

3.2 METHOD

Design

A quantitative, systematic mapping approach was used to review clinical exercise services across the UK for cardiac, respiratory, stroke, cancer and falls. The intention was to use ‘mapping’ to establish the relevant components of exercise services to create a virtual “picture” of current provision in the UK and not to `map` services in the geographical sense. This form of data collection presented an overview of information in a condensed format to enable comparison across services [36]. Data collection occurred across two stages: 1. identification of eligible clinical services and the extraction of publicly available information; 2. follow up telephone calls and e-mails with representatives from each service to clarify details not apparent in the online material (e.g., service delivery protocols, job roles and staff competencies).

Data were then extracted based on relevant items from the physical activity referral scheme taxonomy (PARS) (Hanson et al., 2020) (Appendix 10.1).

Data collection

Data were collected between May and September 2020 and focused on "usual face-to-face" service provision delivered before the March 2020 Covid-19 lockdown (after which face-to-face clinical exercise provision in the UK was temporarily paused, with ~50% of cardiac services moving to online delivery only (O'Doherty et al., 2021)). All data were collected by one author (AC). Members of the research team (LG, HJ, PW) independently reviewed a random sample of 5-10% of the extracted data to ensure continuity and validity of methods. They completed monthly debriefing sessions to discuss the data collection.

Eligibility

Inclusion: A clinical care service that included PA or exercise, had a formalised referral process in place and specifically focused on the management of cardiac or respiratory conditions, stroke, cancer or falls prevention. This included but was not exclusive to:

- Structured PA / exercise programmes
- PA / exercise behaviour change consultations
- Referral to a third-party provider for PA / exercise prescription

Exclusion:

- Services were excluded if no contact information could be found, or insufficient public domain information was available (incomplete data sets).

- Exercise referral schemes that provided non-specific exercise or PA for multiple health conditions and risk factors were excluded.

Procedure

Stage 1: Internet search:

Location search: The first part of the search focused on identifying clinical services across trusts, health boards and commissioning groups, sourced via NHS websites. These were then broken down into individual trusts and then sites (e.g., hospitals) for each of the 135 clinical commissioning groups in England, 14 regional NHS Scotland health boards, 7 local health boards and 3 NHS trusts which focus on Public Health Wales, and 5 health and social care boards across Northern Ireland. Individual services responsible for exercise provision were identified using the service specialism within each site. These services' webpages and social media accounts were searched for information about clinical exercise provision for cardiac, respiratory, stroke, falls, and cancer services (e.g., job descriptions and personal specifications).

Condition-specific search: The second part of the internet search focused on clinical exercise services listed in the public domain, such as previous national audits across condition-specific services such as the National Audit for Cardiac Rehabilitation, Sentinel Stroke National Audit Programme, MacMillan `*Move More*` programme and British Lung Foundation reports. Services were identified, and any available information was extracted. Duplication of services across these processes was removed.

Stage 2: Follow up contact:

Services were contacted by telephone, e-mail (to arrange a telephone call), or video conferencing by the first author (AC). On initial contact, service providers were asked to identify the most appropriate individual to provide operational information

and pass on their contact details. These individuals were then contacted via telephone and, if no response was elicited, e-mails were sent (a minimum of two over a 4-week period). All staff contacted were contracted (full or part-time) or freelance (paid by the hour) capacity. Service representatives were given a verbal or written explanation of the study protocols with verbal consent for participation obtained before data collection. Services were advised that only information available in the public domain was requested during this process.

Data Extraction

A data extraction framework using Microsoft Excel worksheets and based upon the PARS taxonomy questionnaire (Hanson et al., 2020) was used to record information for each service. The PARS taxonomy is a newly validated, peer-reviewed tool for recording PA service information and was developed to promote standardised PA intervention classifications to improve policymakers' interpretation and understanding of the evidence base (Hanson et al., 2020). Although developed for generic PA interventions, the framework was used as a guide for the data extraction, providing specific headings in areas of interest. This included:

Level one: Classification of providers, settings and activities:

Providers were coded as: The National Health Service (NHS) (free health services within the UK), local authorities (local government services) and third-sector organisations (charities, voluntary or non-profit groups). Settings were coded as: Clinical NHS (defined as a hospital site where exercise is undertaken in either internal rooms or attached buildings), community (e.g., buildings that were in some cases NHS operated and not attached to a hospital or non-leisure centre buildings such as local community centres) and leisure centres (usually local authority

operated). Activities were coded as either one-to-one or group-based exercise sessions.

Level 2: Characteristics of staff qualifications and roles:

Staff qualifications were coded as vocational (practical / work-orientated levels 1 - 4) and academic (BSc / MSc). Level 4 vocational qualifications (such as BACPR) are the highest levels obtainable in the fitness industry. They are usually a mixture of theory and practical based learning over a period of months specialising and focussed on one scope of practice, e.g., cardiac rehabilitation, falls, stroke, respiratory or cancer. Undergraduate academic qualifications are typically three years in duration with postgraduate a further year (full-time) and cover a broader scope of practice. Service structure data were coded based on cardiac rehabilitation definitions of phase III provision and referral onto phase IV. Functional assessment delivery was coded by job title.

Data analysis

Data were analyzed for frequencies and percentages using the Statistical analysis software package (version 26).

Ethical approval

The purpose of this study was to define the current practice and was not aimed at producing generalisable academic knowledge. It was therefore defined as a service evaluation ("designed and conducted solely to define or judge current care" (p.1, (UKSHC, 2017)), and did not require research ethics approval. Ethical principles of consent, anonymity and data protection and privacy (Twycross and Shorten, 2014) were adhered to throughout.

3.3 RESULTS

Service identification

A total of 890 services were identified as eligible for inclusion, and complete data was obtained from 731 of these services (Table 3.1). All services had structured exercise components. None had behaviour change consultations only.

Table 3.1: Exercise provision services for cardiac, respiratory, stroke, falls and cancer in the UK

Service	Number of services identified	*Incomplete data	*Complete data used in the study
Cardiac	242	26 (11%)	216 (89%)
Respiratory	202	40 (20%)	162 (80%)
Stroke	158	29 (18%)	129 (82%)
Falls	147	30 (20%)	117 (80%)
Cancer	141	34 (24%)	107 (76%)
Total	890	159 (18%)	731 (82%)

**Data set completion based on level 1 classification and level 2 characteristics obtained from the physical activity referral schemes (PARS) taxonomy (Hanson et al., 2020)*

Level 1: Classification

Services

Cardiac services followed the most standardised approach with a 6-stage (4-phase) delivery model (Figure 3.1). Using this model as a tool for comparison and keeping with the internationally recognised term `phases`, respiratory, stroke, and falls services followed phases I-III but had no specific route to community exercise programmes (stage IV). Cancer services followed stages I and II and had no stage III but a route to community exercise programmes (phase IV).

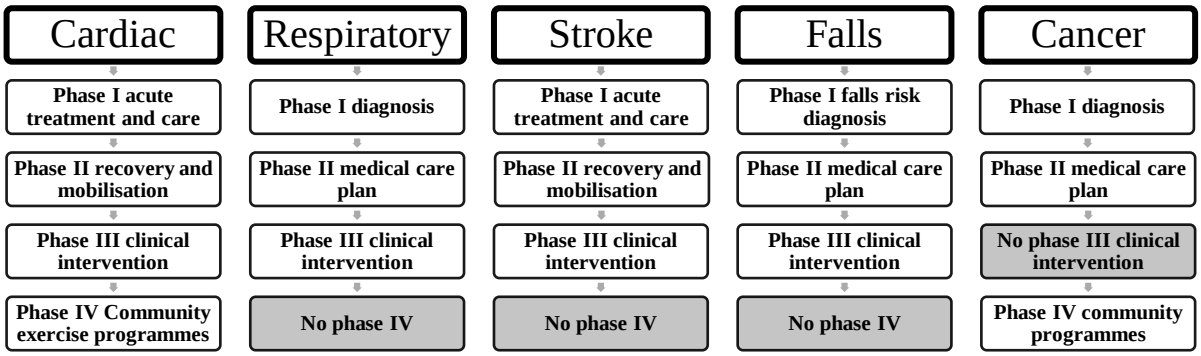


Figure 3.1: Clinical exercise pathways for cardiac, respiratory, stroke, falls, and cancer services in the UK

Provider, setting and activity type

The NHS were the principal service providers for cardiac (89%), respiratory (84%), stroke (95%) and falls (82%) exercise provision (Table 3.2). Cancer exercise services were provided by NHS (30%), local government (44%) or third sector organisations (25%). NHS sites, either clinical or community, catered for most service provision, with cancer services being the exception. Disease-specific group sessions were most prevalent in cardiac (96%) and respiratory (100%). Whilst some exercise services offered group sessions (51%) in falls, one-to-one sessions were more common in falls (89%) and stroke (100%) exercise provision. Cancer exercise provision included a large proportion of both disease-specific group (91%) and one-to-one sessions (76%).

Table 3.2: Providers, settings and activity types available to patients across the cardiac, respiratory, stroke, falls and cancer clinical exercise services in the UK.

	Cardiac (n=216)	Respiratory (n=162)	Stroke (n=129)	Falls (n=117)	Cancer (n=107)
Provider (% and number of services)					
NHS	89% (n=192)	84% (n=136)	95% (n=123)	82% (n=95)	30% (n=32)
Local Authority	6% (n=13)	-	4% (n=5)	15% (n=18)	44% (n=47)
3rd Sector	4% (n=9)	16% (n=26)	1% (n=1)	3% (n=4)	25% (n=27)
***Delivery settings offered by services (%)**					
Clinical NHS	83% (n=179)	54% (n=87)	95% (n=123)	82% (n=96)	25% (n=27)
Community	44% (n=95)	87% (n=141)	26% (n=34)	73% (n=85)	50% (n=53)
Leisure Centre	31% (n=67)	20% (n=32)	5% (n=6)	15% (n=18)	66% (n=71)
Green / Outdoor space	-	-	-	-	47% (n=50)
***Activity type offered by services (%)**					
1-2-1	11% (n=24)	1% (n=2)	100% (n=129)	89% (n=104)	76% (n=81)
Specific Group	96% (n=207)	100% (n=162)	-	51% (n=60)	91% (n=97)
Walking	-	-	-	-	59% (n=63)
Chair-based	-	-	-	92% (n=108)	-
Green / Outdoor space	-	-	-	-	14% (n=15)
Education	100% (n=216)	100% (n=162)	100% (n=129)	100% (n=117)	60% (n=64)

****NB Services offered multiple delivery settings and activity types***

Level 2: Characteristics

Staff titles and roles in exercise delivery and functional assessment

Physiotherapists, either independently or in combination with other staff, including exercise physiologists, exercise instructors, and occupational therapists, delivered exercise provision in cardiac, respiratory and falls services (Table 3.3). In stroke, physiotherapists and occupational therapists (95%) were the primary deliverers of exercise provision. In cancer, exercise instructors were the primary deliverers of exercise provision on their own (79%). Exercise physiologists were employed by 46 (6%) services and exercise instructors by 257 (35%) services across all specialisms

(see supplementary data). Physiotherapists completed the initial functional assessments upon patient entry into most services. The exception was cancer services, with exercise instructors primarily completing the functional assessments (73%).

Table 3.3: Exercise delivery and functional assessment completion by job title across cardiac, respiratory, stroke, falls and cancer services in the UK.

Job title	Cardiac Services	Respiratory Services	Stroke Services	Falls Services	Cancer Services
	n=216	n=162	n=129	n=117	n=107
Combinations of exercise deliverers (% and number of services)					
Physiotherapist	38% (n=83)	57% (n=93)	-	5% (n=6)	11% (n=10)
Physiotherapist & Exercise Physiologist	1% (n=2)	-	-	-	-
Physiotherapist & Exercise Instructor	13% (n=27)	17% (n=28)	-	5% (n=6)	6% (n=6)
Physiotherapist & OT	-	13% (n=21)	95% (n=123)	75% (n=88)	4% (n=4)
Physiotherapist, OT & Exercise Instructor	-	-	5% (n=6)	-	-
Specialist Nurse	4% (n=9)	-	-	-	-
Exercise Physiologist	11% (n=23)	7% (n=11)	-	-	1% (n=1)
Exercise Instructor	30% (n=65)	6% (n=9)	-	15% (n=17)	79% (n=84)
Exercise Physiologist & Instructor	3% (n=7)	-	-	-	2% (n=2)
Assessments completed by (%)					
Physiotherapist	54% (n=117)	85% (n=138)	84% (n=108)	94% (n=110)	22% (n=24)
Nurse	20% (n=43)	5% (n=8)	-	-	4% (n=4)
Occupational Therapists	-	-	16% (n=21)	35 (n=4)	-
Exercise Physiologist	13% (n=28)	7% (n=11)	-	-	1% (n=1)
Exercise Instructor	13% (n=28)	3% (n=5)	-	3% (n=4)	73% (n=78)

NB: The grey shaded box indicates registered and accredited health care professionals delivering exercise independently or in conjunction with exercise professionals.

The qualifications of staff delivering the exercise components were identified independently of job title or whether they held salaried positions within the services (Table 3.4). Some staff were recognised as having a stand-alone qualification (e.g., BSc), while others held a combination of qualifications (e.g., BSc and level 4 vocational exercise instructor). Staff qualified in physiotherapy (undergraduate or

postgraduate), either individually or combined with other qualifications (e.g., level 4 vocational exercise instructor), were widely employed across exercise provision for cardiac (37%), respiratory (67%) and falls (41%) services. Level 4 qualified exercise instructors without a tertiary degree were employed to deliver cancer exercise provision (88%) but were also prominent in cardiac (37%) and falls (29%) services. MSc qualified exercise physiologists were employed in cardiac (18%), respiratory (8%) and cancer (1%) services but not in falls and stroke exercise delivery. In 129 stroke services, exercise provision was delivered by physiotherapists and occupational therapists.

Table 3.4: Exercise delivery staff qualifications across cardiac, respiratory, stroke, falls and cancer in the UK

	Cardiac staff (n=346)	Respiratory staff (n=221)	Stroke staff (n=264)	Falls staff (n=283)	Cancer staff (n=283)
Qualification(s) (% and number of staff with each)					
BSc Physiotherapy	14% (n=48)	62% (n=137)	49% (n=129)	35% (n=98)	7% (n=19)
BSc Physiotherapy & MSc. Physiotherapy	2% (n=6)	-	-	-	-
BSc Physiotherapy & Level 4 Exercise instructor	21% (n=74)	5% (n=10)	-	6% (n=16)	1% (n=2)
*BSc Sport & Exercise Science & MSc. Exercise Physiology	2% (n=6)	4% (n=9)	-	-	1% (n=3)
*BSc. Sport & Exercise Science, MSc. Exercise Physiology & Level 4 Instructor	16% (n=55)	4% (n=9)	-	-	-
*BSc. Sport & Exercise Science & Level 4 Exercise Instructor	8% (n=29)	11% (n=25)	-	-	2% (n=5)
BSc. Occupational Therapy	-	-	49% (n=129)	25% (n=72)	2% (n=5)
BSc. Occupational Therapy & Level 4 Exercise Instructor	-	-	-	6% (n=16)	-
Level 4 Exercise Instructor	37% (n=128)	14% (n=31)	2% (n=6)	29% (n=81)	88% (n=249)

NB *BSc. Sport and Exercise Science undergraduate degree or equivalent

In cardiac, there were 78 exercise physiologists identified (Figure 3.2), 61 of which were MSc qualified (Table 4). These additional roles (n=17) were occupied based on

undergraduate and level 4 vocational exercise instructor qualifications. Similarly, there were 34 exercise physiologists in respiratory services, with 18 qualified at the MSc level. Again, these remaining roles (n=16) were occupied by undergraduate and level 4 vocational exercise instructor qualified staff. In total, 115 exercise physiologist titles were found across all services, with 82 having an MSc qualification in exercise physiology.

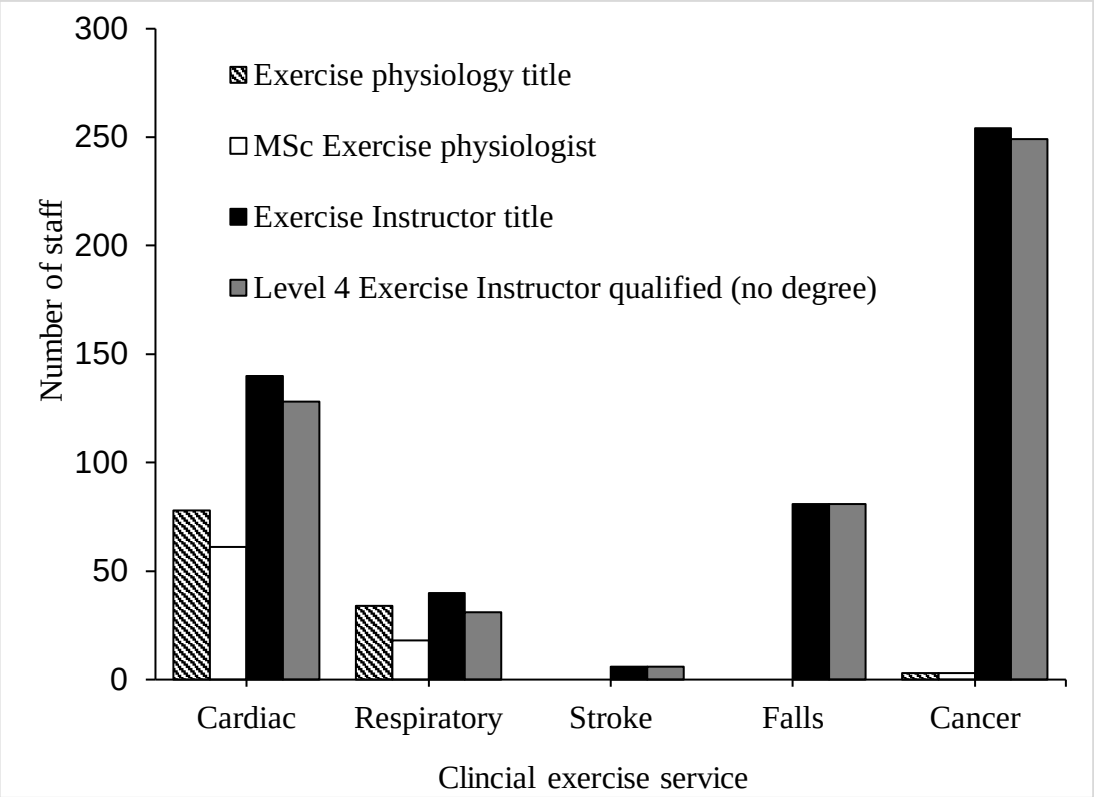


Figure 3.2: A comparison between exercise physiologist and exercise instructor job titles and qualifications across cardiac, respiratory, stroke, falls, and cancer services in the UK.

3.4 DISCUSSION

The NHS long-term plan advocates exercise within clinical care services in the UK. There are, however, few recommendations regarding service structures for this to occur, or the staff requirements, qualifications, accreditation or the continued

professional development needed to fulfil service objectives. This study aimed to provide a coherent understanding of current (pre-COVID-19) clinical exercise services across cardiac, respiratory, stroke, falls and cancer in the UK, focusing on understanding staff roles, qualifications and delivery settings. We found that clinical exercise services were not consistent in staff job titles, roles, or qualifications across service specialisms. In all services, exercise was delivered by either physiotherapists, occupational therapists, exercise physiologists or exercise instructors. The exercise specific job titles for individuals not part of statutory regulation was not uniform across services and did not align with qualifications. Our data suggest that regulation of exercise job titles, roles, and qualifications could help standardise exercise provision within clinical settings in the UK.

An 82% (n=731) coverage of identified services provided a substantial sample size to represent the sector. Cardiac had the greatest number of clinical services, followed by respiratory, with stroke, falls, and cancer having lower levels of provision. A lack of standardisation, however, was identified across service models. Cardiac rehabilitation was the only service utilising both a phase III and phase IV exercise approach consistently, a model that has been adopted internationally as it contains the core components of clinical care (Jackson et al., 2018, Shields et al., 2018, NACR, 2020). Each of the other services (respiratory, falls, stroke and cancer) lacked recognised phasing of exercise provision. Stroke and falls rehabilitation services appear to be built around the traditional clinical therapy provision. Notably, physiotherapists and occupational therapists provide functional movement and activity of daily living support (e.g., getting dressed) in the hospital or in-home settings through early service discharge teams based on patient needs rather than exercise in a more traditional form. Although exercise-specific provision

is recommended, stroke severity can impact the duration of sessions and activities undertaken and is difficult to categorise or standardise (Elson et al., 2009, James and McGlinchey, 2022). Furthermore, stroke and falls services lacked phase IV provision, referring patients directly to exercise referral schemes if/when available. Cancer services typically lacked clinical phase III exercise provision contrasting with recommendations outlined in the cancer prehabilitation guidance document, which advocates universal (anyone), targeted (those with late effects of disease or treatment) and specialist (those with complex needs) interventions provided by both clinical and community hub multi-disciplinary teams (MacMillan Cancer Support, 2019).

The results of this study suggest staff roles and qualifications across services in the UK are inconsistent. Exercise delivery staff within multi-disciplinary teams were primarily physiotherapists, although some services also utilised exercise physiologists and exercise instructors according to their job title. While other countries (Australia, USA, Canada and South Africa) have recognised that clinical exercise physiologists are at the forefront of exercise delivery, the UK does not currently recognise or regulate this profession (Jones et al., 2021). In other countries, the level of qualification for a Clinical Exercise Physiologist is an accredited master's degree in clinical exercise physiology (Smart et al., 2016, Pearce and Longhurst, 2021). While the UK has master's degrees labelled as including clinical exercise physiology, such degrees are not accredited or standardised for content, nor include competency-based assessment or clinical skills. Accordingly, our current data demonstrate that the number of exercise physiologists job titles where individuals had a relevant master's degree (e.g., MSc. Clinical Exercise Physiology) were low (82). Moreover, qualification level bore little alignment to exercise

physiologist job titles (n=115) with individuals also employed based on BSc degrees and vocational qualifications (n=33). Similarly, this level of qualification was present under the exercise instructor job title (n=59) rather than vocational qualifications alone. The current UK system does not stipulate a level of qualification for delivery of clinical exercise provision, with some employers accepting a level 4 exercise instructor qualification (e.g., BACPR). This is likely a contributing reason for the discrepancies between job titles and qualifications. Previous research has highlighted concerns regarding competence and effectiveness of exercise provision in higher-risk and more complex conditions (De Lyon et al., 2017). It would be prudent for the UK to consider formal regulation of clinical exercise physiologists akin to those of other countries. Such an undertaking would align the education and training with other allied health professionals, establish more consistent training of exercise specialists in clinical practice, and most importantly, standardise the exercise knowledge and skill levels of those working with patients with complex long-term conditions (Jones et al., 2021).

The NHS generally provided services and operated in either clinical or community sites except for cancer pre / rehabilitation, which had a diverse range of support, including third-sector charity programmes (MacMillan Cancer Support, 2019). Interestingly, the 44% provision by local authorities appeared to be a legacy of cancer programmes (e.g. Move more (macmillan.org.uk)), which were often delivered out of leisure centres (66% of services offered those venues) and staffed by exercise instructors with vocational qualifications. The location of cancer services could be a factor in the use of exercise instructors with accessibility and capacity linked to local exercise referral scheme availability. Exercise provision often focused on group activity (cardiac and respiratory) or one-to-one (stroke and falls), with

cancer demonstrating a mixture of provision. Ultimately, a consistent level of provision and access should be available across services to ensure all patients are catered for.

IMPLICATIONS FOR PRACTICE

A standardised approach for all specialist services, possibly aligning with the staged (or four-phased) delivery model as seen in cardiac exercise services, requires exploration across all clinical exercise provisions. The current disparate structures in service models, staff roles, and qualifications make it difficult to evaluate and compare both within and across services. Standardised services require staff roles to be outlined and job titles underpinned by appropriate levels of qualifications with the same level of regulation as other professions within the health and social care system. Such recognition could assist in providing assurances to the employers, clinical colleagues and the public that exercise healthcare professionals are appropriately qualified to deliver safe, effective and personalized exercise interventions for primary and secondary prevention across a spectrum of chronic diseases. Such changes would further explore service delivery effectiveness, patient outcomes and cost-effectiveness. It is noteworthy to outline this information was obtained during the COVID-19 pandemic (May - September 2020) without an Open Science Framework registration, the information collected was reported based on the pre-COVID-19 service delivery, and we acknowledge some of the information collected might have changed due to staff re-deployment and halting of exercise services in response to the pandemic.

3.5 CONCLUSION

Clinical exercise provision is currently highly inconsistent and piecemeal in the UK. Staff job titles, roles, qualifications and service models differ between cardiac, respiratory, stroke, falls and cancer exercise services. The exercise specific job titles for individuals not part of statutory regulation were not uniform across services and did not align with qualifications. Future efforts should create a clear, consistent and regulated training route for staff across all specialist services in the UK if the NHS long-term plan is to be met. Additionally, regulation and integration of accredited exercise physiologists into clinical exercise services in the UK should be explored. Finally, research is needed into any unique services concerning staff constructs identified within this data to explore what works well and what could be improved within clinical exercise provision to assist in devising a best practice service model.

4 GENERAL METHODS

4.1 INTRODUCTION

This chapter provides general information regarding the data collection and analyses methods used in chapters 5-7. The theoretical framework that supports this research is also discussed to provide a more detailed insight into the rationale for these methods and the objectives behind these choices. Individual, study-specific methodologies are contained within each chapter.

4.2 QUALITATIVE APPROACH

Qualitative data is rich in detail regarding a particular phenomenon and attempts to further understand the reality of a particular field through a participant's constructs and experiences, to characterise the surrounding environment (Patton, 2002). Qualitative research is recognised as any findings not generated by statistical procedures or quantification and is the most suitable methodology to gain a more context specific understanding of a particular setting (Strauss and Corbin, 1990). Qualitative enquiry allows participants to respond and discuss questions without being constrained, whilst providing the researcher with the opportunity to probe into answers or observations as needed to obtain more detail surrounding descriptive, experiences or behaviours (Patton, 2002, Berg, 2004). Therefore, after establishing the research questions, it was deemed appropriate to utilize a qualitative research design for the following studies, allowing the opportunity to examine the current landscape with clinical exercise services through the staff, service user and the researchers own perspectives (Patton, 2002). Whilst there is a methodology section in each of the four studies (chapters 3, 5, 6 and 7) which provides an overview of the

methods utilized in each respective study, the following sections discuss the qualitative approaches and underpinning framework used throughout the thesis.

4.3 ETHNOGRAPHY

The choice of using a qualitative or quantitative research method often depends on an individual's particular ontological (i.e., reality and what can be known about it), epistemological (i.e., the relationship between the knower and what can be known) and methodological (i.e., how someone will explore what they believe can be known) perspective (Smith et al., 1994). One primarily (but not exclusively) qualitative research method within social sciences is ethnography (Aktinson and Hammersley, 1998, Davies, 2012). The definition of the term `ethnography` is often contested (Aktinson and Hammersley, 1998). For some, it is a philosophical form of research requiring dedication and emersion into a community either overtly or covertly, and the collection of fieldnotes over a period (Aktinson and Hammersley, 1998, Taylor et al., 2015). Conversely, ethnography can be seen as a type of methodology used as and when required, with the outcomes transcribed into publications (Okely, 2020). A consensus is that ethnographic practice aims to explore social phenomena, i.e., uncover specific human beliefs, attitudes, values and behaviours (Aktinson and Hammersley, 1998, Davies, 2012, Taylor et al., 2015, Okely, 2020). Ethnography provides anthropologists unique opportunities to gain insight into `real-world` or `life-lived` experiences from both emic (the insiders point of view) and etic (objective observations) perspective (Davies, 2012). Although there are individual methodologies within ethnographic practice, they are often used in tandem, for example, actively combining interviews with other fieldwork methods such as observational field notes, is integral to increase insight into individual

behaviour motivations and societal tensions which may not be forthcoming in shared environments (Rapport, 2012).

4.4 RESEARCHER POSITIONING

Historical traditions within ethnographic research have meant that methodological bias has come into question (Davies, 2008). The premise that ethnographers offer a detached, innocent, non-prejudice and objective viewpoint has been identified as idealistic in some quarters, as humanistic traits are learned based on a researchers age, gender, social relationships and life experience which ultimately impact their ability to convey objective findings (Rosaldo, 1989; Bourdieu, 2003). Therefore, I feel it pertinent to write the rest of this section in first person and outline my own personal beliefs, experiences and potential bias. I am a white male, mid-forties, RCCP-registered clinical exercise physiologist with excess of 20 years of experience within exercise provision for long-term conditions in both public (NHS and local authority) and private sectors. As a practitioner my time has predominantly been spent in cardiac, respiratory, falls and neurological rehabilitation, focusing on functional assessments and the delivery of both one-to-one and group exercise prescription. Additionally, I designed and delivered exercise qualifications for one of the UK`s leading health and fitness training providers for eleven years, with seven of those focused on the research and development which has given me a good understanding of training providers and qualification specifications. My previous research has focused on the qualitative exploration of barriers and facilitators within the field of exercise referral and although I have limited experience in ethnography, I have postgraduate certification in this methodology. Throughout the case studies my perspective is influenced by my researcher role which aims to understand and portray, with credibility and plausibility, the clinical exercise service environments

that I become part of, based upon verbatim accounts and my interpretation of critical events. I am also influenced by my previous practitioner roles which allow me to observe clinical exercise settings through the eyes of a practitioner, for example the layout of the environment and the delivery of exercise within it. I would classify my philosophical positioning as a 'critical realist', as conveyed by Maxwell (2012). I acknowledge that there is no possibility of having a single, one correct way of understanding the world, with the only way to gain a greater understanding of it being to listen and further develop my knowledge from others who have obtained both expert knowledge and experience within any specific area (Maxwell, 2012).

4.5 A QUALITATIVE, ETHNOGRAPHIC, CASE STUDY DESIGN

A collective (multiple site) case study design (chapters 5 and 6) was completed to better understand real-world practice associated with working in clinical populations within and across two unique exercise settings (Yin, 2003). Case study protocols are recognised as developing context-sensitive expertise (Flyvbjerg, 2006). Crowe et al., (2011) identify that case studies are used to understand the impact of policy initiatives or service development. Yin (2003) acknowledges that case studies should be used to identify the "how", "what" and "why" questions, in addition to the contextual conditions under study. These questions, however, are not only applicable to existing intervention practices as they can offer additional insights into what gaps exist in its delivery or why one implementation strategy might be / have been chosen over another (Crowe et al., 2011). Case studies are often thought of as naturalistic studies, opposed to experimental designs which often test a specific hypothesis by manipulating an environment (Emerson et al., 2011, Creswell and Clark, 2017). This thesis includes two studies whereby time was spent within two individual settings, underpinned by a case study framework, but using ethnographic principles (primarily

researcher observations) to expand on verbatim quotes. Therefore, four key features of qualitative research are incorporated into the fabric of the two studies in this thesis (chapters 5 and 6), with chapter 7 (a compare and contrast review of the data) identifying common themes. Firstly, both studies two and three are naturalistic with data being obtained from participants within their natural surroundings (Emerson et al., 2011, Creswell and Clark, 2017). Secondly, the studies attempt to capture descriptive data, with data taking the form of words and observations rather than numbers for statistical analysis (Creswell and Clark, 2017, Hammersley, 2018). Third, the data is analysed inductively using a bottom up rather than top-down approach allowing the key themes to shape the research findings, in as organic a way as is possible (Creswell and Clark, 2017). Finally, the search for meaning and understanding remains the primary goal, therefore, the accurate capturing and presentation of the perspectives of the clinical exercise service staff and service users is imperative (Creswell and Clark, 2017, Hammersley, 2018).

4.6 COMPOSITE CHARACTERS **(Chapter 6)**

A large volume of data was collected in study 3 (chapter 6) across a broad range of participants including CEPs, clinical nurse specialists, service leads, dieticians and service users. Therefore, it was deemed unrealistic to present individual case studies (for each person), primarily due to confidentiality issues. Subsequently, four 'composite characters' were created to tell the stories of the participants in this study, (whilst retaining anonymity) with a continual synthesis to the theoretical and empirical literature to help explain and understand the meanings behind the stories. The grouping of participants was made based on job roles, experience and qualifications in their field. These details appear in a non-chronological order and are

mapped to the Consolidated Framework for Implementation Research which underpins the research aims and objectives of the cardiac service case study, however, they do not necessarily include every event, yet focus on the critical moments (Nesti et al., 2012b).

4.7 CONSOLIDATED FRAMEWORK FOR IMPLEMENTATION RESEARCH (CFIR)

The CFIR is a framework designed for use in implementation studies and uses multiple existing theories to create a list of constructs that assist in theory development for service implementation and evaluation across various contexts (Damschroder et al., 2009). CFIR focuses on what works where and why across multiple contexts within an organisation (Damschroder et al., 2009). This framework is becoming more popular in health research as it provides additional context to organisational operations by focusing on both summative outcomes and the formative evaluation of the processes involved in service implementation (Stetler et al., 2006). CFIR can also provide a framework for case study work as it highlights five domains of the organisational context that are important for successful implementation; the intervention, inner and outer settings, individuals and the implementation process (Damschroder et al., 2009). Within each domain there are constructs that can be explored relating to the implementation process or the evaluation of it. These constructs can be used individually or in bit part with each other, depending on the setting, type of research being undertaken and the objective of the research (Damschroder et al., 2009). The case studies in the upcoming studies (chapters 5 and 6) will focus on the contextual (staff) factors within clinical exercise services identifying how each team (exercise specialists and the wider MDT) leading the exercise provision function, what works well, what challenges exist and what

recommendations can be made from both service and training provider perspectives (Table 4.1).

Table 4.1: Consolidated Framework for Implementation Research domains and constructs applied across each research study (Damschroder et al., 2009)

CFIR Domain	CFIR construct to consider	Overarching context within the case studies
Intervention development & challenges	**Intervention design & evidence**	Most interventions are often complex and multi-faceted, with many interacting components such as funding providers, service managers and associated staff. Interventions have 'core components' (the essential and indispensable elements of the intervention such as the exercise delivery) and an 'adaptable periphery' (adaptable elements such as exercise locations). This domain focuses on how the service was designed and currently operates.
Service users and resources	**Economic climate and Patient need**	Changes within the outer setting, such as service funding or COVID-19 can impact how the service will proceed with its offering. In this case the focus is on what barriers are faced by service users regarding participation and what resources are available to support them to combat these issues.
Organisation & structures	**Service characteristics**	This domain focuses on how the structure of your service (staffing, age, size, qualifications) impact the implementation of the intervention. Why such characteristics were chosen and how they have developed over time.
Staff skills & perspectives	**Staff Knowledge, skills, competencies and beliefs**	This domain focuses on the individuals within the services (primarily exercise specialists) and how their cultural, organizational, professional, and individual mindsets and beliefs impact service provision. Such beliefs overlap with personal level of qualifications, skills and competencies they have and their beliefs in this area.
Service process and effectiveness	**Staff beliefs regarding effectiveness**	Although, CFIR focuses on implementation and evaluation, this domain concentrates on service effectiveness (or not) and the key indicators of it from staff perspectives.

Across each individual case study, the first domain will consider the effectiveness of the intervention designs, for example, reasons for the service delivery in a clinical or community setting. The outer context (second domain) focuses on the patient needs and accessible resources, ensuring that they align with service provision aims and objectives, and provide suitable support for the local population. The third domain will focus on the staff infrastructure and organisational requirements that are needed to enable a service to function well (inner context) and could involve levels of staff

training or supervisory support. The fourth domain (characteristics of individuals) focuses on the individual staff knowledge, skills and competencies, motivation and self-efficacy to deliver the service effectively (Greenhalgh et al., 2004). Finally, the fifth domain reflects on the service effectiveness from staff perspectives. The CFIR will focus on the day-to-day operations within each site. An emphasis will be placed on who does what (scope of practice for staff)? What works well and why? What challenges exist and how they can be overcome? And what recommendations can be made to existing service and education providers for best practice clinical exercise provision in the future. The methodology outlined above was chosen in order to address the current gaps in the clinical exercise provision scientific literature by gaining an in depth understanding of existing provision with relevant recommendations for practice. Specific study by study methodology information can be found in chapters 5-7.

5 Study 2:

Exploration of the structure and delivery of a UK cancer-specific clinical exercise service: a multi-method case study

5.1 INTRODUCTION

In the UK, in 2019, 38% of the UK adult population had some form of long-term chronic and complex medical condition, translating into one of the largest financial burdens within public healthcare (Lafond et al., 2016, NHS, 2019, Statistics, 2019). The NHS long-term plan advocates exercise within clinical care services, however, there are few recommendations regarding service structures for this to occur, or the staff requirements including qualifications or regulation/ accreditation (Alderwick and Dixon, 2019). For the NHS to achieve its priority of providing standardised, effective and cost-efficient exercise services for long-term health conditions, a system-wide understanding of what is currently being offered, to whom, and by whom, is required (Jones et al., 2021). Recently, study 1 (chapter 3) audited exercise provision within UK clinical services focusing on exercise staff job titles, roles and qualifications across cardiovascular, respiratory, stroke, falls and cancer services. Study 1 reported service provision was inconsistent, piecemeal and unstandardised, within and across most of these conditions. Moreover, a large part of the exercise provision was delivered by an unregulated workforce (study 1 chapter 3).

Given the current disparate structures in service models, staff roles and qualifications, it is difficult to evaluate and compare within and across services (study 1 chapter 3). This study was therefore designed, as an in-depth case study of clinical exercise service delivery, primarily examining the staff structure and qualifications of one selected service. The service was cancer-specific and located in

the North-West of England. Cancer is one of the leading causes of global mortality (Bray et al., 2018) and research over the past 20 years has identified how exercise can be beneficial prior, during (i.e., surgical or non-surgical interventions such as chemotherapy and radiotherapy) and following treatment in improving both cancer-specific and non-cancer specific outcomes (Ahmad et al., 2016, Backemar et al., 2015, Tjeertes et al., 2016, Hall et al., 2000, Richards et al., 2018, Snowden et al., 2010). A number of hospital trusts are developing and attempting to commission cancer-specific exercise services and insight into a cancer-specific clinical exercise service are pertinent (MacMillan Cancer Support, 2019, Moore et al., 2021). It is important to highlight, in the study 1 audit (chapter 3) exercise service provision were less defined in terms of structure compared to other clinical services such as cardiac, and were frequently delivered by an inconsistent range of individuals with a diverse set of qualifications and skills ranging from vocational exercise qualifications, to master degrees in sport and exercise science-related subjects. Therefore, the service purposely selected to be examined in this study was chosen because it was (i) well ***established*** (one of the largest and first to operate in the UK), (ii) *recognised* nationally for good practice (highlighted by MacMillian and received the Health Service Journal NHS partnership award), and (iii) ***delivered*** by exercise health professionals alongside a Multi-Disciplinary Team (MDT) via a novel delivery method (in the community in collaboration with leisure services) (Moore et al., 2021).

This study used a multi-methods approach to explore (i) how staff knowledge, skills and competencies contribute to the provision of an effective clinical exercise service, (ii) how these components assist in creating effective

service teams, and (iii) to identify existing challenges from staff and service user perspectives.

5.2 METHOD

Design and theoretical underpinning

This study adopted a case study format and employed ethnographic principles (including the exploration of peoples' beliefs) to uncover values and attitudes retained by the participants. Multiple qualitative methods (online semi-structured interviews, online focus groups, online and face-to-face observation and field notes) were employed to explore service operations from staff and service user perspectives both individually and collectively. A comprehensive implementation framework (Consolidated Framework for Implementation Research (CFIR)) was adopted (Damschroder et al., 2009). The CFIR, originally designed for use in implementation studies, combines existing theories to create a list of ideas which assist in future service implementation and evaluation (Damschroder et al., 2009). CFIR focuses on what works, where, and why, and has increased in popularity for use in recent health research including qualitative, ethnographic work (e.g., (Downey et al., 2021)). Specific components relating to service delivery including staffing structures, staff skills and competencies, and service user perceptions allow a detailed exploration of these areas through contextual discussions regarding service operations (Stetler et al., 2006, Damschroder et al., 2009). All five sections of CFIR were drawn upon throughout this study. Section 1 explores the effectiveness of intervention designs (e.g., reasons for the service delivery in a clinical or community setting). Section 2 explores the staff structure that is needed to enable a service to function well (e.g., hierarchy of working). Section 3 explores how the service users and local resources are used in the running of the service. Section 4 explores the individual staff

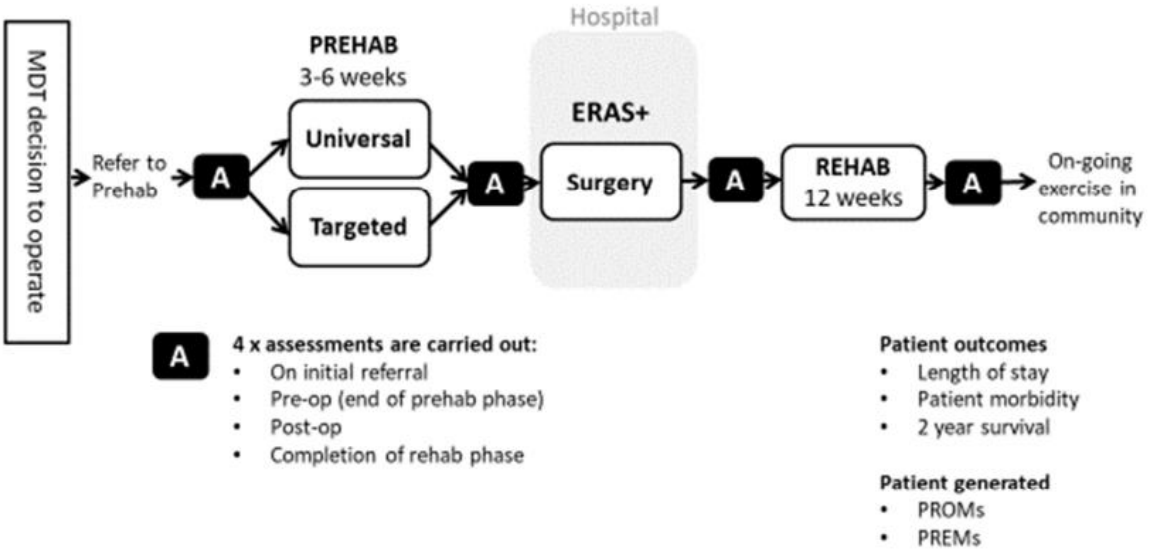
knowledge, skills and competencies needed to deliver the service effectively (e.g., qualifications and experience). Section 5 explores the service effectiveness from both staff and service user perspectives. These categories underpin the study aims and the frame of the interview guide.

Prehab4Cancer Service

The Prehab4Cancer (P4C) service began in April 2019 in collaboration with system-wide stakeholders such as a leisure trust consortium and the NHS cancer alliance. The original programme objective was to provide two thousand patients face-to-face community-based pre/rehabilitation using affiliated leisure facilities (n=99) across the Greater Manchester region. This area is an urban location in the North-West of England with higher than national average levels of deprivation. Patients are supported before (prehabilitation) and after (rehabilitation) cancer treatments (either surgical or non-surgical), and where applicable during treatment, to have increased physical, nutritional and psychological support. Full details of the intervention are provided in Table 5.1 (Hoffmann et al., 2014).

Table 5.1: Intervention components mapped onto items 1 to 9 of the TIDieR Checklist (Hoffman et al., 2014)

Item Number	Item
Brief Name	
1	Prehabilitation for cancer (P4C) programme
Why?	
2	Prehab for cancer patients undergoing surgery in Greater Manchester in the North-West of England become part of the Enhanced Recovery After Surgery+ (ERAS+) pathway. This was designed and developed to reduce complications (primarily pulmonary) after major surgery. The original implementation of ERAS+ at Manchester Royal Infirmary, demonstrated a 50% reduction in respiratory complications in patients undergoing major surgery and reduced hospital length of stay by 3 days (Moore et al., 2021). Such innovation has led to the integration of prehab into the ERAS pathway. The starting point for the surgical P4C pathway is the multi-disciplinary team decision to operate based on the pathway below. In phase 1, all patients undergoing colorectal, lung and upper GI cancer surgery are offered 'Prehab4Cancer' without restriction.



What?

3 **Intervention resources**

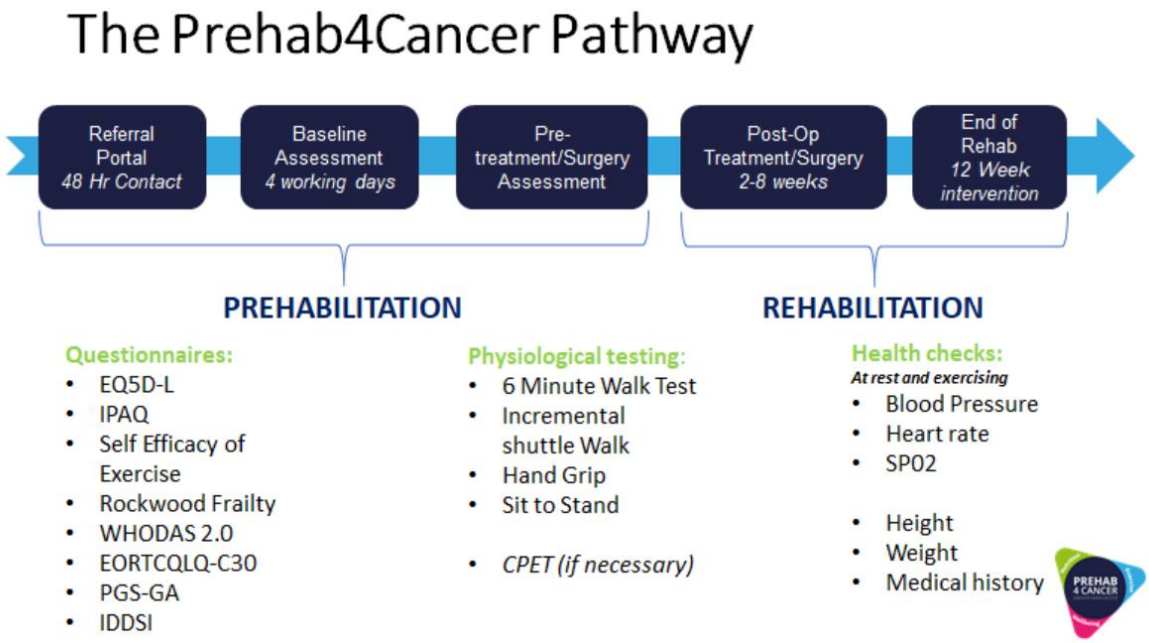
Consultation paperwork and assessments – see procedures and key components (5) below. Equipment available was leisure centre gym-based machinery such as cardiovascular and resistance machines, in addition to free weights and resistance bands. Assessments were carried out using blood pressure monitors, oxygen saturation monitors, weight and height scales, a hand grip machine and shuttle walk cones.

Once paperwork and assessments were completed, a brief conversation about service user goals and service provision was undertaken where possible with the instructor. Service users were then triaged into the pathway of support that best suited their condition and level of need:

4 **Procedures and key components**

Participants' wellbeing modality was constructed using the National Institute for Health and Care Excellence stepped care model approach to psychological support, highlighted in the Macmillan Prehabilitation Evidence and Insight report from 2017 (MacMillan, 2017) and accepted as an effective framework to deliver mental wellbeing assessment and intervention.

Practical application: How this works practically is summarised in section 2.1.2 figure 2.2.



Eligibility: Anyone with a cancer diagnosis on a curative pathway of treatment.

Who will provide?

5.

There are 12 community leisure organisations in the region that collaborate with the local cancer alliance and stakeholders to deliver the intervention. Various referral pathways were used:

Referring health professionals: Referrals were accepted from all health professionals (GP's, physiotherapists, clinical nurse specialists).

Specialist Exercise instructors: Based in regions, these instructors delivered face-to-face and virtual sessions to service users. P4C specialist exercise instructors (including the service manager/deputy manager) were qualified in cancer-specific exercise via vocational qualifications identified by the Chartered Institute for Management of Sport and Physical Activity (CIMSPA). They also retained multiple different specialist vocational qualifications in areas such as cardiac, falls, and stroke rehabilitation. Additionally, these instructors had undergraduate degrees in a Sport and Exercise Science-related subject. There were six staff in total at this level, all retaining responsibility for the whole patient journey. Exercise instructors (2) were qualified in exercise referral, they did not have any higher-level vocational qualifications or undergraduate degrees. Their role was to support the specialist exercise instructors in service delivery.

Programme manager and deputy manager: Ensured all staff had relevant resources to fulfil service requirements, including equipment and training. Assisted in delivering assessment clinics and exercise prescription sessions.

How?

6.

Instructor-led: Face-to-face and one-to-one format of delivery to individuals. This then expanded into small group exercise sessions (due to

	COVID-19) consisting of 8-15 service users via the Microsoft team's platform (virtual).
Where?	
7.	All service user consultations and activities took place virtually via Microsoft teams or face-to-face at a local leisure centre.
When and how much?	
8.	The intervention had an initial 3–4-week prehabilitation phase (where applicable) and a 12-week funded period of rehabilitation. The programme was not restricted in terms of days or times service users could use facilities. Service users were able to access the gym, swimming and fitness classes throughout the region as part of the intervention. Once 12-weeks had been completed service users had the option of continuing to attend the facilities at a subsided rate of membership. The virtual classes, however, were free of charge and had no access restrictions, i.e., it surpassed 12 weeks due to lack of cost associated with virtual delivery.
Tailoring	
9.	All sessions were tailored to individual goals and used individualised exercise prescription developed by specialist exercise professionals.

Participants

Ethical approval was obtained from national NHS ethics committee [ref: 21/EM/0227]. The lead researcher spent time (2-3 days for 12 weeks) within the service between January –March 2022, concentrating on field notes and observational data for the first six weeks via attending exercise classes ran by the service. Krane and Baird (2005) suggested that the process of fitting in is essential to the success of the fieldwork, stating that poor rapport with the participants will result in poor data as they remain unwilling to open their lives to the researcher. This increased both staff and service user familiarity before completing any semi-structured interviews. Participant recruitment was based on convenience sampling with access to both and service users that were freely accessible (Krane and Baird, 2005). A verbal announcement was conducted during service user classes (n=30), asking if attendees (n=50) wanted to participate. If attendees were interested, they were provided with a written study information sheet and consent form, and a

day/time was arranged for focus group attendance. No one formally declined or stated any reasons for not taking part, but often participants cited time restrictions so did not volunteer. An initial (virtual) scoping meeting was conducted with all exercise staff (n=8) explaining the study aims and objectives, after which written consent was obtained covering each aspect of the data collection, including semi-structured interviews and observation. All service users (n=50) attending verbally consented to observational data collection. The final sample (n=7) included a range of staff members; a service manager (n=1) who oversaw the intervention, P4C exercise specialists (n=4) (one of which was a deputy service manager). All of these staff held undergraduate degrees and specialist cancer-related qualifications and delivered the sessions. In addition, there were P4C exercise instructors (n=2) with exercise referral qualifications who supported session delivery. All staff members were white British, female (n=5) and male (n=2), aged between 22-52 years (mean age of 30 years), and employed full-time by the consortium of leisure trusts with a minimum of two years' experience in the role. Service users (n=9) taking part were white British (n=8) and Asian (n=1), male (n=6), retired (mean age of 67 years), had various long-term medical conditions, and were specifically referred due to having one of the three cancer pathologies accepted via the service inclusion criteria (i.e., colorectal, lung or upper gastrointestinal). Very few participants had a relationship with each other or the practitioners before attending the intervention, with the majority forged through interactions. The research team's involvement was limited to participant recruitment and data collection and the team had no prior relationship with the intervention or participants.

Data collection

Staff participants worked across different sites based on individual caseloads allowing observational and semi-structured interview data collection. The eclectic and multi-faceted nature of the service provision meant that service users were unpredictable in their attendance which made it difficult to just use one singular method to obtain a sufficient cross-section of participant feedback. A focus group (Hennink et al., 2019), in combination with observational data were used to capture the experiences of service user participants who attended different sessions within the intervention, encouraging peer interaction and the promotion of shared experience where possible (e.g. (Turner et al., 2016)).

Semi-structured interviews

The semi-structured interview guide (Appendix 10.2) was developed based on the CFIR framework. The lead researcher had previous experience undertaking semi-structured interviews, therefore focused on open questions allowing participants to respond with the issues they deemed most important (Kitzinger, 1994). Interviews (n=7) were conducted on an individual basis by the first author via a virtual platform (Microsoft Teams) lasting 51 minutes on average (range 22-76 minutes). Pilot interviews were conducted by the first author with three independent researcher peers prior to study commencement to enhance credibility and refine interview questions where necessary (Shaw, 2010). Prompts and probes were used during interviews to elicit more detailed responses from participants (Smith, 1995). At the end of each interview, a brief verbal summary was provided by the researcher to clarify the main points and allow participants to add further information (where required) (Braun and Clarke, 2021).

Focus group

One focus group was conducted by the first author with service users (n=9) who had been taking part in the exercise service for (at least) six weeks, via a virtual platform (Microsoft Teams). The focus group lasted 23 minutes and was based on the same semi-structured interview guide used in the interviews for CFIR sections on patient resources, intervention challenges and effectiveness. Spontaneous conversation was encouraged by the researcher with participants able to discuss and challenge opinions if they wished (Kitzinger, 1994). Participants, although not necessarily familiar with each other, were comfortable discussing their experiences meaning the interaction incorporated real-life recollections whereby agreement and contradictions added to discussion topics (Kitzinger, 1994). Clarification of information was sought during the questioning process to ensure participants were able to expand on each-other's opinion and summarise the information provided (Kitzinger, 1994, Kidd and Parshall, 2000).

Observation and field notes

Observations of the setting, daily practice, staff and service user interactions were undertaken through the adoption of ethnographic principles (Davies, 2012) gained through postgraduate learning in this area by the lead researcher. The lead author was typically on-site observing face-to-face interaction 1-2 days per week and engaged in virtual sessions ranging between 1-2 hours per day for 2-3 days a week. The initial expectation to be fully immersed within the environment resulting in a more typical ethnographic position of hanging out and observing events as they unfolded (Braun and Clarke, 2019) was limited due to service alterations resulting from COVID-19. The COVID restrictions reduced face-to-face interactions, sessions

and increased virtual online staff/service user engagement (Woodward, 2008). In terms of procedure, notable moments were written down in a note pad in the form of keyword entries (Krane and Baird, 2005). Memories and reminders in the field notes then allowed the observations and conversations to be developed into a research log, typically completed during lunch breaks or at the end of each day of engagement and never more than 24 hours after the original observation to prevent the risk of memory fading and details being lost (Emerson et al., 1995, Krane and Baird, 2005). Such accounts were accompanied by the researcher's insights and interpretations of events which contributed to the understanding of the setting and a narrowing of the research lens (Krane and Baird, 2005). Throughout this process, the research team acted as "critical friends" and theoretical sounding boards, encouraging lead author reflection and interpretation of the themes which became central throughout the data collection period (Wolcott, 2008).

Data Analysis

Data obtained through the semi-structured interviews, field notes (via participant observations) and the focus group were audio and visually recorded using a portable Dictaphone and Microsoft Teams, then transcribed verbatim. Data were thematically analysed manually using reflexive thematic analysis recommendations such as data familiarisation, generating initial themes, coding and finalising patterns of shared meanings underpinned by a central concept, and writing up using data extracts interspersed with researcher insights and interpretations (Braun and Clarke, 2019, Braun and Clarke, 2021). Although the data themes generated were deductively linked in relevance to the pre-determined categories formed by the CFIR-guided research questions, the patterns of shared meaning were generated, more inductively, from the data themselves allowing interpretation and researcher contextual

awareness to be discussed (Braun and Clarke, 2021). Flexibility in analysis was driven by both the prevalence (number of speakers articulating the theme) and the importance placed on information (Braun and Clarke, 2019, Braun and Clarke, 2021). Primary analysis was conducted by the first author with frequent debriefing sessions with the research team to discuss, challenge and reframe the thematic structure (Costa and Kallick, 1993, Wolcott, 2008, Braun and Clarke, 2019). It is important to note that "data saturation" or "data adequacy" could be assumed as no new themes were identified when analysing the final few transcripts (Hennink et al., 2019, Braun and Clarke, 2021).

5.3 RESULTS AND DISCUSSION

The following findings and discussion are based on my interpretation of events, underpinned by CFIR rather than chronological order, and includes *reflection extracts that are in italics, indented and single-spaced* to ensure separation from the descriptive representation.

Lead researcher positioning

Given this study engaged in ethnographic principles of data collection, lead researcher self-reflexivity was important due to my background and training within clinical exercise provision (Foley, 2002). Such experiences could influence participant interactions, provide pre-conceived ideas regarding exercise provision and enable a broader interpretation of participant concerns or thoughts (Foley, 2002). Such reflection means that this article will retain the use of "I," "me," or "my" on occasion and as such refers to the first author (Foley, 2002).

What follows is my (the researcher's) story of "self" experiences, alongside the "other," in this case, the collective thoughts of staff and service users concerning their experiences within a clinical exercise service (Foley, 2002, Smith and Sparkes,

2008). Each CFIR section explored staff participant perspectives, their lived experiences and feelings, and my observations (Foley, 2002, Smith and Sparkes, 2008). Service user perspectives were captured relating to resources and challenges, alongside their interactions with staff and experiences within the service. The data extracts represent each individual's experiences and opinions at a given time; however, taken in combination with my observations, this re-creates a holistic view of experience that is representative of what any individual may be exposed to in the service at a point in time (Smith and Sparkes, 2008, Foley, 2002). There is an effort towards emphasizing the "…personal and 'real' nature of an individual self, identity, experience and subjectivity." (Smith and Sparkes, 2008) (p9), yet, acknowledgment that these are constructed through social interaction and that socio-cultural factors colour a person's sense of self, or identity (Agar, 1996). Table 5.2 illustrates the themes and subthemes identified during the analysis, supported by verbatim quotes focusing on which staff knowledge, skills and competencies contribute to the provision of an effective clinical exercise service, how an effective service team is created, and the challenges faced when running a clinical exercise service.

Table 5.2: CFIR sections and sub-themes with additional supporting quotes

CFIR Section(s)	Sub-theme(s)	Quote or supporting text	Participant
1.0 Intervention development and challenges	1.1 Collaborative working	"Referrals come directly from the from the CNS nurses… it's about making sure that health professionals understand (the benefits) …I think when certain health professionals haven't really been involved with this sort of thing before there can be a hesitation as to how this is going to be beneficial"	Staff 5
	1.2 Service adaptation	"Blended approach to physical activity support… April 2019 and we were very much offering a face to face service… lung and colorectal and upper GI cancers… face to face assessment… questionnaires and paperwork to assess medical suitability. We emerged out of COVID, could get back into clinic and do some of the face to face appointment appointments. But we learned that things do work just as well sometimes on the telephone. So some of the things that we used to do in clinic we could do over the telephone such as the questionnaires (health screening) and some assessments such as sit-to-stand"	Staff 5
	1.3 Person-centred approach	"Ideally, we want to work patients for a couple of months before they have any treatment, but in reality, it's not always that simple. We often get patients who literally referred and then a week later they go in for surgery"	Staff 6
2.0 Service user resources (challenges)	2.1 Patient resources, support & adaptations	"It was a very generalized booklet that we would give to everybody if the need arose. And I think in some ways, COVID allowed us to kind of hone in to the plan and consider what this actually needs to look like to be more effective for our patients… we were then able to then do assessments over the telephone and provide that home exercise plan for patients to do instead of using the gym"	Staff 5
3.0 Organisational structure (creation of team)	3.1 Organisation structure	"Exercise specialists are responsible for the exercise prescription for all of the patients entering onto the scheme and hosting the assessments…they do the exercise	Staff 1

		prescription, and the exercise instructors take them (patients) through it as support"	
	3.2 Staff roles and responsibilities	"(Work)…Are open to any training that you want to do. We have our CPD's, but if there's anything that's out of interest on any other courses, there will be an email sent through, you know, links to join on webinars and things like that…we did one for stoma care…as an exercise instructor we are constantly being asked what do you want to do? Where do you want to go?"	Staff 7
4.0 Staff knowledge (theoretical) skills (practical) & competencies (effectiveness)	4.1 Theoretical exercise knowledge	"A specialist qualification is always a good thing to have, it makes our team more diverse. We have people with the mental health, falls prevention, cardiac and pulmonary so any of those are brilliant…but really the baseline is undergraduate degrees, then cancer rehab".	Staff 4
	4.2 Skill application in the field	"I can only kind of draw on my own experiences…I've come through from a sports science undergraduate background. So obviously that's fundamental…most important is an awareness of communication styles and being able to flip your communication style and within seconds when you're meeting people so those skills, which are quite hard to assess and quite hard to prove I look for first and foremost".	Staff 5
	4.3 Competency – the ability to complete tasks effectively	"…patient care protocol is that every patient gets seen as by an exercise specialist at assessment in the prehab phase…stay with the them through prehab because things change really quickly…A patient may get handed off to our exercise instructors in rehab should they be on the universal arm of the program, that is a very independent, motivated, engaged patient with mild comorbidities, well controlled and everything went very smoothly in the operation"	Staff 4

5.0 Service effectiveness	5.1 Data monitoring and patient safety	"We obtain the key outcome data that we need to monitor the patients and also to ascertain whether the scheme was doing what it says on the tin essentially and supporting those patients to be fitter for surgeries or treatment"	Staff 5

As a and Registration Council for Clinical Physiologists (RCCP) registered CEP who has completed a similar role in my past, I knew it would be hard to avoid assumptions regarding service operations such as assessment protocols, programme design, exercise delivery or even the referral process. I acknowledge that I needed to see past my own preconceptions and review what was happening within the service. However, these preconceived ideas (that I carried with me) were used to assist me in probing further into areas that I may not have `seen` directly; areas that I felt probably existed but only to those who were behind the scenes such as the level and appropriateness of staff training and qualification levels. Rapport was developed over the initial 3-4 weeks and any researcher vs participant barriers were seemingly lowered once participants were familiar with my presence. At the outset I would have classified myself as an outsider in collaboration with insiders given that I approached the service to observe it (Agar, 1996, Herr and Anderson, 2014). Yet, after a period of around 6-8 weeks and potentially due to my background within clinical exercise delivery, the relationship felt like it had morphed into one of an insider in collaboration with other insiders as conversations became more natural and a mutual respect seemed to develop based on shared anecdotal experiences (Agar, 1996, Herr and Anderson, 2014). For example, staff began to ask my opinion regarding exercise prescription design and the practicalities of one-to-one versus

group exercise sessions. These areas that were closed off in the early weeks, potentially due to limited trust or credibility, but over time these discussions increased in frequency and shifted into a two-way dialogue.

The first meeting

I was first introduced to the exercise team during their weekly (virtual) debrief. I can only assume that this experience was as daunting for them as it was for me. At this point in time, they had little knowledge of me, my background, my agenda or how I might portray them and their service. What made this initial meeting more challenging was its online format. Although ethnographic research has been conducted in online forums, a true representation and sense of feeling displayed by levels of interaction can be more challenging as participants can be unseen or hidden behind their device (Howlett, 2022). After a brief introduction I verbally explained my purpose (to gain a greater understanding of what knowledge, skills and competencies were required to work within their service, how an effective service team operates and the challenges they face in delivering effective provision). Following this, I paused to allow time for questions/concerns (of which few were raised). I felt my research aims were understood and an acceptance of me (given my background in the delivery of clinical exercise) was initiated. I also sensed some relief in the realisation that the study was not a critique of current practices within their service. For the rest of the meeting, I maintained a bystander/observational position. The meeting continued. Hearing the staff discuss their patients and service protocols made it clear from the outset that this group of practitioners were tightly knit, truly invested in their workplace and passionate about the service they provided, most of whom had been there since its formation. I left the meeting feeling that, as a group, they did not view themselves as just exercise practitioners; there was

a caring intent focused on providing an effective service in relation to the goals of the patient, an effectiveness which has been criticised in the past from a patient outcome perspective, mainly in relation to physical goals (Rowley et al., 2021, Steele et al., 2021). This desire to care for their patients was captured by Staff 5, *"We're not just a program that supports people in exercise…we provide so much support to patients holistically to help them have a better quality of life."* It would be easy to think that such a comment was made for my ears, a level of social desirability given it was our first meeting. Yet, my impression was one of authenticity, I observed a genuine belief that the service had one priority, the patient.

CFIR Findings and Discussion

CFIR Section 1.1 – Collaborative working

Throughout my observations it became clear that at the forefront of service decisions were patient needs. Discussions around service inception demonstrated that many moving parts were involved in shaping the delivery model into one of patient-centred care package:

> *…our service was so considered in its design. We collaborated with leaders in the fields that were necessary, but also we had a huge service user involvement at the start. For me it's that service user involvement which has led to the effectiveness of the program, the 80% uptake of referral demonstrates this…they're [service users] the guys who said actually no, you don't want it in a clinical setting, you want it in a community setting… you don't want to do it that way, you don't want to ask that question, you need to ask this, it was designed by the people who were going to use it and not by the people who thought of the outcomes. (Staff 4).*

The collaborative nature of service design is not unusual and has been identified as good practice when multiple stakeholders are involved (Buckley et al., 2018). In this case it was purposeful and demonstrated a high rate of success with 80% of referred patients entering the service (Moore et al., 2021). Yet, the team driving this forward were exercise specialists, recognised in their field, but not necessarily the people you would expect to be lobbying for service funding. Staff 4 reported that there *"wasn't the evidence base or another service that they could look at to say their approach works."* They had to base their tender on their understanding of the emerging scientific literature regarding exercise benefits for cancer patients, something which stemmed from their academic backgrounds, cancer-specific qualifications and the clinical MDT support team. The ability to communicate with health care professionals, commissioners and top-end management demonstrated a capability to overcome any challenges along the way as described by staff 4:

> *…trying to get everybody around the table to all work the same…that was a huge challenge! There was some butting heads between clinical backgrounds and exercise professionals…everybody had to understand where their professional boundaries were, to be relaxed enough and confident enough to say, actually, NO! We can't do that. Or no, that is our remit. So, in the early days that was quite difficult…understanding people`s roles and what they were able to do and what they weren't able to do and where everything was going to fit…we had to get people on board, the programme had to be collaboratively designed so that everybody felt that they had ownership of it...the clinical teams and the leisure [exercise] providers."*

The challenge of pleasing all parties is indicative of multiple stakeholder collaboration (Buckley et al., 2018). Yet, the expertise of staff to articulate their (and

their patient`s) requirements to collaborators displayed a level of confidence in their own proficiency that can only be gained through a combination of experience (workplace craft) and education (Tribble and Newburg, 1998, Ganeshan et al., 2021).

> *My feeling was that such skills were a by-product of their training and education, i.e., exercise specialists were educated to degree level which facilitated an understanding of communication methodology (verbal and non-verbal formalities) and the cancer-specific exercise literature, with both qualification attainment and workplace practice leading to skill development in this area.*

Further, such skills were evident when discussing their own team environment *"…we work as a team… it's about getting the right people for the right roles" (Staff 5).* The importance of such knowledge, skills and competencies were highlighted when recruiting for exercise specialists:

…Staff need the right training such as exercise prescription and behaviour change…somebody's ability to communicate, empathize and work with a patient is what's going to engage and motivate that patient… (Staff 4)

In isolation, "right people for the right roles" could just refer to qualifications, but on further exploration to be part of this team you would have to convince the service lead (just as I did to gain trust and credibility) that you could communicate with a wide spectrum of patients and co-workers and had an up-to-date knowledge of cancer-related exercise literature.

> *It was evident through our discussions that respect, sharing experiences and being transparent in their ways of working were traits that not only applied to patient care, but internally within the team environment. My observations led me to believe this was truly a collaborative service, both externally with partners, and internally across the team, driven by a need to provide knowledge driven patient centred care.*

CFIR Section 1.2 Service adaptation ~ COVID, moving online…

The COVID-19 pandemic highlighted the flexibility of the service as the team transitioned from a face-to-face format to a virtual delivery model. I observed staff coach in front of a screen with minimal (if any) control over the service user environment, deal with increased levels of risk (managed by safety protocols they implemented such as fellow instructors observing without taking part, known as `spotters`) and have a reliance on patient honesty concerning how they were feeling (this is usual, but is often accompanied by other monitoring tools such as observation and talk test on an individual basis). This transition required high levels of planning and implementation (initiated by the degree qualified exercise specialist service lead) from an exercise specialist / patient perspective regarding environmental risk assessments, risk stratification of conditions, safe and effective exercise prescription and exercise delivery (Ganeshan et al., 2021).

> *As we approached these online sessions, I had my own reservations. How would the observation of participants work and how will they control any potential adverse events such as home hazards and falls? Will the patients understand (both verbally and visually) what is required of them and how will they feel about not having the personal interaction that accompanies face-to-face exercise sessions?*

As the sessions unfolded, my concerns were soon lessened. I was surprised how smoothly sessions went. Patients actively provided perceived intensity level feedback and created space to ensure the surrounding area was free of hazards (e.g., furniture). On reflection I feel this came from the team's learned ability to coach participants within clinical exercise settings. The team`s knowledge and understanding of risks (primarily risk prevention) from doing the job in a face-to-face setting, underpinned by their knowledge of the cancer-specific exercise literature through and in combination with their previous workplace experiences of

exercise prescription design and delivery (craft development) (Tribble and Newburg, 1998) shone through. Session planning covered all potential condition-specific outcomes (specifically adverse) through risk stratification, whilst factoring in patient needs from the session (e.g., physical benefits, but also social and psychological benefits via interaction with peers (Crozier et al., 2020). Communication skills (honed through team training in virtual settings) were excellent both verbally and visually (via demonstrations), and staff ability to problem solve during sessions (e.g., technical difficulties) was akin to critical thinking originating from high volumes of practitioner experience. Such abilities displayed competency in delivering effective sessions. These qualities were driven by the exercise specialist`s need to retain service provision during COVID-19 adversity. This transition to virtual delivery was however met with some initial trepidation, but it surpassed staff expectations regarding effectiveness; *"Surprisingly, I think it's been a positive thing, when we started this, I wasn't convinced that not having face-to-face would be the way to go" (Staff 2).* Furthermore, patients were appreciative of the shift to online provision and the seamless impact on their ability to exercise;

…It (online delivery) was great, I really enjoyed the social aspect…it made no difference to how I did the exercise, other than I would not have been going to the gym, therefore, I got the opportunity to do some (exercise) (Service user 1).

It does, however, remain questionable if such a transition would be as successful or even possible for clinical services that did not employ exercise specialist staff with such high levels of qualification and experience.

Inadvertently, the forced change in format appeared to enhance service provision in multiple ways. Originally the service was gym-based in a one-to-one delivery format as it was decided that the exercise provision needed to be

individualised and the gym was the safest setting (Moore et al., 2021). Evidence suggests that the social aspect of PA aids engagement and adherence, so it did seem unusual that group activities were not introduced at the point of service conception (Crozier et al., 2020). Logistical issues similar to the formation of any exercise service (e.g., venue availability, space, equipment) were acknowledged at the outset and identified by the staff due to their previous experiences in clinical exercise delivery (Moore et al., 2021). Together with concerns about trying to create too many exercise options too early, in conjunction with having no other cancer-specific service models to draw upon for reference, meant that group activities were only explored more recently (Moore et al., 2021). The switch to online groups did lead to a change in the team's thought processes. It was evident to all that social interaction between service users increased due to the group setting, something which was limited in the original model design. Once teething issues around technology were overcome, I witnessed generic group discussions, questioning (between service users) around condition management, shared experiences and a continuity of attendance which resulted in support networks being created similar to other PA (Crozier et al., 2020):

…many people haven't necessarily exercised before so their fears and anxieties towards exercise on top of the cancer diagnosis can be a bit of a barrier to participation in the scheme…the blended model allows patients to overcome some anxiety by attending in their own homes rather than a gym setting, it also allows for more patient to patient contact than our 1-2-1 delivery of the gym-based model (Staff 6).

> *It was interesting as a practitioner to find that the service was gym-based in its formation. My personal bias, although also well documented in the physical activity evidence base, has always led me to consider the social benefits of exercise as the adherence or `hook` alongside any physical benefits patients may recognise (Crozier et al., 2020, Humphreys et al., 2022). Therefore, to discover that online platforms can encourage some social benefits was pleasing and reinforced my beliefs, but more satisfying was to hear that the service planned to continue with the blended option for the foreseeable future aligning with other conditions that have seen similar benefits (Ganeshan et al., 2021, Lewis et al., 2021).*

CFIR Section 1.3 Person-centred approach

Six weeks into my observation and in keeping with my previous reflections around patient-centred delivery, a plan was developed by the team to experiment with face-to-face group exercise sessions whilst continuing with the home-based assessments/consultations which were found to establish better rapport before asking someone to enter the potentially foreign environment of a leisure centre. This is a key concept. Firstly, understanding that rapport needed to be created to aid engagement is not something which should be taken for granted. This was a learning curve for the service given it was now aiming for group `buy in` during sessions. Drawing upon both their educational knowledge and skills in supporting patient behaviour change, and their experience from delivering one-to-one sessions in person, the service manager (and team) realised they could enhance service provision through both virtual and face-to-face formats. Secondly, having the capacity to explore such options and recognising that a one size fits all model rarely works requires a level of academic reflection, innovative, adaptation to a changing landscape and a highly educated, skilled and competent workforce to enable this:

…We`re determined to blend the best practices of both models, face-to-face and virtually, one being the telephone assessment as it`s a better way of introducing patients to our services, patients not attending is basically non-existent now. We also want to explore live group sessions (Staff 4)

Thus far the focus has concentrated on service user needs, however, psychological support, counselling and training became vital for the exercise specialists. Issues arose, no doubt exacerbated by the pandemic, regarding the psychological impact of working in a field whereby patient outcomes may be negative (Baumann and Sander, 2021). During discussions staff expressed that a shift to homeworking was efficient for them personally (no travelling), increased engagement with patients (very few wasted appointments) and catered to patient needs (service remained operational). Yet, from personal perspectives, there were negative connotations of homeworking. Staff openly discussed the self-isolation and personal wellbeing fears they had developed once an initial 4-week period of homeworking had passed:

…it was different, you`re involved in long conversations that can be draining…patients might be isolated themselves and offload all of their feelings and concerns on you, a cancer diagnosis is stressful, but for me, when we`re out in the centres I can escape and switch off somewhat, sometimes at home that`s hard to do (Staff 1).

Given the complexity of managing a service and the logistics of maintaining exercise provision, it was refreshing to hear that adjustments had been made once these fears had materialised in team meetings:

…our lead psychologist has protocols in place to protect the team who were constantly speaking to people for six hours a day in high stress, high trauma

situations. There is a lot of unloading by patients on to the team which could impact their mental health, even more now that they were all working from home (Staff 4)

Staff within this service acknowledged a need for additional skills training in counselling and managing psychological stress to support themselves through the evolving demands of the service;

…personally, it was great to get some training in stress management…when dealing with patients became too much I had an idea how I could look after myself, usually it would be a walk, but to get more professional support was great (Staff 1).

Although the intention was to aid staff wellbeing, there is no doubt that this extra training translated into teachable moments useable for both themselves in a personal capacity, but also for patients when discussing cancer diagnosis, treatments and in some cases negative outcomes. For example, service user 5 recognised the relaxed atmosphere during online group exercise sessions with staff having the ability to reduce encourage conversation and make patients feel relaxed in unfamiliar surroundings; *"I don't feel that anybody feels embarrassed or has the need to turn off (virtually)…it's a pleasant, informal, chatty atmosphere".*

CFIR Section 2: Patient resources and support

Throughout my time in the service, it was evident that the patients appreciated the care and attention they received:

…I think staff proactiveness, constant contact from assessment to induction, they went through questionnaires, they followed up with calls or reminders…people struggle to remember things so the support was brilliant (Service User 1)

Service users (n=9) spoke to me about their appreciation of having access to this service. More interestingly, the recognition of specialist skills by service users was

evident. Firstly, they identified that exercise specialists in this service could discuss complex conditions and surgical procedures due to their in-depth knowledge of cancer.

…they made things understandable, both the reasons why I needed to exercise and the benefits of doing it for my recovery…I wanted to know my limits after surgery…they helped me progress back to a normal life (Service user 4)

Secondly, they highlighted the excellent communication skills staff had, i.e., listening and asking questions to engage the patient further;

…Emotional intelligence was evident (by the staff), their understanding and interest was spot on…I spoke to them about what I've gone through and they listened to me, I've had bowel cancer and they want to know more about it and how to help you (Service User 2)

These interactions provided teachable moments in lifestyle education between staff and patients, whereby staff utilised empathetic behaviour skills to enhance confidence in the patient / staff relationship. For example, a brief conversation with service user 7 during some cycling demonstrated to me that not all participants enjoyed exercise, *"I don`t like getting all sweaty"* was the reaction I got to asking if they were enjoying the sessions. Yet, in the same breathe they realised its importance as it had been explained during lifestyle discussions with the staff;

…the chemotherapy decimated my body cells…everybody's journey is different with different recovery times, I`m not a fan of exercise, but the three months I was given (at the gym) helped me to get back on my feet. I learned (from the staff) that exercise (and its benefits) would help me overcome this (cancer) (Service user 7)

Finally, lifestyle education, in conjunction with staff ability to discuss personal issues (learned via counselling and psychology training) that a patient may have been

struggling with (e.g., financial signposting, family issues, COVID) was essential to maintain adherence to the service. Although the service design changed during COVID-19, access was maintained and supporting literature (e.g., home exercise programmes) were improved, but these are changes that can fundamentally be made by any service. My impression, however, was that alongside cancer-specific knowledge, the variety of psychosocial skills (e.g., the ability to communicate clearly both verbally and visually, interpersonal skills and traits that pertain to empathetic personalities, positive attitude, active listening, emotional intelligent and non-judgemental behaviour) utilized by staff and previously acknowledged in oncology pathways (Snell et al., 2002, Gibb, 2014, Dal Mas et al., 2021) raised this service to a level that surpassed service user expectations, hence they were so grateful for this unanticipated support network as explained by one participant:

…the training they (exercise specialists) have is amazing, everyone (service users) feels comfortable, no one feels judged, we`re all at different stages of our journey but staff make you feel like you can participate, they are an invaluable outlet (Service User 5).

CFIR Section 3.1: Organisational structure

A clear staff structure was evident. The exercise delivery team was led by the programme manager (current Master degree student, undergraduate degree qualified with multiple specialist exercise instructor vocational qualifications), with exercise specialist instructors (n=4) (undergraduate degree with exercise instructor vocational qualifications) and exercise instructors (n=2) (exercise referral vocational qualification) (Table 1). A hierarchal structure existed concerning service protocols and decisions (service lead responsibility) yet sitting in team meetings and during

my observations a feeling of team unity without egos or superiority was evident. Staff appeared to interact on an equal footing without rank or marginalisation. Management proactively encouraged conversation and opinions which in my mind enhanced empowerment and inclusivity. One example is the interworking between staff to manage exercise delivery while retaining a level of hierarchy:

… Once they`ve done their assessment the exercise specialists would write the program and pass it over to the exercise instructors. They adjust it when needed, send it to the exercise specialists to check and sign off (Staff 1)

In this case, there was a skillset and scope of practice recognition. Staff adhered to their professional boundaries, communicated changes within those parameters, yet retained a team ethos which supported peer learning and development (Soukup et al., 2018). Previous literature has recognised that the success of a clinical service is associated with highly developed and well-functioning staff, forged by the mutual respect of each other's knowledge and skillsets (Soukup et al., 2018).

CFIR Section 3.2: Staff roles and responsibilities

Another area recognised as contributing to service effectiveness is internal professional development through the use of peer training and support (Soukup et al., 2018). Peer training is the passing on of knowledge and skills, potentially to less qualified or experienced staff, to enhance the wider skillset of the team and allow craft (on the job) learning to occur (Tribble and Newburg, 1998). Learning can take many forms (e.g., observation or undertaking unfamiliar tasks) to aid personal skill attainment (Tribble and Newburg, 1998). One task (not necessarily documented) for exercise specialists was this fostering of progression of their (less qualified) exercise instructor counterparts by mentoring and developing their skillsets, expanding their

levels of responsibility and experience allowing them to grow and learn within the service (Soukup et al., 2018, Tribble and Newburg, 1998). Internal, peer-supported staff development might be idealistic rather than realistic in most workplaces due to working policies, time constraints or poor levels of peer support (Tribble and Newburg, 1998, Soukup et al., 2018). Soukup *et al.* (2018) suggest that clinical service staff should recognise each other's abilities and value opinions on an equal footing, reinforcing collaborative working and ultimately improving patient decision making through shared craft learning. This, however, stems from a highly qualified leadership team that encourages teamworking, patient-centredness, equality and inclusiveness as they are comfortable in their service structure and not threatened by team member progression (Soukup et al., 2018).

> *Anecdotally, clinical settings can be less friendly in nature with various exercise practitioners disagreeing over roles, responsibilities, scope of practice and seniority which can impact their willingness to support the development of peers. In my experience this came from a lack of team morale, low levels of management support / implementation, and perceptions around levels of knowledge, skills and competency in roles, potentially due to some roles being occupied by non-accredited exercise professionals.*

On the contrary, this service dispelled my preconceived ideas and experiences as captured eloquently by staff:

…giving them (exercise instructors) the responsibility to be able to develop as an individual and to potentially be an exercise specialist themselves is very important, we need to foster that pathway for them to improve and develop…they are very competent, we are very lucky, but I think it is about challenging them a little bit more sometimes (Staff 5)

…the managers (service lead and deputy service lead) are really for development, supporting and encouraging you to learn from team members (craft experience) or via different qualifications (Staff 7)

CFIR Section 4.1 Theoretical exercise knowledge

It is established, and is also my belief, that exercise testing, assessment, interpretation, prescription, delivery and outcomes evaluation for individuals with chronic and complex conditions requires a specialist knowledge base and expertise (Warburton et al., 2011, Santa Mina and Burr, 2013, Smart et al., 2016, Berry et al., 2020, Jones et al., 2021). The main difference between the exercise specialist staff in this service was the arm of the programme that each level worked on, based on their level of qualification. Prehabilitation patients, those at higher risk (targeted) and all data point assessments were completed by exercise specialists, whereas lower risk patients undertaking rehabilitation (minimal co-morbidities) or those on the universal arm (low risk stratification) could work with the exercise instructors (Table 1). Nationally, job roles and levels of education across clinical exercise staff vary with differences noted within specific areas of provision (e.g., cardiac) and across conditions (e.g., stroke vs. cancer) (chapter 3). This service was unique due to their hierarchal format of exercise delivery and their exercise specialist qualification levels (chapter 3). Against the grain, this service built their foundations on educational backgrounds:

…Essentially, you need an undergraduate degree in a sports and exercise science-related subject…the vocational cancer and ideally cardiac qualifications are useful…any other specialist (vocational qualification) is always a good thing to have as well as it makes our team more diverse (Staff 4).

From a knowledge perspective staff felt that degree qualifications were vital, expressing that a degree in a sport and exercise science provided a knowledge base in exercise screening, assessment and prescription; key areas in delivering clinical exercise services (Warburton et al., 2011, Jones et al., 2021). Although the degrees referenced were sport and exercise science-related, no staff had completed a master`s degree (MSc.) in a relevant area (e.g., such as clinical exercise physiology). Interestingly, only 1% of exercise staff within cancer services had an MSc. in clinical exercise physiology (chapter 3). Conversely, 18% (n=61) of exercise staff employed within cardiac services were MSc qualified CEPs (chapter 3). During discussions, no staff mentioned post graduate qualifications as a pre-requisite for their role or deemed that this level of qualification could provide the diverse knowledge referenced as a benefit for the team.

> *On reflection, this could be attributed to their current (high) levels of qualification and experience in this specific field, rather than the wider cancer landscape. My impression of the cancer landscape is that the sudden demand for an exercise pre/rehabilitation workforce outweighed the ability to pursue a higher qualification level, this combined with a leisure centre focused delivery model meant that exercise instructors (vocationally qualified without degrees) were the most accessible and possibly convenient solution, even though advocacy existed for CEPs to be involved through Macmillan.*

One area of concern raised was the lack of suitable training in prehabilitation-based exercise prescription itself. Fundamentally, in any workspace where there are advances in practice there needs to be an evolving and relevant continued professional development (CPD) obligation. Yet, in this case, the potential issue was offset by the innovative use of the wider MDT clinical team who provided regular in-house CPD:

…There's not a specific prehab qualification…but I think the CPD's that we've done have been brilliant, for example we had a stoma workshop which was excellent. I

didn't really understand or know that much about it so having that opportunity to gain the information from clinical services has been incredibly valuable" (Staff 1)

Staff appeared to gain deep levels of understanding about cancer-specific treatments and complications from workshops that were delivered by health practitioners. This additional application-based knowledge obtained from highly experienced professionals allowed them to hone and refine their broader knowledge, but also provided opportunity for questions that could assist in improving their skills and competencies, thus raising their own standards in line with higher levels of qualifications (Tribble and Newburg, 1998).

CFIR Section 4.2 Skill application in the field

Clinical exercise skills are linked to patient assessments, interpretation of outcomes, risk stratification and screening, exercise prescription design and delivery (including monitoring) and the ability to communicate all of the above effectively (Jones et al., 2021, CEP-UK, 2021a). It was clear to me that listening and behaviour change skills were paramount and on an equal footing within this service, an area that is frequently discussed in clinical service provision (Soukup et al., 2018). Watching staff interact with diverse communities in places that were out of peoples' comfort zones (e.g., leisure centres) reaffirmed that without the ability to listen, gain trust and confidence, and to communicate suitably, the whole service would be pointless. Empathy, understanding stages of lifestyle change and recognising the need for autonomy for patients, learned throughout their qualifications (mainly their degrees according to staff) were essential, coupled with on-the-job experience (learning from peers and previous interactions) (Tribble and Newburg, 1998). Staff pointed out that cancer, like most long-term conditions, does not have one demographic or typology, so the

way in which they were able to reassure and support people from all walks of life underpinned all facets of the service:

… we need to communicate effectively with patients, have a bit of empathy, you need to have people skills, you can't be a robot, you need to see them as a person not just as a cancer patient with a cancer diagnosis (Staff 1)

Conversely, it is hard to know whether or not these skills were indeed learned, or did they come more naturally to these staff than they would to others, hence the learning supplemented the personal traits and understanding they already had (Buckley et al., 2022). Either way, engaging in behaviour change training was an important part of staff skillsets as identified by the new curriculum recommendations by Clinical Exercise Physiology UK (CEP-UK) and duly acknowledged by staff 5;

"…I believe in CPD's, workshops and practical understanding…learning from the clinical teams about cancer types, surgical complications and how to communicate this to patients effectively so they have a better understanding is vital"

Staff frequently mentioned that cancer rehabilitation does not typically engage patients (specifically from an uptake perspective), possibly from negative connotations associated with the condition itself. Patients I met were often sceptical during the consultation, questioning the need and benefit of exercise. It was only over time and exposure to staff interactions where I witnessed first-hand the ability of staff to communicate, empathize, `see` and understand patients from a psychological perspective, then work with them as individuals that created the `buy in` and personal motivation to begin and adhere to the programme (Soukup et al., 2018). A core component in many clinical exercise services is the role of exercise professionals in supporting changes to PA behaviour that are sustainable (MacMillan Cancer Support, 2019).

Staff acknowledged that a prehabilitation offering was a useful step in the behaviour change process as the majority of people want to do all they can to get fitter and stronger before treatment as a way of improving outcomes. This is, however, only a short-term means to an end or fix (i.e., they want to get fitter before the operation) and once completed has no bearing on any future behaviours as it was an externally motivated goal (Ryan and Deci, 2000, Teixeira et al., 2012). On the contrary, the empathetic, more autonomous approach demonstrated within this service has been shown to aid long-term behaviour changes (Moore et al., 2021, Teixeira et al., 2020). Multiple techniques to promote/encourage behaviour change were used depending on patient needs, for example motivational interviewing, healthy behaviour education and peer-to-peer support by way of a buddy system (Teixeira et al., 2020). It cannot be underestimated how important it is for such skills (theoretically learned in an academic setting) to be polished through real-life application (Tribble and Newburg, 1998). However, due to intervention restrictions (12 weeks attendance per patient) and individual session durations (usually 1 hour), these techniques often relied on the assumption that if people were shown what to do they will do it, which evidence suggests is not always the case (Kelly and Barker, 2016). To offset this, and learned through experience, staff used relaxed discussions around areas of patient interest to pick up on any bits of information that could help them promote behaviour change (Tribble and Newburg, 1998, Teixeira et al., 2020). This subtle, non-prescribed approach of integrating behaviour change information into discussions or environments (during consultations, before or after exercise sessions or even in the form of a text message) opposes the less effective practices of including formal education sessions after each exercise session, something I personally delivered throughout my time in cardiac rehabilitation and witnessed first-

hand how ineffective it was (Teixeira et al., 2020). An additional benefit of this format was the reduced time they were asking a patient to `give up` without compromising the support they provided, whilst still enhancing behaviour awareness:

"I think the way they explained how I could help my recovery was very good. I could ask questions, discuss the support I needed and get advice of what I should be doing each day" (Service User 2).

It could be that services needed to evolve, step away from legacy methods associated with behaviour change information and use `teachable moments` as and when they present themselves (Buckley et al., 2020). In addition higher education providers and curriculum standards (e.g., CEP-UK) should contain suitable levels of detail to ensure effective behaviour change training is available throughout practitioner qualification journeys, specifically at points that aid maximum understanding (e.g., prior to placements with live scenarios) (Buckley et al., 2020).

CFIR Section 4.3 Competency – the ability to complete tasks effectively

Within any exercise service delivery, there are a number of key competencies, one being clinical assessments (CEP-UK, 2021a). Gold standard clinical assessments may include Cardiopulmonary Exercise Tests (CPET) or Exercise Tolerance Tests (ETTs) (Arena et al., 2020). Yet, in community venues not conducive to such assessments, field tests (e.g., six-minute walk test or sit-to-stand) were the next best thing and are frequently used (Reychler et al., 2018). Although being effective in delivering assessments is important, it was pointed out to me that *"anyone can teach someone to complete an assessment" (Staff 1).* Moreover, this reaffirms the principle

that staff were not hired based on qualifications, rather the service ethos of patient-centred care. Staff indicated the real competency came in the translation of results: *…you need to be able to complete an assessment effectively, but then be able to interpret those results, if you've got any concerns, you need to be confident enough to refer back to the CNS (Clinical Nurse Specialist) (Staff 1).*

This was refreshing to hear, not only from a fellow practitioner `best practice` viewpoint, but it demonstrates consistency with the latest CEP-UK standards (CEP-UK, 2021a). Even more encouraging was that staff understood the importance of applying this data to individualised exercise prescription, *"it`s the practical application…it's all well and good having all of this knowledge and doing these tests. But if you can't put it into practice, it's pretty useless" (Staff 6).* Staff accredited these competencies to both their undergraduate degree training (e.g., interpretation of data) and craft experience in the role (choosing the correct assessment) endorsing the belief that exercise application cannot take a one size fits all approach.

> *On reflection, I feel that this combination of theoretical and practical learning sees skills and competency merge by way of risk stratification, functional assessment and the ability to utilize and interpret formulas and relevant results into a meaningful exercise prescription. In my experience this is where the specialist nature of the role lies and sets the instructors apart.*

Writing safe and effective exercise prescription is clearly at the forefront of any service, yet sufficient knowledge, skills and competencies are rarely learned through training alone (Tribble and Newburg, 1998). There is as element of `craft` and professional development forged through workplace mentoring and learning (Tribble and Newburg, 1998). I can only compare it to the work of Tribble and Newburg (Tribble and Newburg, 1998) who identify that surgery is `more about decisions than

incisions`. In an exercise environment this translates into implementing your knowledge based on a sound rationale, something which is learned over time and not necessarily part of your initial training, an example being the fostering of progression that is built into the service:

…exercise instructors help me (exercise specialist) manage my workload, but also give them the responsibility to be able to develop as an individual, to work through to potentially being an exercise specialist themselves. I think it is very important that we try and foster that pathway for them to improve and develop…we wouldn't give anybody complex (to them) just because of the knowledge and the understanding, but they (exercise instructors are very competent" (Staff 5)

It was clear that theoretical knowledge, skill application and competency (effectiveness), alongside craft-based learning interact simultaneously during a working day (Raymond et al., 2020). Further, these competencies or qualities (effective communication, professionalism, assessment and interpretation, exercise planning and delivery, lifestyle change and risk management) were consistently visible within this service (Raymond et al., 2020). Although this service employed exercise specialists, their job titles did not reflect their overall abilities, i.e., staff were educated to higher levels than vocationally-qualified peers with the same title, presenting an anomaly when describing the service as `exercise instructor-led` rather than physiotherapy or CEP-led.

CFIR Section 5.1: Service effectiveness - data monitoring and patient safety

My experiences have shown me that service effectiveness can be subjective and alter depending on the lens you are viewing through, yet in this case all staff overwhelmingly championed the provision:

… everything is covered, you have contingencies for all areas such as safety protocols - every base is covered for the team. We`re organized and have efficient processes, we're all very much on the same page that provides a continuity of care which is fundamental (Staff 5)

In this service effectiveness could be viewed from multiple perspectives. Safety protocols were a priority and devised by the lead exercise specialist in conjunction with the wider MDT who together have experience of risk assessment, data protection, safeguarding and exercise-specific contingencies in case of injury or illness. Effectiveness can also refer to patient outcomes through objective measures (e.g., fitness outcomes). Staff cited the numerous data points gathered from assessments, a continuity of referral processes and the ability to adapt and maintain the service through COVID as key demonstrators of effectiveness. Possibly more importantly, service users reflected on effectiveness as *"proactiveness (by staff), constant contact from assessment to induction, follow ups via calls or reminders" (Service user 1).* Service users acknowledged that being at the forefront of staff thoughts, to them, created an effective service provision, which made me reflect back to my first staff meeting and my initial impression that staff genuinely wanted to create a person-centred service.

> *Looking back on my time within clinical exercise services and comparing it to what I have seen here, I to have often found that services prioritized objective evidence, rightly so when demonstrating effectiveness to those funding services. Yet, my overriding feeling is that this service also prioritises subjectivity via behaviour change which I personally feel is vital for service users and was great to witness.*

Listening and active listening rather than interjecting let patients air their thoughts, and only then did staff explain the support they could provide (Ryan and Deci, 2000, Teixeira et al., 2020). I feel the subtle use of communication skills, high levels of

staff morale and the autonomy provided by service managers engaged the patients more than any physical measurements completed along the way (Teixeira et al., 2020, Ryan and Deci, 2000). Other than attendance figures, the subjective nature of human interaction driving service effectiveness can be hard to decipher, yet in this case the feelings and experiences shared explained the high levels of adherence. It would be remiss of me not to acknowledge the ability of the service to adapt to change given the recent COVID pandemic. I witnessed a new age of clinical exercise provision and one that was able to be effective (according to both staff and service users) in its ability to engage its target audience, even if it was not able to be as objective in a physical assessment capacity due to the remote delivery.

5.4 CONCLUSION

The aim of this study was to explore how staff knowledge, skills and competencies contributed to the provision of a clinical exercise service, how these components assisted in creating effective service teams, and to identify what challenges existed in running services from staff and service user perspectives. This community-based, cancer-specific clinical exercise service collaborated with healthcare professionals and patients at inception to develop a nationally recognised referral pathway. Advanced exercise instructors, with equivalent education and experience to RCCP-registered CEPs, were able to prescribe and deliver exercise based on high levels of cancer-specific knowledge, skills and competency, underpinned by undergraduate degrees and facilitated by peer learning and CPD-based training delivered by healthcare professionals from the wider MDT. Behaviour change was delivered through patient-centred communication that focused on building patient rapport and used subtle, informal messaging during conversations to reinforce effective, cancer-specific and generic lifestyle advice. Finally, the ability to

offer menu-based exercise through online consultations/group exercise sessions, alongside in person, one-to-one appointments across a vast amount of venues, was highlighted by staff and service users as creating effective patient-centred care. Some caution must be taken in generalising across the cancer landscape as this service is not freely commissioned or widely available in the UK, job titles did not necessary match staff qualifications and it does not have a research component within the service that can progress the learnings within the field. Future research should explore daily practices within clinical exercise services across other long-term conditions to assist in the generalisation of findings. These observations should consider different staffing structures (e.g., CEP-led provision), distinct educational backgrounds (e.g., MSc. qualified) to gain an understanding how it may impact knowledge, skills and competencies, a single exercise delivery setting and a research-focused service to ensure currency in the field of practice.

6 Study 3:

A multi-method case study exploration of a cardiac rehabilitation service delivered by registered Clinical Exercise Physiologists in the UK

6.1 INTRODUCTION

In the UK, 26 million people live with a long-term condition, of which 24% have two or more conditions (ONS, 2021). By 2035 the UK population is estimated to grow by over four million, with a 50% increase in the over 65s, and a quadrupling of those with four or more illnesses (multi-morbidities) (ONS, 2021). In recognition of this rise in both population growth and associated chronic and complex medical conditions, the NHS long-term plan identified the need for clinical exercise services within acute care pathways to aid the prevention and treatment of non-communicable diseases (NHS, 2019).The need for specialist exercise staff within clinical settings, primarily with higher educational qualifications, has been frequently acknowledged (Warburton et al., 2011, Jones et al., 2019). Yet until recently, a lack of clarity has existed regarding what exercise services are being offered, to whom, and by whom to create an effective system-wide approach in exercise service provision for long-term health conditions (chapter 3). Chapter 3 reported inconsistency in UK clinical exercise service provision, notably disparities in exercise specific job titles (e.g., clinical exercise physiologist (CEP) or exercise instructor) for individuals not part of statutory regulation, leading to inconsistency in staff knowledge, skills, competencies and experience within services. Such variances have led to a diverse workforce ranging from those with only vocational qualifications to postgraduate master degree level qualified staff delivering exercise within clinical settings, making it difficult to compare within and across services (Franklin et al., 2009,

Warburton et al., 2011, De Lyon et al., 2017, Jones et al., 2021). A recent case study in a unique, successful and one of the largest cancer pre/rehabilitation services in the UK found that exercise specialists were degree qualified and possessed equivalent knowledge, skills and competency levels to apply for RCCP CEP registration via the equivalency process (chapter 5). Yet, this level of qualification is rare in cancer services (see chapter 3). For example, the audit (chapter 3) identified that 88% of exercise delivering staff in UK cancer services did not possess an undergraduate degree or higher.

In the UK, clinical exercise service provision (n=242) are the most prevalent for cardiovascular disease or more specifically for coronary heart disease with BACPR attempting to standardise exercise provision (BHF, 2017). BACPR outline six stages of cardiac rehabilitation in their core standards, with services audited based on compliance via the National Audit of Cardiac Rehabilitation (NACR, 2022a). Although UK cardiac provision retains some similarities to its international peers (e.g., Australia) regarding service structure (Woodruffe et al., 2015, Jackson et al., 2018) , there are differences in staff knowledge, skills, competencies and job titles for those delivering the exercise components (chapter 3). Indeed, structured education and employment pathways for registered/accredited CEPs have existed internationally across long-term conditions for ~30 years (e.g., Australia and USA) (ESSA, 2019a, ACSM, 2022). Conversely, in the UK only 18% (n=61) of exercise staff within cardiac services were postgraduate qualified CEPs (chapter 3). This lack of consistency even in the most standardised service network is concerning when trying to regulate patient care and ensure patient safety, therefore, a purposeful case study is valuable to understand current practice (Franklin et al., 2009, Warburton et al., 2011, Jones et al., 2021).

As outlined previously comparison within and between services is difficult. For example, as outlined in chapter 5, although some services (e.g., cancer) employ staff identified as `exercise specialists` that are undergraduate degree qualified and possessed equivalent knowledge, skills and competency levels that would allow them to apply for RCCP registration as a CEP via the equivalency process to that of a graduate of a CEP masters course, this is unique. Therefore, job titles alone are not sufficient to judge service effectiveness or staff qualities without exploration . Consequently, the service purposely selected to be examined in this study was chosen because it was; (i) well ***established*** and delivered clinical exercise provision by *registered CEPs* as part of an MDT, (ii) delivering exercise to wider range of patients with cardiovascular disease including high-risk cardiac and vascular conditioning as well as with congestive heart failure, (iii) conducting research into enhancing exercise service provision for cardiac rehabilitation as well as other conditions, (iv) uniquely operating in a dedicated building for exercise services with use of a purpose build gymnasium for strength and conditioning, and (v) commissioned by the NHS.

Study aims and objectives

This study aimed to examine:

1) How CEP staff knowledge, skills and competencies contribute to and influence the provision of a cardiac-based clinical exercise service
2) How these components assist in creating effective service teams
3) How this service differs to previously explored services
4) Staff and service user perspectives with a view to better understanding the challenges and barriers to effective service provision.

6.2 METHOD

Design and theoretical underpinning

(See chapter 5 section 5.2)

Registration Council for Exercise Physiologist (RCCP) registered CEP-Led cardiac service

The NHS service was created over 30 years ago, initially as a nurse and physiotherapist-led cardiac rehabilitation programme, which shifted to being CEP-led for exercise provision ~25 years. This change occurred due to a combination of physiotherapy availability or lack of, and increased conversations with BACPR who advocated the use of exercise specialists within clinical exercise services. This cardiac rehabilitation programme is delivered over two sites, the primary one being community-based, the other being within a hospital. An umbrella term for the service is cardiac rehabilitation, yet face-to-face exercise support for patients is offered for a variety of cardiac (e.g., post-myocardial infarction), vascular (e.g., peripheral vascular disease) and heart failure (e.g., left ventricular failure) conditions. Patients are contacted after diagnosis or treatment (either surgical or non-surgical) regarding the uptake of physical (e.g. exercise), nutritional and psychological support. Full details of the intervention are provided in table 6.1 (Hoffmann et al., 2014).

Table 6.1: Intervention components mapped onto items 1 to 9 of the TIDieR Checklist (Hoffman *et al.*, 2014).

Item Number	Item
Brief Name	
1	Cardiac rehabilitation
Why?	
2	Cardiac rehabilitation for patients undergoing treatment for cardiac (post-myocardial infarction) vascular (peripheral vascular disease) or heart failure (left ventricular failure) conditions in the Midlands, UK.
What?	
3	**Intervention resources** **Fitness:** Equipment available was gym-based machinery such as cardiovascular (Ski Erg, rower, treadmills, bike, Cross Trainers) and resistance machines (chest press, leg press, seated row, shoulder press), in addition to free weights (dumbbells), medicine balls, TRX and resistance bands (various resistances). Assessments were carried out using ergoline bikes, ECGs, blood pressure monitors, oxygen saturation monitors, weight and height scales, a hand grip machine and shuttle walk cones. Home-based exercise programmes were available to service users. **Nutrition:** Referral to dieticians were made as part of the MDT support system. **Clinical Nurse Specialists:** Managed the service user caseloads in conjunction with CEPs, providing educational support for behaviour change at various stages of the intervention.
4	**Procedures and key components** Referral pathways were developed based on cardiac, vascular or heart failure patient status. Referral forms were completed and electronically processed via the administration team of the service. **Practical application:** A variety of physical assessments are conducted, primarily an exercise tolerance test via a bike or treadmill with a RAMP protocol will be completed with an ECG attached. Other measures may include: **Physiological testing:** 6 Minute Walk Test, Incremental shuttle walk, Hand grip, Sit to stand.

Health Measures: Blood pressure, Resting Heart Rate, active heart rate, Blood oxygen saturation levels, Height, Weight, Medical history

Questionnaires: Lifestyle questionnaires that could be used are: IPAQ, EQ-5D, Stages of change/readiness to change

Eligibility: Anyone with a cardiac-related (umbrella term) diagnosis

Who will provide?

5.

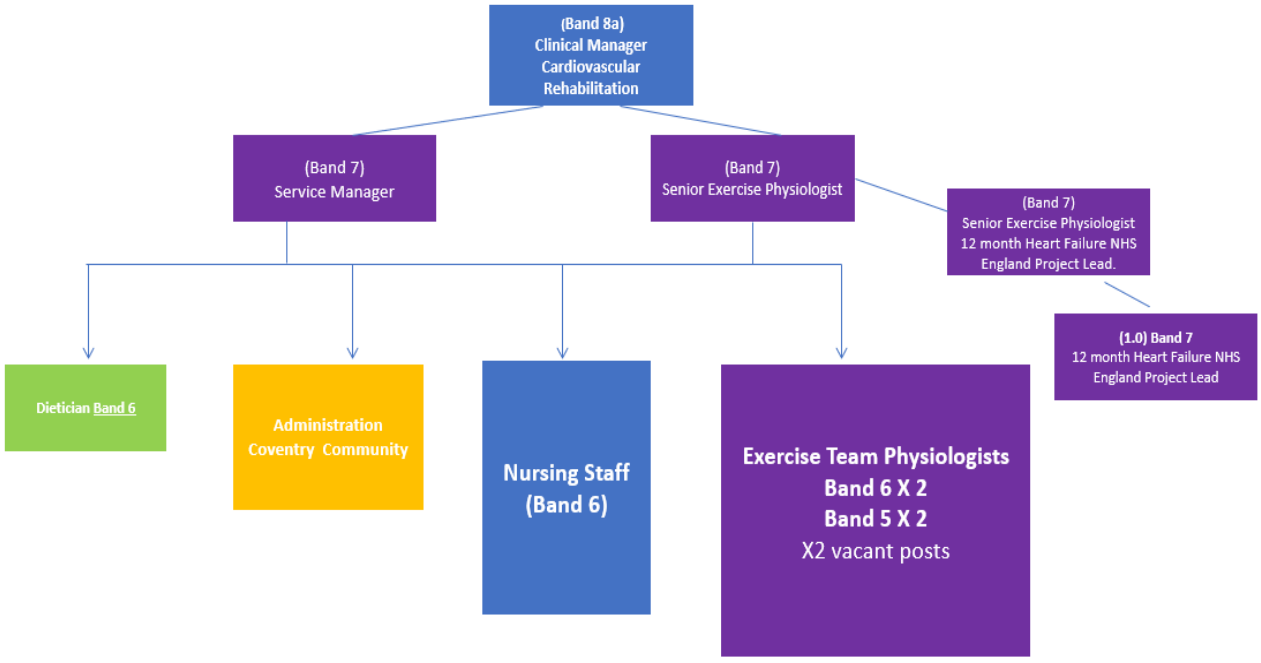
The service is provided by the NHS. Various referral pathways were used:

Referring health professionals: Referrals were accepted from all health professionals (Consultants, GP's).

***Staff in service at the time of the study:** Band 8 Clinical manager (n=1), Band 7 Service Manager (n=1), Band 7 CEP service lead (n=1), Band 5 (n=1), band 6 (n=2) and Band 7 (n=1) CEPs, Band 6 Clinical Nurse Specialists (n=2), Band 6 Dietician (n=1).

***Note 1 x Band 5 CEP has since been employed and did not take part in the study.**

A full staff structure can be seen below:



How?

6.	**Registered CEP-led:** Face-to-face consultations and group exercise format delivery
Where?	
7.	All service user consultations and activities took place face-to-face on site at either hospital or community locations.
When and how much?	
8.	The intervention had a 12-week funded period of rehabilitation. The programme was restricted in terms of days/times service users could use facilities with two sessions per week allocated based on patient choosing. Once 12-weeks had been completed service users had the option of continuing to attend the facilities at a subsided rate of membership under the supervision of privately employed registered CEPs.
Tailoring	
9.	All sessions were tailored to individual goals and used individualised exercise prescription developed by registered CEPs and based on exercise assessments.

Participants

I spent time (2-3 days per week for 12 weeks) within the service between April – August 2022. For the first six weeks I concentrated on field notes and observational data by attending face-to-face exercise sessions. This increased both staff and service user familiarity before completing any semi-structured interviews with the staff (Krane and Baird, 2005). Krane and Baird (Krane and Baird, 2005) suggested that the process of fitting In is essential to the success of the fieldwork, stating that poor rapport with the participants will result in poor data as they remain unwilling to open their lives to the researcher. Participant recruitment was based on convenience sampling across both staff and service users. A verbal announcement was conducted before classes (n=30) asking if attendees (n=45) wanted to participate in the study with field notes used to record observational data, including conversations. If attendees were interested, they were provided with a written study information sheet and consent form. No one formally declined or stated any reasons for not taking part,

but often participants preferred to concentrate on the exercise components without fielding questions during conversations for data purposes. An initial (virtual) scoping meeting was conducted with the service multidisciplinary team (MDT), defined as a group of specialists with the expertise relevant to their clinical management of patients (Munro and Swartzman, 2013). An MDT, without a designated size or official structure, can include various health professionals such as consultants, physiotherapists and clinical specialist nurses (Munro and Swartzman, 2013). In this service the MDT included RCCP-registered CEPs, dieticians, cardiac nurse specialists, and clinical service leads/managers, with occasional consultant interactions in the event of unforeseen complications. The meeting explained the study aims and objectives, after which written consent was obtained covering each aspect of the data collection, including semi-structured interviews and observation. The final sample included MDT staff (n=10); a clinical service manager (n=1), clinical service lead (n=1) who oversaw the intervention, RCCP-registered CEPs (n=5) with a mixture of undergraduate and postgraduate degrees and specialist vocational qualifications, cardiac nurse specialists (n=2) and a dietician (n=1). Staff members were white British, female (n=7) and male (n=2) and black other male (n=1), aged between 26-38 (mean age of 30), and employed full-time by the NHS with a minimum of two years' experience in the role. Service users (n=7) were white British, female (n=3), male (n=2) and Asian, male (n=2). Service users were retired, had a mean age of 61 years, reported various long-term medical conditions, but were specifically referred due to having one of the umbrella term of cardiac-related conditions accepted via the service inclusion criteria (e.g., post-myocardial infarction, heart failure, peripheral vascular disease). Written informed consent was gained prior to study commencement. No participants had a relationship with each

other or the practitioners before attending the intervention. The research team's involvement was limited to participant recruitment and data collection.

Data collection

Staff participants worked on individual caseloads allowing observational and semi-structured interview data collection. Service users were assigned to specific sessions (days/times) of their choosing, yet could be unpredictable in their attendance due to various factors (e.g., health, transport). Observational data in the form of field notes were used to capture a sufficient cross-section of service user experiences across different sessions within the intervention, encouraging peer interaction and the promotion of shared experience where possible.

Semi-structured interviews

The semi-structured interview guide (Appendix 10.2) was developed based on the CFIR framework, with a specific focus on the staff factors that influenced exercise provision (e.g., what knowledge, skills and competencies were important within service delivery and how these were obtained). Open questions allowed participants to respond with the issues they deemed most important. Interviews (n=10) were conducted on an individual basis by the first author via a virtual platform (Microsoft teams) lasting 28 minutes on average (ranging from 24 minutes to 36 minutes). Pilot interviews were conducted by the first author with three independent researcher peers prior to study commencement to enhance credibility and refine interview questions where necessary (Shaw, 2010). Prompts and probes were used during interviews to elicit more detailed responses from participants (Smith, 1995). At the end of each interview, a brief verbal summary was provided by the researcher to clarify the main points and allow participants to add further information (where required) (Clarke and Braun, 2013).

Observation and field notes

Observations of the setting, daily practices by the staff, and service user interactions were undertaken through the adoption of ethnographic principles (Davies, 2012). In terms of procedure, notable moments were written down in a note pad in the form of keyword entries (Krane and Baird, 2005). Memories and reminders in the field notes then allowed the observations and conversations to be developed into a research log, typically completed during lunch breaks or at the end of each day of engagement and never more than 24 hours after the original observation to prevent the risk of memory fading and details being lost (Emerson et al., 1995, Krane and Baird, 2005). Such accounts were accompanied by my insights and interpretations of events which contributed to the understanding of the setting and a narrowing of the research lens (Emerson et al., 1995, Krane and Baird, 2005). Throughout this process, the research team acted as "critical friends" and theoretical sounding boards, encouraging my reflection and interpretation of the themes which became central throughout the data collection period (Wolcott, 2008).

Data Analysis

Data obtained through the semi-structured interviews and field notes via participant observations were audio and visually recorded using a portable Dictaphone and/or Microsoft Teams, then transcribed verbatim. Data were thematically analysed manually using reflexive thematic analysis recommendations such as data familiarisation, generating initial themes, coding and finalising patterns of shared meanings underpinned by a central concept, and writing up using data extracts interspersed with researcher insights and interpretations (Braun and Clarke, 2019). Although the data themes generated were linked in relevance to the pre-determined categories formed by the CFIR-guided research questions, the patterns of shared

meanings were generated from the data themselves allowing interpretation and researcher contextual awareness to be discussed (Braun and Clarke, 2019). Moreover, the CFIR framework was used to shape the reflection and writing processes within this study, i.e., scenes and events were chosen that best represented any generated theme with the use of critical friends to ensure credibility. Flexibility in analysis was driven by both the prevalence (number of speakers articulating the theme) and the importance placed on information (Braun and Clarke, 2019).

It is important to note that "data saturation" or "data adequacy" could be assumed as no new themes were identified when analysing the final few transcripts (Hennink et al., 2019, Braun and Clarke, 2021). Primary analysis was conducted by the first author with frequent debriefing sessions with the research team to discuss, challenge and reframe the thematic structure (Costa and Kallick, 1993, Wolcott, 2008).

Creating the Non-fiction composite characters

Large volumes of data were collected and analysed, therefore, alongside confidentiality issues, it was deemed unrealistic to present singular case studies for all staff and service users (Erikson., 1968). Subsequently, four 'composite characters' were created to tell the stories and journeys throughout the service. The case studies of the four participants were created based on participants who shared *some* similar, common experiences or backgrounds during their time within the clinical exercise service setting, but also have potentially different perspectives of clinical exercise services (Erikson., 1968). The theme and identity that holds these characters together are; Character 1 (Sam) was a CEP with more than six years' experience in the role, undergraduate degree qualified in sports and exercise science with additional vocational qualifications in cardiac rehabilitation; Character 2 (Lauren) was a CEP with a minimum of three years' experience in the role, has a

master`s degree in a clinical exercise physiology-related field and additional vocational qualifications in cardiac rehabilitation; Character 3 (Tom) represented the wider MDT team of non-CEP clinical leads/managers, clinical nurse specialists and dieticians who had undergraduate degrees, Health and Care Professions Council (HCPC) registration and excess of five years` experience working in cardiac rehabilitation; Character 4 (Mira) was a retired service user attending the 12-week programme due to cardiac-related condition. The character of Mira also included service user volunteers; current phase IV attendees who appreciated the support they had received in phase III and wanted to `give back` to the service by assisting via social support for new attendees and equipment cleaning during sessions. The stories and interactions are told using the CFIR themes as underpinning headings, through the critical moments that occurred within my journey through the programme, but not necessarily in chronological order (Nesti et al., 2012a). The composite character interactions are told from my first-person perspective as I had come to understand them (Tierney, 2002).

Ethical approval

(See chapter 5 section 5.2)

Lead researcher positioning

What follows is a researcher's understanding and interpretation of a clinical exercise service based on the collective thoughts of staff and service users concerning their experiences within a clinical exercise service (Foley, 2002, Smith and Sparkes, 2008). Each CFIR section explored participant perspectives, their lived experiences and feelings, and my observations (Foley, 2002, Smith and Sparkes, 2008). The data extracts represent each individual's experiences and opinions at a given time and in combination with my observations, re-creates a holistic view of experience

representative of what any individual may be exposed to in the service at a point in time (Foley, 2002, Smith and Sparkes, 2008).

As an RCCP registered CEP myself with ~20 years' experience within both phase III and IV cardiac services, I was always conscious about harbouring preconceptions or assumptions regarding cardiac service operations. I had an awareness of my own expectations; how the service should look, my own opinions based on my thoughts and experiences, trying to be non-judgemental regarding fresh and/or different ideas regarding exercise assessment, prescription or delivery that I had not considered or previously seen in practice. I acknowledge that I needed to see past my own biases and review what was actually happening within the service. However, these preconceived ideas (that I carried with me) were useful in assisting me when probing further into areas that I may not have witnessed before or expected to see and did not. As my time within the service increased I forged a closer relationship with certain staff who I spent more time with, enabling both parties to speak more openly and less candidly. Rapport was developed and any researcher vs participant barriers were seemingly lowered after the initial 2-3 weeks demonstrated by my involvement in typical workplace `banter` and out of work conversations. At the outset I would have classified myself as an outsider in collaboration with insiders as defined by Agar (1996) and Herr & Andersen (2014), given that I approached the service to observe it. Yet, after an initial period (roughly 4 weeks) and given my background, the relationship felt like it had morphed into one of an insider in collaboration with other insiders due to flowing two-way conversations about exercise provision, a sharing of opinions and a mutual respect developed forged through past experiences (Agar, 1996, Herr and Anderson, 2014).

6.3 RESULTS AND DISCUSSION

The following findings and discussion are based on my interpretation of events, underpinned by CFIR rather than chronological order, and includes *reflection extracts that are in italics, indented and single-spaced* to ensure separation from the descriptive representation.

Introductions

The service was exiting COVID-19 restrictions when I was first introduced to Sam, Lauren and Tom, resulting in a pre-arranged virtual discussion over MS Teams. Similar to my first meeting with the cancer service staff, the cardiac service staff had little knowledge of me, my background, my agenda or how I might portray them and their service. I had no reason to think that this meeting would not go as well as the cancer one, if anything I had more in common with this service given my background in cardiac services. Although the online format remained challenging, I had experienced it before and was prepared for some silences, hoping to gain a true representation of how everyone felt concerning the forthcoming study by showing a real interest in the service and developing trust by displaying a level of knowledge in the field of cardiac rehabilitation (Howlett, 2022). After a brief introduction I verbally explained my purpose and provided time for questions/concerns (of which few were raised). Moreover, because all staff were engaged (currently or previously) in research projects, there was an understanding of what to expect and a recognition that research is vital in furthering the evidence base and maintaining currency in the field. I felt reassured that my research aims were understood and an acceptance of me (due to my ability to converse on a practitioner level) was initiated. The acknowledgement, familiarity with research and level of comfort with observation I witnessed was reassuring. I would be surprised if other services without research

links would be so at ease. I left the meeting feeling content that I had set the tone for my face-to-face encounter a few days later.

Face-to-face contact

I arrived on the primary community-based site early hoping to create a good impression, but also expecting to see how organised staff were in preparation for the day ahead. I received a warm welcome with open body language and suitably friendly words while being re-introduced to the team by Sam. A walk around the facility followed, accompanied by an explanation of the current staffing levels (two CEPs had recently left) and how that impacted session delivery for the day. I could see straight away that this was a building dedicated to exercise service delivery. It was two-floored, on the bottom was a café and seating area for service users to relax, prepare and recover from their exercise sessions. It had toilets, changing and showering facilities and included the main gym floor area where the cardiac-based sessions took place. The first-floor featured meeting rooms, offices, assessment rooms and exercise studio space which contained portable equipment for use within classes when applicable. The first hint of NHS involvement and clinical working was the separation of these spaces. There was a clear divide from a logistical perspective; keypad restrictions were in place throughout the second floor to negate public access, alongside telecom access through the front door into the building itself. The gym environment had a clinical feel, partly due to uniforms on show displaying NHS logos, half of which were worn by clinical nurse specialists. Mask wearing by staff, although no longer mandatory by law, provided another example of how (inadvertently I`m sure) the service presented a clinical feel. Yet its size (roughly 20m by 15m) and the volume of apparatus (six rowers, two Ski Ergs, double digit treadmills/X-trainers, resistance machines, TRX, free weights and portable

equipment) made the gym unique in its appearance compared to other clinical services I had observed.

> *This was a considered layout. My experience of clinical gyms is that they are unorganised in the placing of equipment or use space poorly. This area was the opposite; organised with an area for walking on the outside of the equipment ideal for a warm up and cool down. There were guidance resources on the walls, useful information that could remind patients about what they should be doing and how they should be feeling such as Rate of Perceived Exertion (RPE) and claudication charts, stretching and resistance-based exercise posters. Anecdotally this is not uncommon, but I`d be interested to see how staff use these – do they get patients to actively engage with the materials? Can they use these resources as education pieces that provide added context to the effort that they want patients to work at or experience? Or, are they included because it`s best practice only?*

Sam and I discussed current service operations, but swiftly digressed into how incorporating virtual exercise classes could improve their offering. There was a feeling from Sam that integration of online sessions could potentially lessen some of the access barriers regularly cited by service users (e.g., transport), in addition to advancing their `menu-based` delivery (Ganeshan et al., 2021). Rather unexpectedly, this discussion shifted into a Q&A led by Sam who wanted to understand my experiences of virtual exercise delivery (an area I had previously observed in a cancer-specific clinical service);

Sam: "What do you think are the main issues with virtual exercise sessions?"

AC: "Safety would be the main one for me, hazards such as furniture, suitable equipment, monitoring of exercise, including contraindications, having someone else in the home in case of an emergency…it`s no easy thing to sort!"

Sam: "Yes, these are the things we`ve talked about, we just need to create a document to ensure we`re checking all those boxes…and more".

AC: "Yes, I can speak to my contacts, it could be a start point?"

Sam: "Brilliant…I`ll let you know if we need anything".

Being useful, maybe even an asset or sounding board regarding my knowledge of virtual exercise delivery in practice, felt fantastic and more accepted than I was expecting.

> *One of my underlying concerns before I entered the service was the staff perceptions of me, I was an unknown entity, therefore I expected doubts about my skillset and knowledge of the setting. It was refreshing to discuss patient screening and risk assessment, data protection, accessibility of service users, problem solving, exercise prescription and delivery, adherence and fitness assessment measures – all of which I was familiar with and could offer insight into. My impression was that Sam gained confidence in me, in my ability to converse in these areas. I felt this simple conversation (shared knowledge and findings) demonstrated my own researcher and practitioner credibility. Over time I found this type of discussion became more prevalent. It assisted me in gaining confidence that I was being accepted rather than seen as an outsider, I felt like my opinions mattered and a more naturalistic (less forced on the premise of research) relationship with the participants was being formed, it made me feel like I was part of the team.*

CFIR Section 1.1 – CEP-led service conception

I entered the service knowing that certain components were unique compared to the wider cardiac rehabilitation landscape through my previous research; primarily the sole use of registered CEPs for exercise delivery, compared to unregistered CEPs or exercise specialists with vocational qualifications. To understand this uniqueness I wanted to gain insight into the reasons behind this; Where did the use of CEPs come from? Had it been different in the past? Why did it change and how long has it been like this? Numerous conversations skirted around the subject over the weeks as both Sam and Lauren acknowledged that it was all they had known within this service. Interestingly, they talked about their initial assumptions regarding exercise delivery within clinical services, which centered on the belief that others (services) utilized CEPs similar to themselves with equal levels of training and education in exercise prescription and the ability to become registered once RCCP registration became available, until they crossed paths with other peers;

Sam: "I`ve never known anything different, it`s only when you start talking to other people (at other services), that you discover they are different…lots (of services) are nurse or physio-led…but I don`t know why, when or even if we changed".

Looking to delve deeper I questioned Sam about the possibility of physiotherapists or nurses delivering the exercise components within their service;

Sam: "It comes down to the knowledge and skillset…the exercise prescription quality…the knowledge of exercise benefits/goals…I feel the CEP background in terms of exercise prescription is stronger due to their degree training (undergraduate and/or postgraduate)…I think physio`s and nurses look at things in a different way…more recovery focused than improving exercise or health outcomes maybe".

This appeared to be a considered response. I could sense that Sam did not want to say anything too controversial about other health professionals, but tactfully made it clear that CEPs where the preferred choice based on knowledge, skills and competency in exercise delivery. Attempting to probe further I asked Sam about the two CEP vacancies within the service, trying to flip the narrative to see if the response altered;

AC: "If all your service knows is CEPs, you advertise for CEPs…is this what other services do…is there bias?

Sam : "Absolutely, I`ve never seen anything different, I wouldn't change, so why would they if we don`t? If services are running effectively (in their opinion), patient outcomes are good and so on, there is no reason to change I guess, so yes, I think there is an element of bias".

This raised further questions in my mind – What is quality exercise prescription, and how do we judge the quality and rate its effectiveness? How can we get services to strive for increased effectiveness if they are set in their ways? CEP inception within this service, however, was not something I could let go of, it came from somewhere, yet it was only during an interview with Tom at the back end of my stay where I finally found some answers;

Tom: "We were working with physiotherapists some ~25 years ago, we inherited two-part time physiotherapists for about four hours a week as a rotational post. At the time both physios and nurses would take the patients downstairs for exercise…but the physios were coming to the end of their careers, we needed to look at some succession planning…that's when we looked at what was going on in America, how their private care providers worked. At the time BACPR was just starting to take off, we did some exercise-specific training for the nurses and using our contacts we were approached to see if we wanted to take on a very young exercise specialist (officially titled a CEP) for 7 hours a week to complete our fit tests and it grew from there".

AC: So this was unusual with cardiac rehab?

Tom: "it was a new concept, nationally rehab was more about the nursing teams and then physiotherapists had naturally gone into that role as well"

AC: So why change?

Tom: "We identified the skills CEPs had… care was very static for these patients, very traditional at the time…patients came in with a heart attack, they wouldn't be allowed to walk to the toilet for five days. They would be discharged at 10

days...initially we weren`t enrolling people until 6-8 weeks post-MI, then all of a sudden we started seeing that care was changing as primary PCI started coming on board. (Exercise) with the physiotherapist felt quite static and stifled…similar to how BACPR still delivers their phase IV now, it's still very much a one size fits all approach and we felt that having a CEP that was exercise educated, dedicated and following the science felt safer…we were risk stratifying our patients, everything was personalized…it was very much based on the American College of Sports Medicine (ACSM) model...Beg, borrowing and stealing resources we started looking at how we could build our service using CEPs…we were one of the very first services that took them on".

> *This was one of many lightbulb moments for me. Externally to the service, people may call this change of direction a calculated risk or an educated guess. Yet, for me, the foresight to use the sport and exercise science evidence base to underpin the direction of their service and recognize a new skillset within the field (that is still to this day underutilized) was unprecedented at that time.*

Tom identified that treatment pathways were evolving, personalized patient care had to be at the forefront of service delivery, and the days of bed rest and inactivity were gone. Exercise, although prominent in later stage care, was now even more vital in the rehabilitation process, therefore, the most qualified people (CEPs) were needed to deliver it.

CFIR Section 1.2 – Referral pathways and health care professional interactions

It was clear from the outset that this service had a well-established referral pathway due to the levels of organization and clear protocols that were in place (e.g., referral forms sent via secure NHS email). Sam and Lauren explained that a seamless pathway for the patient referral was developed, highlighted by the current 81%

patient uptake, with the clinical nurse specialists meeting patients at their bedside and referring them straight through to the exercise component. From a service user perspective, the ease of the journey was vital. Mira acknowledged that the service was efficient;

"Support was great, constant really…I got started quickly…everyone (staff) helped me understand my condition…it was good to be told that it was safe to exercise and that it would benefit me".

It became apparent when discussing referrals, that the ability to educate and `recruit` patients efficiently was, in part, explained by the size of the team and their capacity to engage straight away;

Sam: "…UK services, and even just locally, they've got one physiologist at best, here we've got between 5-7 (CEPs)… we've got more patients but there's no concern in terms of seeing patients in a timely fashion. So from discharge to obviously being assessed, there's no waiting time".

That said, from just observing the interactions between the team and the patients, I felt the knowledge and understanding of how to communicate with patients were the driving factors for uptake and adherence to the program. Conversations were engaging, open and friendly, with active listening taking precedence;

Sam: "…do you have any concerns about your recovery…is there anything you need me to explain?"

Mira: "…I think it`s knowing what I can and should be doing…will you be able to guide me when I come, exercise is not something I do?"

Sam: "Of course, is there anything you want me to explain now before you start your fitness assessment?"

The conversation continued with Sam explaining the procedure Mira had undergone (angioplasty) and then a detailed brief of the steps Mira would go through during her time in the service, allowing questions along the way. Educating patients in how they can manage and improve their symptoms/condition was at the forefront of this team as I found out from Tom;

Tom: "We see them (patients) on the hospital ward, talk to them at a little bit, brief advice really, then touch on their risk factors at the bedside after their cardiac event and start goal setting, discuss medications, and how the CEPs can help them exercise"

Sam and Lauren both discussed education and how this type of early intervention helps them receive more referrals into the service with Lauren identifying that when *"its fresh to the patient, it really hits home how important it is to seek help and recover quickly as they`re lying in bed recovering"*. Additionally, active participation in research was vital to the development and exploration of different referral pathways. One example being the Post-sternotomy Cardiac Rehabilitation Exercise Training Study (SCAR) which identified that (qualifying) patients should be exercising earlier than guidelines stated (2 weeks rather than 6 weeks post-sternotomy) (Ennis et al., 2022). This innovative research was translated into practice and shifted the referral process guidelines within their service as explained by Sam;

Sam: "I worked on the SCAR study which monitored patients during exercise earlier than normal post-surgery…6 weeks was the guidance, but that had seemed to be

plucked out of thin air with no real evidence behind that…as I was working on the study, it meant then that once the study had finished, I could look at the pathway and go to the surgeons at the hospital and say, look this is proven to be quite safe, can we start doing this? Can we change practice? Now we have started bringing people in earlier, I had someone today who is at 4 ½ weeks, so rather than them sitting at home festering for 6 weeks wanting to get back to work sooner, they can start earlier. Does that make us forward thinking…Yeah, I would say so".

Unlike most services who follow BACPR guidelines for patient recruitment, this service (due to the knowledge and skills of the CEPs) looked to use the latest evidence to enhance patient outcomes in areas such as cardiovascular fitness in an earlier timeframe (Ennis et al., 2022). Moreover, this decisive integration into the rehabilitation system allowed a speedier onward referral into the CEP-led phase IV service that was available on site but delivered by a private partner. The concept of phase IV is nothing new, but having CEPs deliver it is quite unique as Sam explained to me;

Sam: "It`s great being able to see patients move from us (to phase IV) but remain on site…we can follow their journey from a distance…it`s great to know they`re remaining active…being looked after by similarly qualified CEPs in phase IV…I don`t think that`s common at all to be honest…continuity of care…knowing the standard of phase IV meets ours, they might be a different service but we`re under the same roof and interact…they`re just as qualified as us".

> *Having that seamless onward referral process was such a positive for the service. There was a level of trust in Sam`s voice, happiness in the knowledge that patients were going to be looked after by peers of the same caliber regarding skillset.*

Having contact with patients throughout their journey through the service was acknowledged as imperative. Sam, Lauren and Tom were constantly monitoring patient attendance, following up on any non-attending patients to provide continuous support. It occurred to me that this level of patient `chasing` is hard to achieve and maintain. My lasting memories of contacting patients was the time consuming and draining nature of it, but Lauren emphasized that without this contact *"we cannot ensure we`re providing the optimal level of care".* MDT size can be a positive factor in the whole referral process (more capacity to deal with the patient flow), but without steadfast principles running from the leadership team down patient-centered care cannot be implemented (Soukup et al., 2018). From working in this setting I know that creating a fluid, timely and consistent patient journey is not easy. Here, in part, it came from longevity of the service (pathway development over time), but primarily through the knowledge of how a clinical service should operate and a willingness to implement it by the team. Implementation was initiated by Tom (learned through the HCPC and nurse-led training), with a continuity of care obtained through internal training and documented procedures that met NHS standards in areas such as data protection and safeguarding. The importance of both theoretical knowledge in procedure creation and on the job training shone through;

Tom: "case management throughout the patient journey is very much part of our success story…it wasn`t in place ~20 years ago, but we implemented it based on knowledge we gained through our nurse training and how I`ve worked in previous services…patients are now case managed across the team, from the minute they go into hospital, they're allocated a nurse and they take them all the way through to their endpoint of their program with the support of the CEP for the exercise component…we all understand our roles, what`s needed and when"

The service had long-standing relationships with the hospital-based health care professionals (e.g., consultants) which enhanced their referral pathways. Even though patient suitability and uptake fell within the realms of Tom, frequent conversations by all team members could be had with consultants regarding surgical or non-surgical treatments, complications, or re-referrals if contraindications were identified at any point. Yet, even in this service, Sam made me realise that interactions with health care professionals can, on occasion, be difficult and sometimes a barrier to providing optimal care;

Sam: "…we speak to consultants, there was a time when they were not really sure who I was, what I did and if I should be doing something, for example, if I noticed someone hadn't been started on a medication and query it, they'd wonder why I'm querying that and not a nurse…I think it was a lack of understanding…it's a fairly new role and not many trusts have CEPs so consultants may have never heard of them".

This lack of awareness, even in such an innovative service, was concerning, but not uncommon based on my own experiences. Sat in the office during admin time, I wanted to understand the cause of this issue so I questioned the team;

AC: "How could you improve your relationship with other health professionals?"

Sam: "…recognition of our role within a hospital setting in terms of registration is one way, but it`s challenging, we're not recognised as a as an allied health professional, even though we`re now RCCP-CEPs".

AC: "How is that a problem for you?"

Sam: "It's the understanding of our role, people (in the NHS) don't feel that we have the skill set to deliver the intervention, sometimes it can be an issue, but generally we have good pathways…I`m sure it could impact referrals (in other services)"

AC: "But it doesn't here?"

Sam: "For us, not massively, but I would imagine it could do if we were not as well established as we are".

A conversation with Tom demonstrated how this lack of recognition can create frustration for Sam and Lauren;

Tom: "some experiences (of the team) when redeployed were really poor, it was before they were getting registered…our staff were made to feel like a the non-registrant on the ward…when you've worked in an environment where you've been on autonomous practitioner and your colleagues have looked at you as having a high level of expertise it was quite an eye opener…we've got to make CEPs look more credible within the NHS".

It is conceivable that recognition and registration is often thought about from an individual perspective, i.e., what can it do for me, will it improve my standing within the NHS? In this case I am sure it would have vindicated (to others) Lauren and Sam`s belief that they belonged and, more importantly, assisted their peers in being respectful of their skillsets and scope of practice. On a larger scale, referral pathways can be impacted if a lack of confidence from referring practitioners is identified (De Lyon et al., 2017). These perceptions about scope of practice may impact the patient journey, and ultimately the level of care they receive (De Lyon et al., 2017).

After two months of observation, it is evident and acknowledged by the team that service links with health care professionals were in place. It seemed like having Tom on the wards with that nursing background made the whole process easier and this was duly acknowledged by service users who cited surprise at the ease and speed of referral post-event. It was, however, concerning to hear that there is still scepticism from other health care professionals in NHS about the skillset and scope of such highly qualified exercise professionals (CEPs) – a questioning of their belonging and what they could offer. Had the RCCP registration been available/in place at that time I have no doubt that it would have helped dispel some scepticism, although to do this an awareness of the latest Clinical Exercise Physiology UK (CEP-UK) scope of practice would have also been needed – that is a challenge in itself. Health care professionals need to be aware and understand the CEP-UK scope of practice to realise that registered CEPs are best placed to deliver exercise interventions and an NHS acknowledgement of this and of the new RCCP registration which is regulated by the Professional Standards Authority, would assist in achieving this.

CFIR Section 1.3 – NHS protocols

NHS influences were evident in all aspects of service delivery and ways of working. Just as I was surprised at the venue size and equipment volume, it was not unusual to see the rigid, methodical steps staff went through when dealing with patient information. Identification (ID) cards were used for computer access and the sound of hardcopy information being shredded was a frequent occurrence. Patient IDs were used when transferring data and names only used in discussions in secure areas (e.g., patient handovers). The influence that Tom`s formal and clinically focused nurse-based training had on the CEPs from a procedural perspective cannot be underestimated. Sat in the office watching Sam and Lauren work stimulated an acknowledgement that learning from their MDT peers was vital in understanding how an NHS-funded service should operate;

AC: "That shredder is loud..."

Lauren: "It`s a pain, but you`ve just got to be careful with all aspects of paperwork…we`re dealing with safeguarding issues around patient support, building access, privacy, data protection regarding patient health records…"

AC: "everything shredded once finished with?"

Lauren: "Yes, it was a shock initially as you don`t get told about this when you`re training, you`re just expected to know it"

Sam interjected;

Sam: "You have to complete a raft of internal training when you start in the NHS covering all procedures and protocols about patient data, how to behave, working practice and so on…it gives you the knowledge, but remembering to apply it is hard at the start, especially if it`s your first job".

This reinforced previous findings that clinical placements within postgraduate programmes is essential (Manley et al., 2009). Not only is there evidence to suggest it enhances exercise-specific knowledge, skills and competencies, but it would aid student understanding of NHS/clinical settings and the requirements of working within them. Processes such as secure email communication, electronic patient referral forms and health care professional update letters are not areas that CEPs will be overly familiar with before workplace exposure – it was new to me not having worked in the NHS for ten years.

> *Having exposure to ways of working may sound simple but cannot be overestimated. As a new starter it is daunting enough to enter a workplace, so to have an idea of professional conduct is definitely something that would have helped me settle in during my early practitioner days. Time in service would definitely prepare students for effective practice from day one and support the internal learning new employees have to undertake from an NHS perspective.*

CFIR Section 2.1 – Patient integration and support

A few weeks into my observations and keen to see the level of support Mira received, I sat in on an outpatient consultation (on site in the exercise facility) led by Tom. This was the first time Mira met Tom outside of the hospital environment (4-weeks post-surgery). We sat in a small office upstairs which reminded me of a doctor` surgery with its white walls and randomly placed NHS-based posters. There was a relaxed atmosphere yet the discussion, although polite, friendly and occasionally humorous, was clearly one of a patient/nurse due to its interview-based format. Tom and Mira exchanged high volumes of questions/answers/explanations, with the occasional probing for additional information by Tom. Mira described the build up to the heart attack;

Mira: "I had shortness of breath on various occasions when we were walking…it led to some chest pain…my husband called 999".

Throughout the conversation Tom was friendly, clinically focused, yet compassionate during the enquiries, empathy was evident and matched by a clear understanding of the experience Mira had undergone. It was fascinating (and not uncommon I`m sure) to hear Mira describe the discomfort as *"coming out of nowhere"*, an interesting observation given the discomfort occurred at *"multiple times"* leading up to what was eventually diagnosed as an heart attack. Tom educated Mira that her symptoms where signs of a heart attack and not uncommon, frequently using lay terminology to explain the complexity of the condition and associated surgery via visual and verbal descriptors (e.g., rubber models of an artery or pictures). This demonstrated a high level of knowledge, skill and experience as it factored in patient learning styles to the information delivery. In addition to re-enacting the sequence of events, this consultation was used as an extension of the

behaviour change discussions from Mira`s bedside (e.g., risk factors for future events). Tom used this opportunity to initiate more discussion around lifestyle change focusing on Mira`s individual needs rather than a broad approach;

Tom: "What changes since we spoke a couple of weeks ago?"

Mira: "I`ve stopped smoking (after 17 years)…I`ve also tried to reduce my fat intake by going on a diet, you know, following some of the suggestions you made"

Tom: "That`s great. What can I do to help you with these changes?

Mira: "I think I know what to eat but is there anyone I could speak to about it?"

Tom discussed dietetic support and completed an internal referral. This itself demonstrated the value of having a complete MDT approach to service provision whereby internal referral is commonplace and allows continuity of care. The conversation shifted towards medications as Tom described (in great depth) each tablet Mira was taking, its purpose, side effects and why it was important.

> *I would have expected medications to have been discussed earlier, only to discover (via Tom after the consultation) that it had been, but to enable adherence there was a constant reiteration in the importance of compliance. This in itself formed a major part of Mira`s new behaviours, one that had been thrust upon her quickly. I got the impression that without this discussion, medications could have been seen as short-term and not necessary, just from her body language and terminology used.*

Mira: "So this is an important one (medication)"

Tom: "they are all vitally important...these are life-long"

Mira: "what, forever? I`ll have to take these for the rest of my life?"

Mira could easily have fallen back into a curative mindset, no longer associating risk of future events with medication conformity. This again was a teachable moment created by Tom and relayed in a manner that Mira appreciated and hopefully took on board. A referral for CEP assessment was explained and consented, with Mira extremely receptive to attending. Overall, the appointment lasted ~45 minutes, not

especially drawn out by either party, so I would take this as a standard timeframe. This consultation confirmed that support was individualised and tailored to Mira. Moreover, it continued the theme of a seamless patient journey created by a diverse MDT working efficiently in conjunction with their service protocols (Soukup et al., 2018).

> *The behaviour change element was definitely initiated then followed through by Tom. Long-term observations (12 weeks) showed that it was Tom who began the goal setting process and CEPs only got involved during the prescriptive exercise sessions when trying to encourage patients to work in a range of intensity or duration that facilitated progression. Behaviour change was not something the CEPs touched on in great detail, in fact, they themselves recognised it as an area they needed to improve, and they had undergone a change recently to try an address the balance...*

I arrived on site (during week 8) to find no exercise sessions were planned with educational sessions replacing them. Sam explained that behaviour change within the exercise team was something they needed to improve, but how they did this was currently up for debate;

Sam: We`ve tried the traditional exercise followed by education sessions that most services use…these were ok but they dragged out the time people were here so some (patients) weren`t in favour…also COVID hit and ever since we`ve concentrated more on getting people in for exercise…now we`re putting on hour-long education only sessions. We tell people there is no exercise that week and to turn up for some talks about how to manage their condition, etc. But the take up hasn`t been great and the feedback is that they`d prefer to be exercising".

The session I witnessed was led by Lauren via a Microsoft Power point presentation. The group was small, I got the impression (closed body language through crossed arms) that they really wanted to be exercising rather than talking about cardiac risk factors, in fact, there was little engagement in the talk and they finished early. At this

point Mira asked if they could use the gym before they left. After the talk I spoke to Lauren about how it went;

Lauren: "It`s hard to find a balance, the turnout was disappointing (only 4 people rather than the 12-15 in sessions normally) and lack of interaction made it hard for me"

Lauren asked if I had any experience of delivering such sessions and I explained that I had using the model of exercise/education;

AC: "I think exercise/education can work as you already have an audience, I think it`s about how you use the time…it cannot be a tick box, which I think is often the problem"

Lauren: "I think that`s the problem, finding the balance between be impactful and not wasting peoples time…some people turn up, find out its education day, then turn around and leave".

I overheard one gentleman expressing his concerns about having to interact during the talk, specifically introduce himself. I found this slightly strange as he was attending a group exercise session with these peers, but he was clearly guarded in his behaviour. This type of behaviour was common in this session. Mira frequently nodded, acknowledged information and appeared to understand the content. Yet, Mira was not willing to step outside of the self-created comfort zone and answer questions that were posed or even challenge ideas that were present, either positively or negatively. This could have been due to the lack of numbers, or just the nature of the situation, i.e., discussing personal trauma in front of others, even those experiencing similar circumstances can be daunting and intrusive. Yet, the passion to exercise was clear;

Mira: "To be honest I`ve come because I feel that I should, the team are great and I don`t want to let anyone down, but really I`d prefer to be downstairs (exercising)…I can read this anytime".

There seemed to be a lack of value associated to the education (Mira`s perspective), which could be associated with a poor understanding of what to expect or because Mira had already received a lot of the information from Tom in previous consultations. It did suggest that the format may need adjusting for future cohorts and displayed similarities with previous literature that identifies many health services fail to deliver effective behaviour change interventions (Kelly and Barker, 2016). Conversely, when Lauren asked Mira about how much PA she was doing and how she could improve it, Mira responded;

Mira: "I want to do more, I just don`t know how?"

Lauren: "Well, to measure how hard we can use the RPE charts, you know, the ones we have on the programme cards and walls…to see how you feel, then gradually build up the time you exercise on your days away from here"

Mira: "If I do that once a week is that ok?"

Lauren: "Yes, we can look at once a week and see how we get on, you can write down what you`ve done and I`ll have a look when you`re here, is that a plan?"

Mira: "Yes, ok"

> *That night I thought about behaviour change within services a lot, especially what I had experienced and seen over the past few weeks. Was it ineffective, was it overkill or was it just wrong place/wrong time in this service? Although it appeared the service was slightly muddled in its behaviour change delivery, when I reviewed it most of the work had been done up front at the bedside and reinforced during consultations and follow-up discussions on site by Tom. Maybe this area was best suited to Tom or one-to-one, leaving the CEPs to reinforce small elements when in one-to-one situations as and when they arise. I feel the patients identified the CEPs as exercise specialists, this is what they wanted from them, not talks about lifestyle or their condition. They wanted to use the time with the CEPs to get `fitter`. So,*

if the CEPs continued to subtly use their communication skills to integrate more behaviour change prompts into simple conversations, it may be sufficient. This constantly occurred during exercise sessions, specifically when Mira talked about medications or PA uptake, diet and condition specific considerations. Sam and Lauren had the skills; the communication was good, specifically their empathy and active listening as they took note and responded to Mira when required. This type of interaction was similar to scientific evidence that shows subtle nudges/details drip fed into conversations were more effective that specific education sessions. There is a common misconception in health settings that if a practitioner provides the information it will be sufficient for patients to make changes. This service had both elements but lacked a clear strategy of enforcement. Tom was providing information up front and the CEPs were reinforcing it when necessary, therefore, they inadvertently had the best of both worlds. But I feel it needed structure and understanding that this is what they were doing with suitable outcome objectives. I believe, in the current format the separation was the issue for CEPs and often is across services – the education is `packaged` into a block of time. It may be something to consider not only for this service, but generically across how/when services present this information to a patient, who does it, and the depth of information at any specific time. The less formal conversations seemed to be the most powerful as I witnessed during Lauren and Mira`s discussions.

CFIR Section 2.2 – Patient safety mechanisms – `the huddle`

Patient safety underpinned everything I witnessed within this service and at no time did any patients express concern before, during or after their exercise sessions. One of the most prevalent and enlightening examples of this was the `team huddle`, a daily activity that included the whole MDT within this service. This event was equivalent to a pre-exercise session meeting taking place in a small conference room, whereby all patients were discussed re: progress and status (both new starters and current attendees) including condition overviews and adherence. New starter referrals were explained in detail by either Sam or Lauren to ensure everyone who had contact with them was aware of any considerations such as medications or multi-morbidities. Either Sam or Lauren completed the fitness assessment and retained primary responsibility and case management of a specific patient during the exercise component in conjunction with Tom, yet all staff were required to monitor the

sessions and therefore needed this in depth overview. On a Friday the discussions included a summary of the past week and information about the forthcoming week which included session fill rates, fitness testing waiting lists/times, any issues or potential insights into problems (e.g., service capacity due to staffing levels or holidays). The shared responsibility and addition of Tom into these discussions highlighted the integrated nature of the service, with the importance of this service tradition acknowledged in a discussion after the huddle with some of the team;

Tom: "There is nothing better than sitting and listening to the physiologist sound like a nurse and vice versa…there's a real crossover of skills and learning due to the shared experiences we have…it means everybody's upskilling without even knowing it".

This collective and unified working process is an unofficial and unaccredited knowledge exchange with similar interactions acknowledged as enhancing MDT skillsets (Soukup et al., 2018). The huddle facilitated this learning. Further, allowing different members of the team to lead the huddle each day fostered personal growth, developed workplace craft and enhanced the team ethic, demonstrating that each member held equal status concerning patient safety and were capable of adhering to NHS policy in this area (Soukup et al., 2018, Tribble and Newburg, 1998).

Sam: "Who`s taking it today…Lauren you`re up I reckon"

Lauren: "Ok, today we have a new patient who completed their FIT test (fitness assessment) last week, did fine, 6 METS, and should be ok, they`re with me, but keep a lookout in case you run into them, they won`t know the equipment…"

> *The conversation continued, with new patients discussed and current patients acknowledged based on changes or occasional concerns. Equipment was mentioned, (after all, such a wide range is unusual in this setting) the set-up and technique of patients using Ski Erg, rowing, X-Trainer, Bike and Treadmill machines was highlighted with an acknowledgement that additional coaching will be required for new starters and reinforcement needed for current patients. Alongside portable equipment and resistance machines, the dedicated nature of this exercise facility was further demonstrated. I soon realized how something so simple as the huddle could be so effective – why didn't we do this in my previous services? The huddle set the tone for the day/following week regarding expectations for both individuals and the team collective. It acknowledged what `worked well` or what had gone well in the past week and how they could improve (where appropriate). Staff were vocal, no one hid, which demonstrated a solidarity and unity in the team – no fear of being chastised if they spoke by any perceived hierarchy. Thinking about it, this might be why we didn`t do it – hierarchal status might have overridden everything else. This discussion was informal with room for social banter if the opportunity arose. Kudos regarding any achievements was given, but at the same time areas for improvement and development was highlighted. I watched an inclusive and engaging 15-20 minutes `chat` each day which created a learning environment in patient centered-care – something I`d have liked to have been part of myself in the workplace.*

CFIR Section 2.3 – Patient safety mechanisms – Fitness assessments

Patient facing activities that required a high level of risk management and in depth safety protocols were often completed jointly between Sam/Lauren and Tom, an example being fitness assessments. Clinical services can utilize a variety of fitness assessments, some highly clinical (e.g., cardiopulmonary exercise testing) and others more field-based (e.g., 6-minute walk test) (Arena et al., 2020). This service used a mixture, but the primary one was a submaximal bike or treadmill assessment with a 12-lead electrocardiogram (ECG) and blood pressure monitor attached to the patient during the assessment. I observed Tom and Lauren work in combination to monitor Mira during a bike assessment. Lauren used lay terminology to explain how the assessment would work, including the function and purpose of the ECG and focusing on what Mira would be asked as she pedaled (such as RPE levels). Mira seemed slightly anxious as Tom attached the leads, uncertain of what lay ahead, but Tom

was empathetic whilst explaining how the results would help Mira`s exercise programme design. Mira was happy with this and contently continued though the assessment, pedaling at the required speeds against the increasing resistance and answering Lauren`s questions regarding RPE levels, while Tom monitored any ECG changes. The assessment itself went without issue. Mira looked comfortable throughout, even when faced with increasing resistance she challenged herself, clearly understanding the importance of providing an accurate representation of her capability as was explained by Lauren and Tom before she started.

Mira: "Well that was better than I thought, not as hard, I was worried before I came but I was ok."

This itself displayed a high level of communication skill, specifically empathy as Mira was anxious about the unknown, yet this was managed by Lauren using active listening and questioning to dispel any undue fears. After Mira had left I questioned Lauren and Tom about the importance of the assessment process in relation to patient safety;

AC: "How do you ensure patients are safe throughout the fitness assessment process?"

Lauren: "Assessments are really important…It's the first time we see that patient, especially from an exercise point of view, so being able to understand their fitness levels and their physiological responses when they're in the fitness assessment is really important…I think most people could probably tell somebody to get on the bike and pedal away for 10 minutes, but we need to be on the ball. We need to keep track of all the physical responses, the ECG, that sort of thing. Knowing when to detect something might not be right or even before we start the exercise…even with an extensive knowledge of physiology, you need to know if they`re ready to be

exercised? Is a blood pressure too high? Is the heart rate too high? Have they got irregular rhythms? You need to be competent in these things".

AC: "Competency?"

Lauren: "Being able to conduct an assessment correctly…interpreting the information and creating exercise prescription that is fit for purpose…you have to be able to talk to a person though, get the information out of somebody, not just not just look at clinical information and think that's all that you've got to use…you get a lot of information from patient interaction"

Lauren recognised that patient safety is multi-dimensional. Not only is there a knowledge of how to theoretically carry out the assessment, there is the skill of completing it safely whilst screening/monitoring patients and then competently analyzing the results to formulate suitable exercise prescription. Lauren continued and further emphasized the need for communication skills;

Lauren: ""It's essential that we've got people skills…we can empathize, sympathize, be just a pair of ears sometimes to help them and give feedback…having open discussions (with patients) goes a long, long way".

This level of competency in communication and the awareness of its importance is acknowledged within scientific literature (Teixeira et al., 2020), but it was good to see it identified within practice.

> *Mira`s fears were managed and allayed by Lauren and Sam before and during the assessment as recognised by Mira herself. At this time my thoughts went back to previous conversations around the behaviour change element of the service, the more I observe, the more I think a separate programme of education may not be needed from a CEP perspective. The level of behaviour change knowledge and the implementation of it by the MDT in this service is excellent. If discussions remain fluid with a backdrop of behaviour adherence retained by Lauren and Sam during interactions, and their skillsets were constantly developed through ongoing CPD, it may be sufficient to delicately touch on lifestyle choices as they arise throughout the programme rather than actively bombarding patients with information. I then continued with my probing around assessments…*

AC: "So, why is it important to have both of you in assessments?"

Tom reiterated the previous comments made by Lauren, but clarified his role, acknowledging that it intertwines with Lauren rather than being independent;

Tom: "I`m responsible for recognition analysis; having a decent understanding of ECG, chest pain management, the safety aspects for patients that have had a sternotomy during an assessment, aetiology of any particular condition and what adverse reactions we could see…we monitor all of that in conjunction with the CEP…to be honest it`s a shared responsibility…we work together, generally the CEP takes the lead but we review symptoms together…if there's any problems we collaborate, if it's symptoms they might come to me or if it's exercise-related I would go to them…we combine our skillsets for the best possible patient experience and outcomes".

AC: "Could it work individually? Just one of you completing the assessment?"

Lauren: "It could…would it be as effective, I don't know…there is a lot going on, a lot to monitor and set up…it`s definitely more controlled with two of us (one CEP and one clinical nurse specialist)"

Tom: "I agree, it`s part of our working processes, naturally we have different backgrounds so we look for those areas of concern first…we can both do all elements (of the assessment including ECG recognition) because we`ve been doing it for so long (and through our training), but we want that experience in the room from both perspectives (nurse and CEP)".

It was interesting to hear that this service had adopted a policy of using both CEPs and clinical nurse specialists within the assessment process to further reduce risk. Further, it is important to note that the CEPs were trained and qualified in all aspects of the procedure (blood pressure, ECG and exercise monitoring), therefore, did not need the clinical nurse specialists to perform the assessment, in fact, I would be surprised if other services utilized two people for such procedures. Yet, the `belts and braces` approach seemed to be valued in this service. Additionally, Tom referenced experience and longevity, both of which are linked to workplace craft and the ability to identify risk from experience (Tribble and Newburg, 1998). Although Lauren identified that an *"extensive knowledge of physiology"* was needed, in isolation it would not be sufficient to undertake such assessments to the standard I witnessed. Without communication skills, workplace experience in recognizing symptoms of distress during fitness assessments and competency in results analysis and interpretation, patient safety would have been compromised.

> *The first question I asked myself was would a newly qualified, inexperienced CEP, with no exposure to a real-world setting have been able to undertake that assessment safe and effectively? Technically, they would due to their master's level training, but I honestly I think they would struggle from a situation management perspective. Could a graduate follow the basic procedural requirements of the assessments, i.e., set up the bike, run the test…probably, but could they communicate whilst doing it, reduce anxiety, explain the relevance of their actions in a format that Mira would understand? Personally, I think only being exposed to this type of situation/learning within it would prepare you. A good level of*

communication skills would be vital (e.g., empathy, active listening) to engage and retain control of a delicate situation that an exercise tolerance test may present. From the outside I can see how having exposure to a real-world setting would be beneficial. Having a placement during your training would greatly increase your understanding of the standards you would need to reach to provide safe, patient-centered care in a workplace. It would also clarify the NHS protocols you needed to follow, safeguarding would be a keep one and another reason for joint working. It may only be in the form of observation, some placement providers may allow a student to assist, but either way craft learning would take place, only raising the standard of CEPs coming out of the education settings.

CFIR Section 2.4 – Patient resources

An ongoing theme throughout my visits was the development of an online classes to patients to expand service provision or *"menu-based exercise prescription"* as Sam described it.

Sam: "At the moment we have centre-based group exercise that we give to majority of patients, we do offer home exercise programmes and we used telephone calls and home programmes during COVID, but not live exercise sessions… if they're post-surgical and need to work a lot more on their full body strength we can access tools like Physio Tech which is an online software for strengthening exercises... we have some standardized programs…a mixture of full body resistance or strength training that we gave out mostly during the pandemic…but I think we need to look at the online virtual side of things something that we can devise ourselves as opposed to pre-set and generic (exercise)".

Sam was conscious that a greater level of support for COVID-anxious patients, or on a wider scale, those with travel, financial or accessibility barriers preventing uptake or adherence to sessions, was needed. Yet, there was an acknowledgement that it had to be an effective and suitable solution;

Sam: "…the heart failure patients can use `Reach HF`, a facilitated home programme which has a DVD and manual…we're also in the process of setting up the online exercise classes, we just need to finalise the logistics of it such as safeguarding policies and data protection…they need to align with NHS policies".

Tom: "we're also looking at a virtual education program…five weeks of face-to-face and then we'll repeat it all over again on Microsoft Teams for patients who aren't able to come into the centre due to increasing cost of living, etc…to make it a little bit more accessible to everyone – we have done this with the dietetic referrals and it's going well".

Again, the behaviour change and education conundrum raised its head. Interestingly, it was Tom identifying the need rather than me pressing the subject, so in a final attempt to decipher how the service wanted to use behaviour change I asked about a solution not previously discussed;

AC: "Would you employ a psychologist?"

Tom: "Funny you say that, I forgot to mention it earlier, but we did have a psychologist for about a year, it just didn`t work though, people didn`t engage with her and in the end we decided to re-deploy the funding and take on the education elements ourselves…we`re qualified (in behaviour change), we`ve completed internal (NHS) and external (all staff are degree-qualified) training as an MDT, we just need to find the right solution for our patients".

> *At this point I felt the team were confident in their ability (and skills) to deliver a well-rounded education programme that supported patients (demonstrated by their removal of the psychologist role) they just needed to decide the most effective delivery method, which for such an advanced service in relation to research outputs and exercise prescription innovation, seemed strange, yet mirrored the majority of the scientific literature concerning the delivery of behaviour change interventions within healthcare settings (Kelly and Barker, 2016).*

One of the challenges seemed to be how the service could increase uptake and adherence from exercise and education perspectives, interestingly, Tom shared ideas that extended past the virtual world;

Tom: "going out into the community is one way we could improve... my aspiration is to look beyond the centre, it's a community we're trying to create here, but we`re looking at population health, we've got a pocket of patients who cannot get here for various reasons, specifically high levels of Non-English speaking people, a big Asian community who struggle to access services…in two or three years with regards to financial hardship we`ll see a high dropout rate with patients returning to work a lot quicker…online sessions and outreach work will be a necessity".

AC: "What do you need to be able to do this?"

Tom: "We`ve got the skills (in the team), the exercise team are highly qualified and experienced in their field, but it`s what the patient`s want that counts…we`d need to be able to maintain the face-to-face offering here and increase our reach…so far we`ve managed caseloads and time effectively and it has made us stand out (as a service), but there`s always more we can do…for now it`s about posing the question to the patients about what they want from us".

> *I went for a walk and pondered the answers I had received. A solution might not have been identified, but I sensed the question I asked was not straight forward and did not have a simple answer as elements such as funding, venues, referral pathway development and staff safeguarding (working in the community) would be areas of concern for any service looking to branch out. Furthermore, as explained by Tom, patient consultation would be needed. To my knowledge, and after speaking with Mira throughout sessions, at no point in time was online or other community venue access discussed as an alternative to attending face-to-face sessions here. This could have been because Mira did not have any accessibility issues, or she had not considered an online option? Online cardiac rehab has become more prevalent due to COVID, but it may not necessarily be in demand in this area, especially when a previous conversation with Sam highlighted high levels of deprivation and potentially low levels of IT literacy, both of which would need resolving to enable online access. The premise of service development, however, sat well*

> *with me. I was blown away by the passion to explore expansion, the proactiveness in reducing the barriers to patient care and willingness to engage in a consultation process with patient`s. This drive demonstrated the pioneering thought processes within the service and confirmed to me that as a team, there was no settling for what they had.*

CFIR Section 3.1 – MDT roles

Service structure was typical of NHS provision including banding pay scales ranging from band 5-8 dictated by seniority (service leads/managers to practitioners), qualifications (undergraduate or postgraduate degree qualified) and experience. The CEPs entered the service in practitioner roles (band 5 or 6), with the lead CEP a band 7 role. Interestingly, in this service there was no correlation between qualifications and banding, for example, CEPs with undergraduate degrees held band 6 roles, yet CEPs with post graduate degrees held band 5 roles. Banding appeared to be linked to specific projects or changing responsibilities;

Sam: "The opportunities are rare to sort of like progress through the banded structure…I`ve gone from a band 5 to 6 in in five years due to a change in responsibilities, that`s a great achievement for me, but I think that's where it might stop until a member of staff leaves...I don't think there's that much progression from the NHS side of things regarding banding, but in terms of training and experience, there's lots".

The organizational structure within this service was epitomised by the `team huddle`. It would be incorrect of me to exaggerate and say the service acted as one entity and there was little line management of staff. Yet, it would be remis of me not to acknowledge how the service functioned in a cohesive manner, typified by the responses when I asked Tom, Lauren and Sam to explain the MDT roles;

Tom: "We've got the nurses working with the CEPs in the gym, it's about the patient not about the role, we're sharing the patients amongst us, it's that crossover of skills which I think the patients can only benefit from".

Lauren expanded, recognising that integration of skillsets has a positive impact on patient care;

Lauren: "…the appointments are joined… there's definitely a shared learning, a bridge between the two (parts of the services), for example a nurse could see a patient struggling during the exercise component, they`d come to me and then we work quite closely to find a solution or reason."

Sam was keen to stress the importance of this and compared effectiveness based on his experiences and dealing with other cardiac services;

Sam: "We have five CEPs that specifically work on the cardiac, vascular and heart failure rehab programmes, we have nurses and dieticians who look after the clinical elements that sit outside of the CEP scope (of practice)…I speak to some colleagues about the way they run their programme and they have physios who rotate, they're not embedded in the service but on a six month rotation therefore are probably not invested in it, they can't develop the service, whereas we're employed full time to work on this on this programme so we can develop it".

> *After months of observation it became apparent that there was little significance associated with pay bands, no apparent power struggles or seniority complex within the MDT. I cannot help but feel that this was a unique service though and not what I had experienced in my time in the NHS. Here, each person had a mutual respect for one another and their skillsets were verified through the close working relationships they had, i.e., Lauren and Sam consistently demonstrated their knowledge, skills and competencies during exercise assessments, prescription and delivery and patient interactions in the presence of their nurse/dietician counterparts and vice versa. A hierarchal structure existed, but was less important than the shared goal of improving patient care. I decided that I would chase the benefits of*

> *this shared working, I understood how and why the MDT operated in conjunction with each other from a safety perspective, but what were the benefits for staff regarding personal development?*

CFIR Section 3.2 – Training and development

I wanted to explore Sam`s comment about *"lots of training and experience"* opportunities and how that could be important to both the individual and the service. Internal training and development have been recognised as good practice within MDTs (Tribble and Newburg, 1998, Soukup et al., 2018) and it was pleasing to hear it whilst observing one of the morning exercise sessions;

Sam: "I dread to think if I were to have gone to a different centre when I first came out of the university. I came here for work experience and then basically stayed…the varying types of experience was great, you had people that had worked here for over 10 years…there were loads of opportunities to learn from others in the team".

AC: "Like what?"

Sam: "Anything from external courses like BACPR, internal NHS-based training in first aid or safeguarding, but mainly being able to sit and observe team members at work, learning how they do things, discussing how and why they work that way…I was also taught how to complete tasks, like assessments, I knew roughly how to do them, but I worked through the process with someone to make sure I did it safely for the patient and got the results we needed".

As Sam moved quickly to assist Mira with the rower set up, I pondered about how this type of learning or craft within a real-world setting can only be achieved with the support of highly trained and skilled peers (Tribble and Newburg, 1998). Moreover, a few weeks later the subject of planned supervision and observation was raised again. Over a tea/coffee, Tom acknowledged that a period of supervision was enforced for all new starters to develop the theoretical skills they have gained

through their academic training and ensure they evolved into safe and effective working practice;

Tom: "I think the important thing is when (CEPs) start they are given supervision, guidance and the training to the job…they come out of university with a masters or BACPR qualifications, and that's great, but it`s less clinical with less placement time than a nursing degree… it's that hands on experience that`s really important and where the learning occurs and that`s missing…I think having a period of supervision is really important…developing clear ways of working".

Tom identified that work placements are the cornerstone of nursing degree and this type of experience cannot be overlooked for CEPs. Staff training included observation of all MDT roles, not just one CEP following another, but familiarity with the whole service was essential. This promoted growth for all staff, i.e., leadership opportunities for more senior members of the team through unofficial mentoring, and theoretical learning and practical application experience for the newer members of the team. Tom stressed that staff development was vital for preserving a consistent level of provision (and staff engagement/retainment) within the service;

Tom: "I'd like to see a formal training post as a band 5 for a year, then staff could move up the banding scale with the flexibility to increase to a band 6, that`s not normal in the NHS and would be a conversation with the finance people I`m sure, but that`s our vision for staff development (in this service)…progression and reward for learning and developing your skillset".

> *I could hear Tom`s frustration regarding formal training and how it could help change the rigid NHS banding scales. Tom recognised that you shouldn`t need to move into a management position and out of the job role you spend many years training to do to move up a banding. It took me back to thinking about the need for formal CEP registration and how it could raise*

> *the profile of CEPs in the NHS amongst more established professions. It may not be enough to facilitate someone`s transition through banding levels, but it could regulate the scale at which CEPs enter a service. Once again Tom`s thought process was refreshing to hear and demonstrated the way the service attempted to challenge the status quo. I believe that this service valued their staff, wanted to provide a progression route and therefore, in doing so raised the standard of their service regarding patient care…*

Specifically relating to CEPs, during brief conversations throughout my stay, both Lauren and Sam identified how daily interactions can improve practical application;

Lauren: "…having such a big team of physiologists, we challenge each other…I think if you're on your own, you can get comfortable in what you've always done or known, it's safe, you've not had any problems so you just keep plodding along…we chat about how we can increase intensity or duration of activity for patients depending on their condition…I tend to challenge duration for cardiac patients whereas Sam is more aggressive with intensity early on and shorter times…we both aim for 30 minutes of continuous exercise but just get their slightly differently…in vascular patients I look to challenge claudication or pain thresholds with interval work, increase patient`s functional power output so they can complete daily activities rather than having to stop and sit down because they can work through that level of pain…if they`re not used to working that hard they have to stop and recover…we overcome this through training, it`s hard at first for them, but durations increase at the higher levels and they can do more for longer".

AC: "Why do you think you work differently?"

Lauren: "For me, I use my exercise physiology knowledge – my master`s…I couldn`t do the job without it…it`s how body responds to exercise, how the body adapts to exercise or responses…having this understanding and knowledge about exercise physiology is a must… then how the body is affected by disease? How it impacts

their Physiology, the response to exercise and then try to combine the two so that your exercise physiology knowledge can positively benefit the disease".

Sam: "We've got the links to the research side as well with the university, that just brings a whole new light on rehab as a service…our learning and how we think about exercise prescription".

I had never been exposed to a service that actively completed research within a cardiac rehabilitation setting. This was unique within the field and I wanted to explore how this influenced CEP practice and training/development of new staff.

> *I went away and read the SCAR and HIIT or MIIS papers to give me a deeper understanding of how this research could help in practice. I went in the next morning and decided to question both Lauren and Sam about their development as practitioners…*

Lauren explained how the research studies they have completed, alongside their qualifications, underpins their exercise prescription;

Lauren: "…a couple of years ago the HIIT (high intensity interval training) or MIIS (moderate intensity interval training) trial was done here. It`s a new thing for rehab services (research)…prescribing off the back of the research means we can start to introduce little bits with some of the patients knowing that it's safe to do …the prescription is constantly evolving, there's always new exercise prescription methods so it's about us being on top of that…recently we`re pioneering through the SCAR trial bringing surgical patients in two weeks after surgery. I think being involved in that research and challenging ourselves has enabled us to look at things and go `why are we doing it that way? Is it just because that's historically what's always been done? Or is there evidence to say that's the right thing to do? We've never been backwards in reviewing our policies and changing things, for example I worked with heart failure patients and previously they were excluded from a lot of

cardiac rehab services, saying it`s not safe for you to exercise, but if you look at the evidence base, then yes, it is safe to exercise you just need to be mindful of what parameters you will push them to…HITT or MISS (high or moderate intensity training) recognised it's not all just about moderate intensity, there are different ways of getting benefits for patients either through short bursts of higher intensity intervals or via moderate intensity for longer durations. So yes, research has played a huge part in the development of our service. There's a few programmes where I know members of staff and they're still doing what we were doing 15 years ago, and they're not challenging their practice, which is frustrating really…I think that's what we've got here and that may be difference from other services where they might say `we've done this for 25 years, it works, we're just going to leave it like that`.

Interestingly, the research, although focused on exercise prescription in most cases also influenced MDT practice as a whole as Tom explained during our interview;

Tom: "SCAR was a real big learning curve for the nursing team who were set in our ways with regards to enrolling patients, but we embraced it…the implementation into wider practice, regional or beyond is hard though as it requires a change in resources and working practice".

Research was a driving force throughout this service epitomised by the working practice changes based on the scientific evidence and forward-thinking approach across the service. Whether it related to exercise prescription design or delivery, referral pathways, internal training programmes or progressive recognition of skills (band structure idealism), this service pushed the boundaries in the field of cardiac rehabilitation through a determination to expand the evidence base and implement new findings into practice. Completing this research, however, required a level of understanding in ethical practice, methodology and literature creation, which

undoubtably stemmed from the academic background retained by the MDT and allowed a mutually beneficial relationship with the nearby university to be created.

> *Thinking about what they had said, I concluded that real-world practitioner research completed by highly qualified and skilled practitioners with academic understanding was the ideal solution for advancing the field. It sounded so basic, common sense in fact. But until now I had not experienced it within this field. The evidence they unearthed was shared within the team and the service adapted, it didn`t conform to outdated guidelines, they took the proactive approach to develop their own safe and more effective practice based on scientific literature which I feel can only be commended. Based on my experience in cardiac rehab, it was unsurprising to hear that other services did not take this approach, after all, implementing change across a business is challenging whilst delivering a public facing service, not just from a logistical perspective, but from a staff buy-in viewpoint. The fact that this service could overcome such barriers was a testament to both the management and staff having allied goals; patient-centred support through internal upskilling to create effective patient outcomes.*

CFIR 4.1 – Theoretical knowledge levels

Exercise testing, assessment, interpretation, prescription, delivery and outcomes evaluation for individuals with chronic and complex conditions requires a specialist knowledge base and expertise (Warburton et al., 2011, Jones et al., 2021). 8 weeks into my visit and during an afternoon gym session I saw something that I had never this in this setting before. Not unusually, patients were using their programme cards as guidance and referring to the charts on the walls on occasion for assistance in clarifying exercises or intensity, which answered one of my previous questions about Mira actively using resources rather than seeing them as decorations. But, more significantly as I walked past the rowing machines I noticed the speed and intensity of one particular patient. I know from speaking to Lauren that patient autonomy was encouraged, i.e., CEPs wanted patient`s to challenge themselves (safely) using the guidelines they have devised. Yet, in this case the patient could have been in a regular `mainstream` gym. Rowing at a pace of 2:00 mins/500 meters for 2000 meters is not something you generally see in a phase III cardiac setting in my

experience and would be challenging for most people. Technique was good; legs and arms in tandem, breathing maintained, working hard (7/8 RPE) based on the response to my asking. It was enlightening and I wanted to understand what gave the CEPs the confidence to safely prescribe and monitor this level of exercise and to have the confidence to let patients do it;

Sam: "…core knowledge is physiology of the body, cardiovascular response to exercise and the cardiovascular disease process including risk factors…you definitely need to have done a bachelors in sport and exercise science…also a masters specifically in exercise physiology would be ideal…if it's a band 4 post, minimum would be a sport Exercise Science degree, then we would look to do the BACPR course or a master's (in CEP) whilst on the on the job. If it's a band 5 or band 6 role, then essential would be Sport and Exercise Science (undergraduate) and then desirable would be an exercise physiology master's…if we have a pool of 20 applicants for a job, I would say 75% will have a master's…to compete they would have to have a masters nowadays…but as much as you can have all the skills and qualifications, often experience, whether it's after studying or an effective placement always appeals…they've been exposed to patients and the clinical side of the role as opposed to everything being on paper".

AC: "Is it just cardiovascular knowledge you need?"

Sam: "No, you need knowledge of associated pathologies like obesity, diabetes, and so on…we get a wide range of patients presenting with multiple morbidities".

It was interesting to hear that most applicants for a CEP role at this service will have master`s degree, demonstrating the standard of entry into the field of clinical exercise is high (in this service), along with a recognition that CEPs required a wide scope of understanding across long-term conditions (Warburton et al., 2011, Jones et

al., 2021). Additionally, Sam acknowledged that banding structures can be related to qualifications, yet the demand for a role is so great that perspective employees were willing to accept a lesser band even with higher qualifications to get into an established service (as was the case already in this service). Lauren reiterated the need for higher level academic qualifications and knowledge in exercise prescription and physiology, whilst stressing that experience in the role was vital;

Lauren: "I would say a degree (undergraduate) is the absolute minimum, I wouldn't say many people will come out of a degree straight into this role though, for me personally, work experience was the biggest thing to enhance my knowledge…it's all well and good knowing the theory, but it's then how to apply that practically, so I would say work experience is massive for knowledge attainment and skill development".

The stipulation of high level qualifications (e.g., master`s degrees) is recommended in clinical exercise services (Warburton et al., 2011, Smart et al., 2016, Jones et al., 2021) and in this service it allowed for a more expansive patient inclusion/exclusion criteria as I discovered in one conversation with Tom;

Tom: "Some services are much more cautious in terms of high risk patients or exercising patients to a level that`s effective…because we've done a lot of research and have staff that are highly qualified, master`s generally, we tend to accept higher risk conditions and understand how to safely progress them".

Having the academic knowledge of physiology and exercise prescription not only underpinned the way CEPs approached each patient, but allowed a higher catchment of patients, enhancing inclusivity within the service. Further, having RCCP-registered CEPs with exercise-specific knowledge and the application of it within research studies extended into challenging service effectiveness and national

guidelines. Once again this was not something I was familiar with, therefore, I raised the question about effectiveness and guidelines frequently during conversations with the CEPs;

AC: "So is cardiac rehab effective?"

Sam: "…it depends on the service I guess. Powell et al. found that nationally, cardiac rehab was not effective in the way was being delivered, so based on that we changed our approach…I think a lot of cardiac rehab centres deliver a traditional style from when the BACPR course was first brought out, circuits no equipment…is that because they have only one CEP or none at all, I`m not sure, but how can you run quality services like that? I do think we are one step ahead of most centres in the UK".

AC: "I was speaking with Sam previously and mentioned current guidance, any thoughts?"

Lauren: "National guidance takes so long to catch up…just thinking about the BACPR as our main governing body, they`re not challenging us to change…guidance is the same as when I did my instructor course 16 years ago…if we weren't involved directly in research and in a team of CEPs it'd be easy to tread water…I think that's what's happening across other services".

> *I participated in numerous conversations that discussed knowledge levels needed for the CEP role. A master`s degree was generally accepted as being optimal, but real learning came from having a team of CEPs with the ability to support and challenge each other's way of thinking daily. In my opinion, the confidence in their own ability to `test` different training approaches originated from their formal postgraduate or equivalent training, but developed through experience in the role. Research involvement cannot be underestimated in enhancing knowledge and widening staff lens of what can be achieved from a patient outcome perspective. I frequently observed (and participated in) discussions regarding recommended training protocols, such as 40-70% heart rate reserve (the intensity level cited in BACPR literature/training courses for cardiac patients beginning exercise), its*

relevance and origin, which was felt to be outdated, or too generic, for most competent patients.

One such example conversation was with Lauren in my first week whilst I observed a fitness assessment;

Lauren: "40-70% heart rate is fine, but it`s not for everyone…patients can work harder, HIIT makes them work harder and recover, it allows them to challenge their cardiac threshold and develop their cardiac health…if we stayed in the 40-70% bracket I don`t think most patients would get those benefits".

AC: "I suppose there is no point doing a FITT test if you don`t use the results to prescribe?"

Lauren: "Exactly, we prescribe individually, not a one-size-fits-all approach…that`s why I feel we`re effective and other services are not…it`s also what the evidence said".

Discussions concerning current practice were frequent. The topic of other services not aligning with newly updated literature (e.g., HIIT being safe and effective in cardiac patients) and how staff experiences within both research and in practice have led to exploration of new ideas in exercise prescription design and delivery, were frequent. An awareness that national guidelines were outdated, or least needed more depth, demonstrated that learning and service evolvement was in place. Acknowledging that exercise guidelines are outdated is a small step to making changes in provision which require a high level of understanding and knowledge in clinical exercise provision. Yet, this service went further and applied changes based on the evidence base (some of which they created) to support their rationale for innovative exercise design and delivery. The one area of contention is the patient viewpoint. Speaking to Mira it was clear that she was happy to be exercising and seeing a level of progress, i.e., slightly less breathless doing daily tasks six weeks in, compared to when she started. But regarding effectiveness, Mira was only able to give me her understanding, she didn't know what she didn`t know, so how could she tell me that this exercise prescription was more effective than any other? In this case it may have to be objective assessment outcomes that define effectiveness as long as the feeling of safety is acknowledged (by patients).

CFIR Section 4.2 – Practical skill application and competency (effective task completion)

Clinical exercise skills relate to the practical application of theoretical learning (e.g., conducting physical assessments) and the ability to communicate the information effectively to patients (Buckley et al., 2020, Jones et al., 2021). Having observed fitness assessments early in my visit, I revisited the subject whilst sat in a consultation room just after a week 10 fitness assessment with Sam, wanting to know more specific information about what he felt were the key areas of his role regarding skills and competency;

Sam: "…for me exercise screening, testing and interpretation of the results are vital…we screen and assess a patient choosing a submaximal fit test such as a bike or walk, or alternatively a functional assessment (e.g., sit-to-stand) if they are really limited, then take that information and prescribe cardiovascular and strength exercise, be it in the gym or at home…we want to improve functional capacity, increase their power output and predefined levels…monitoring using the RPE scale and heart rate training zones is ongoing in all areas".

Having previously discussed the importance of monitoring physiological responses in ECG or blood pressure during assessment, the implementation of the latest HIIT exercise design and acceptance of complex (higher risk) patients, it became clear that monitoring patients was a critical skill. One area of this was the ability to demonstrate and identify how to progress (or regress) exercise by coaching patients through sessions and leading group exercise activities (warm up/cool down) (Raymond et al., 2020) as explained by Lauren after a group session warm up later that afternoon;

Lauren: "Designing the program based on your exercise physiology knowledge and putting it into paper shows the theory behind the practice….coaching patients, leading the class, making sure that everybody is safe and they understand what you`re asking them to do…these are the practical skills we need….then clinical skills such as taking blood pressure during sessions…ongoing monitoring using RPE and heart rate monitoring and pain scales is vital".

AC: "Any adaptations?"

Lauren: "Loads...anything and everything I guess…range of movement, intensity, options for balance, avoiding exercises that could exacerbate risk such as quick turns or direction changes…we have to respond to the patient, how they feel…it cannot be generic and it might change daily or weekly, ongoing monitoring is essential".

> *The real skill that I witnessed related to Sam and Lauren`s ability to actively challenge the cardiovascular thresholds of patients to increase cardiac capacity. During my BACPR training intensity was often talked about as the last type of progression, frequency and duration being the optimal increments. Yet, (patient dependent) Lauren and Sam opted to use their research background and implement HITT workouts. Working patients intermittently at heart rate percentages greater than 70% required clinical knowledge of physiology, patient history, accurate fitness assessments, precise exercise prescription and most importantly, excellent exercise delivery skills and monitoring throughout. Using scientific evidence to create rationale for your ways of working should be commonplace, yet many services I have observed continue to follow guidelines of low-moderate continuous cardiovascular exercise prescription because they know it`s safe. But is this blanket approach effective? The research says not. We now know that HIIT training can elicit more improved cardiac functionality. I feel replication in more services requires an RCCP-CEP level of knowledge and skills, this specialist exercise expertise will follow the evidence and enhance patient centred practice. RCCP registration alone will ensure they have been through a rigorous application process whereby they demonstrate competence across a wide range of knowledge and skills, such as adapting exercise to meet the needs of each individual and be capable of monitoring them at a level that minimises risk.*

Part of this patient-centred practice and exercise implementation relates to communication (Teixeira et al., 2020). The ability to liaise with Mira was of vital importance before, during and after any exercise sessions (Buckley et al., 2020, Teixeira et al., 2020). It is common that an element of anxiety will exist during exercise with this patient group (Friedrich et al., 2019). Displaying empathy, understanding the emotional stress associated with a cardiac episode, and expressing confidence in their skillsets (learned throughout their degree qualifications) were essential in motivating Mira (Friedrich et al., 2019, Buckley et al., 2020, Teixeira et al., 2020). Coupled with on-the-job experience (learning from peers and previous interactions) detailed (yet lay) conversations ensured Mira understood the CEPs approach to exercise and what any given level of exertion should feel like (Tribble and Newburg, 1998, Friedrich et al., 2019). As we were casually sat in the office discussing exercise intensity, Lauren made it clear that communicating her actions to Mira was just as important as the exercise design itself;

Lauren: "It`s essential we've got people skills…we can empathise, sympathise, be just a pair of ears sometimes to help them and give feedback when we need to motivate them, set goals and have open discussions with the patients about how hard they can push themselves which I think goes a long way…they need to understand it`s a collaboration, we`re trying to help them, help themselves…".

AC: "What happens if you can`t (communicate)?"

Lauren: "if they don`t understand, they might not come back…lots of patients think they`re cured after surgery, some are scared of triggering another event…we want them to engage so communication is key."

The CEP role is diverse and complex, therefore, skills and competencies are wide ranging and not just associated with exercise per se (Jones et al., 2021). Tom

expanded and emphasised that potential employees needed a high level of education which included communication skills such as empathy, but also experience (and competency) in working with real patients;

Tom: "…we have some really challenging patients that don't want to engage or haven't got the literacy levels…CEPs need some of those softer skills that help to deliver personalized care to patients. I feel that at the moment that isn't there nationally, when we're interviewing CEPs with academic ability (masters level) they don't know what they don't know… they're hit with patients that come from all sorts of backgrounds, have all sorts of challenges and this is where soft skills come in".

The combination of CEP and wider MDT interaction during daily/weekly huddles, the shared practice and craft learning (teachable moments), alongside research exposure and proficiency in communication ensures that the knowledge and skills of this team were exceptional (Tribble and Newburg, 1998, Warburton et al., 2011, Jones et al., 2021). I feel that this combination of theoretical and practical learning sees knowledge, skills and competency unify (Braun and Clarke, 2019). The inclusion of high risk patients within their scope of practice, undertaking submaximal clinical assessments and interpreting outcomes to generate innovative exercise prescription sets this service apart from others I have experienced. Similar research (chapter 5) identified that education alone would not be sufficient to create a well-rounded or complete CEP. The specialist nature of the role requires exposure to real world practice, with peer support and training (akin to Tom`s suggestions) essential (Tribble and Newburg, 1998, Raymond et al., 2020). This service provided that support network in abundance with staff able to reference it when applying for RCCP registration.

Hearing Tom, Lauren and Sam discuss the knowledge, skills and competencies required by a CEP made me think about how the RCCP registration could change the landscape of clinical exercise provision moving forwards. Firstly, individuals could demonstrate they had undertaken the education and training akin to other health care professionals, including rigorous assessments and exposure to the up-to-date scientific evidence base. This also made me recall my previous reflections about respect and recognition from NHS-employed peers in other health care professions. Registration should help lessen any perceived barriers around competency in my opinion and reduce the negative experiences outlined by Sam and Lauren. Secondly, academic institutions would have to conform to Clinical Exercise Physiology UK standards to gain RCCP accreditation, updating their curriculum accordingly and ensuring it contained suitable work placements for students to obtain those teachable moments (one of Tom`s concerns). Finally, I know from my own registration and involvement with RCCP and CEP-UK that behaviour change and communication skills are prominent within the curriculum requirements, thus increasing student proficiency in areas identified as being essential for effective service provision. Accepting my biases, and reviewing CEP skillsets in this service and previous services I have observed, I cannot help but think that CEPs are best placed for exercise delivery with clinical exercise services. Yes this service is unique, it has multiple RCCP-registered CEPs within it and a research arm that provides opportunities for staff to participate in innovative projects that undoubtably advance their knowledge within the field. Even so, an environment that supports staff and enhances their skills through shared practice has been created and exposure to it makes me feel that we (as a profession and clinical service deliverers) have to learn from it.

CFIR Section 5.1 – Service effectiveness

My experience has shown me that service effectiveness can be subjective depending on who you are talking to and what level of interest (or bias) they have. Nationally, the effectiveness of recognised best-practice exercise provision in cardiac rehabilitation has been questioned (Powell et al., 2018). Interestingly, this was frequently mentioned by Sam, Lauren and Tom in our discussions and clearly demonstrated an awareness that an individualised, menu-based offering was required. Translating evidence into practice is not always easy, it requires a high level of education and understanding, alongside like-minded team members who can communicate with each other to implement change as described by Lauren;

Lauren: "I think it's the type of people you're working with…you respect opinions and different peoples ways of working, as long as you achieve the same outcome it's fine and that's what makes the service effective…we`ve all got different ways of prescribing exercise but we have a similar level of education, so if I talk about something and explain what I'm doing the other person understands…so qualifications are a big part of it (effectiveness) plus always trying to find the best ways of working…the passion of the staff that genuinely want to give their best and as a result o' that our programme has got lots of options (for patients)".

Moreover, the individualised case management approach, identified as effective in clinical MDT settings (Soukup et al., 2018), was one of the real strengths of the service displaying a dedication to patient-centred care;

Tom: "from bedside to cardiac discharge post-exercise the patient receives personalised care…we help people get back to what they want to do in the long-term".

It would be remis of me not to highlight the strict NHS safety protocols in place which ensured streamlined referral pathways and safeguarding of patients throughout their journey. Additionally, the facilities that were available to patients were, in my opinion, unrivalled in this field and duly recognised by the team while we were delivering exercise sessions. During my first face-to-face contact Sam was keen to show off the options they had;

Sam: "We are very lucky with what we have in terms of our facilities…we're able to use a fully equipped gym holding up to 20 people…we have consultation rooms, assessment rooms with dedicated equipment and clinical monitoring, other services only have circuit-based portable equipment".

AC: "This isn't the norm then?"

Sam: "No, not in my experience…it does help, but it`s just one part of a bigger puzzle".

AC: "Why?"

Sam: "Funding…usually it is…but we`re lucky in that respect, well to a point…having good outcomes and being involved in research aids our profile and supports the service".

There was also a feeling that the service could develop further. Both Tom and Sam identified the need to diversify their exercise offering via community `pop up` sessions and the remote/virtual delivery of classes to address some of the demographic barriers they identified (e.g., transport, costs, accessibility). Again, this typified the never satisfied attitude and willingness to advance practice that I frequently witnessed within the service.

> *During my time within this service, I came to the conclusion that facilities and safety protocols alone were not sufficient to engage and sustain the patient levels I witnessed. Yes, equipment and space helped and this was acknowledged by the team, but I`m sure that, given the skillsets of the team, any setting they occupied would contain the same rigour regarding patient safety and exercise prescription. It was the combination of knowledge and skills within this MDT that were the reason for effectiveness. A personalised patient care pathway with numerous staff touchpoints along the way typified this. The MDT approach and interpersonal skills of the team allowed potentially vulnerable individuals to feel safe, whether that was during the physical demands of exercise, or the challenging behaviour/lifestyle discussions which can create their own psychological stresses. The fact that potential CEPs had to be at master`s level to compete at job interviews and that clinical research trials were ingrained into their DNA consistently raised the standard of the service. Having such a large volume of registered CEPs within the service was in itself unique in cardiac provision. But title and qualifications only carried partial weighting. Tom highlighted the need for socially adept individuals with empathy, good communication skills (verbal and non-verbal) and experience of working with disengaged demographics.*

Wanting to clarify the teams thoughts on RCCP-CEP registration and the potential impact on service effectiveness, during my last week of visits I made a concerted

effort to mention registration to gauge their views without trying to stimulate any bias as they knew I was a registrant.

AC: "What does being registered accomplish?"

Sam: "Recognition, autonomous working due to enhanced status, maybe banding…allowing CEPs to enter a service on a banding scale equivalent to physiotherapists…but for me it`s about recognition, individually and for the service…it`s been a long-time coming so I hope people get on board (across other services)".

AC: "Will it help the service?"

Sam: "Definitely…funding, research projects, status in the region…then again, maybe nothing…I think it`s a positive as we can ensure staff are suitably qualified when they enter the workplace…placements, knowledge levels, skills, and so on".

> *The CEPs within the service were of the highest level, not only based on my opinion, but demonstrated by RCCP registration across the team which will no doubt help the service gain further recognition with its peers in the future. Further, Mira frequently praised the standard of care she had received. From point of referral, through to exercise sessions and lifestyle advice, high levels of adherence to sessions and many expressions of appreciation demonstrated that the service must be doing something right for Mira to continue to attend. That being said, this is one service and possibly a limitation of observing such a successful one. The bigger picture of continuity in cardiac exercise provision remained and I 100% agreed with all of Sam`s sentiments regarding registration. Creating a fit for purpose exercise specialist requires regulation to ensure applicants have relevant knowledge, skills and competencies to deliver effective exercise prescription.*

6.4 CONCLUSION

The aim of this study was to explore how staff knowledge, skills and competencies contributed to the provision of a clinical exercise service, how these components assisted in creating effective service teams, and to identify what challenges existed in running services from staff and service user perspectives.

RCCP-registered CEPs within this cardiac-specific, hospital and community-based service were essential for the provision of innovative and individualised exercise prescription, underpinned by their participation in real-world clinical research trials. The localised (site specific) MDT structure enabled staff upskilling through shared peer experiences, observations and collaborative working between CEPs and the other healthcare professionals within the service. Clinical nurse specialists enabled a smooth transition of referrals from hospital into the exercise component of the service and delivered most of the behaviour change elements of the programme. Registered CEPs were able to take part in impromptu lifestyle conversations and `teachable moments` with patients concerning behaviour change, however, specific timetabled education sessions were less effective for patient engagement. It is, however, important to consider that although operating as an MDT akin to cardiac rehabilitation guidelines, this cardiac-specific service was unique by solely employing registered CEPs for exercise provision and had links to an academic institution for the research activities which is not widely available in the UK.

7 Study 4:

A comparison of two clinical exercise services in the UK: recommendations for service and education providers

7.1 INTRODUCTION

In the UK, the NHS long-term plan recommended that clinically supervised exercise services form part of the prevention and treatment of chronic and complex medical condition care pathways (NHS, 2019). In the NHS plan key areas outlined for improvement were to increase the NHS workforce, (specifically NHS training pathways and the recruitment of more healthcare professionals), to provide more clinical placements, to ensure the effective use of staff skills and experience in current services and to increase training pathways into the NHS (NHS, 2019). The desired outcome from these improvements were increased preventative treatment and reductions in patient waiting lists/times (NHS, 2019). Since the publication of the NHS plan in 2019, NHS job vacancy rates have climbed to 9.7% (up 2% from 2019) while hospital bed availability fell by 6% (BMA, 2022, NHS, 2022b). Moreover, COVID-19 has impacted all aspects of the NHS, most notably on waiting time for treatment (NHS, 2022a). A record high 7.21 million people were waiting for treatment in October 2022, with 2.91 million people waiting over the 18-week government guideline and 410,983 for excess of one year (BMA, 2022). Current curative approaches are expensive, overwhelmed and relatively ineffective (NHS, 2022a). The NHS delivery plan for tackling elective care backlog identifies that improvements in referral pathways, greater pre-surgical support for patients (specifically those with low fitness levels) and improved access to specialist out-patient advice will reduce treatment backlogs and improve health outcomes (NHS,

2022a). This care will be driven by personalised preparation plans (PPPs), part of which focuses on co-morbidities that increase surgical complication risk (NHS, 2022a).

A crucial part of PPP development is the inclusion of exercise which can increase pre-surgical fitness levels, thus helping to manage co-morbidities and reduce in-hospital recovery three-fold or more (Moore et al., 2017, NHS, 2022a). The creation of RCCP-registered CEPs in 2021 provides a solution for the NHS through a regulated clinical exercise service workforce. As registered health professionals, CEPs are able to prescribe and deliver exercise to high-risk patients in community and clinical settings (see chapters 5 and 6). Individualised exercise prescription that outlines specific dosage based on health status requires high levels of knowledge, skills and competency for patient safety (Jones et al., 2021). Current RCCP registration requires applicants to meet the CEP-UK scope of practice concerning education and experience across a range of pathologies, making this workforce the most suitable to prescribe exercise in clinical services (CEP-UK, 2021b). An example of best practice for cancer pre/rehabilitation (chapter 5) demonstrated that a community-based, clinical exercise service that employed CEPs in the process of applying for registration, could provide individualised exercise prescription which reduced surgical complications and hospital stay by three days (Moore et al., 2017). Further, a cardiac rehabilitation service (chapter 6) utilised registered CEPs to deliver innovative (regarding duration and intensity) exercise prescription based on recent real-world clinical trial data which demonstrated improved health outcomes in cardiac-specific treatments (e.g., (McGregor et al., 2016, Ennis et al., 2022)). These services align with the needs of the NHS by

reducing patient treatment times, improving patient contact and reducing the burden on treatment pathways.

Chapter 5 and 6 case studies explored individual cancer and cardiac-specific clinical exercise services. This exploration was service specific and probably condition specific. A comparison of both services was required to gather common themes to suggest broad recommendations for all patient delivering clinical exercise services and for universities educating and training the future CEP workforce. The aim of this study was to compare and contrast the common themes across each clinical exercise service that could translate into consistent, evidence-based, and actionable recommendations for both current/new services and universities providing education for CEPs.

7.2 METHOD

Data sources

The main objective of this study was to compare and contrast the key themes presented across two observational individual case studies within the field of clinical exercise service delivery. This paper investigated the combined views of both clinical exercise service staff and service users within cardiac and cancer pre/rehabilitation programmes using real-world observations in case study format to develop context-sensitive expertise which could translate across the field of clinical exercise provision (Aktinson and Hammersley, 1998, Taylor et al., 2015, Okely, 2020). The original data was obtained over a 12-week period (per service) and used multi-method approaches to qualitative data collection, combining online semi-structured interviews, online focus groups, and face-to-face observations and field notes. For detailed information about the individual study design for each service see chapter 5 section 5.2 and chapter 6 section 6.2.

Participants

Ethical approval (See chapter 5 section 5.2). Clinical exercise service staff (n=17) comprised of registered CEPs (n=5), unregulated advanced exercise instructors (n=7) clinical nurse specialists (n=2), dieticians (n=1) and service managers/leads (n=2), females (n=12), males (n=5) and had an average age of 30 years old. Service users (n=16) attended either one of the exercise interventions, were male (n=10), female (n=6), had an average age of 64 years old and were ether cancer or cardiac (including vascular and heart failure) patients. A detailed description of the participants of each study can be found in chapter 5 section 5.2 and chapter 6 section 6.2.

Data extraction and synthesis

A comprehensive implementation framework (Consolidated Framework for Implementation Research (CFIR)) was utilised during the original studies analysis (Damschroder et al., 2009). Extracted data for each of the pre-identified CFIR categories (chapter 5 section 5.2) across both services were independently analysed by AC and reviewed by the research team to create a thematic synthesis (Thomas and Harden, 2008). This involved independently coding the data to identify recurring, unique and contradictory content and using the codes to independently summarise the content of the theme in a series of sub-themes (Thomas and Harden, 2008). The findings were discussed and agreed, and a final analysis for all categories was refined by the research team without further participant input (Thomas and Harden, 2008).

7.3 RESULTS

This study generated five common themes across the two services; (i) streamlined and consistent referral pathways, (ii) RCCP-registered clinical exercise physiologists (Or qualified to level to apply for RCCP registration via equivalency), (iii) clinical

workplace learning and craft development, (iv) behaviour change and communication requirements, and (v) person-centred, individualised and innovative evidence-based exercise prescription.

Individual themes

1). Streamlined and consistent referral pathways

Streamlined, efficient and effective referral pathways were evident in both services from staff and service user perspectives. Referrals were primarily made by clinical nurse specialists as part of an MDT or as part of the wider care provision. A patient-centred focus from the outset, demonstrated by effective communication regarding the benefits of exercise and lifestyle change, enabled exercise service referrals to be made after diagnosis/post-surgical intervention with smooth patient transition identified by all participants:

"We have a seamless pathway for the patients…they are picked up on the wards by the nurses and referred straight into the service...from bedside risk factor education to consent for exercise referral, testing and participation" (Cardiac service staff)

"We've got colorectal, lung and upper GI tumours usually referred by the clinical nurse specialists into universal or targeted parts of the programme depending on condition severity…patients are classes as universal if they're quite able and can exercise independently, targeted if they need more support from the exercise specialists" (Cancer service staff)

An example of this streamlined patient-centred practice was seen in the Enhanced Recovery After Surgery+ (ERAS+) pathway (Figure 7.1) in the cancer service. This innovative pre-operative pathway was designed and developed by a variety of healthcare professionals (e.g., Anaesthetists and occupational therapists), then

piloted across six NHS trusts in Greater Manchester to reduce postoperative pulmonary complications after major surgery (one of the most common forms of postsurgical difficulties) (Moore et al., 2021). The pathway focused on exercise, nutrition, smoking cessation, anaemia management and medical optimisation prior to surgical intervention, and displayed a 50% reduction in postsurgical respiratory complications in combination with a reduced hospital stay (mean 3.1 days) (Bougeard and Moore, 2019). This success provided rationale for the integration of cancer prehabilitation into the ERAS referral pathway, the starting point being an MDT decision to operate or not.

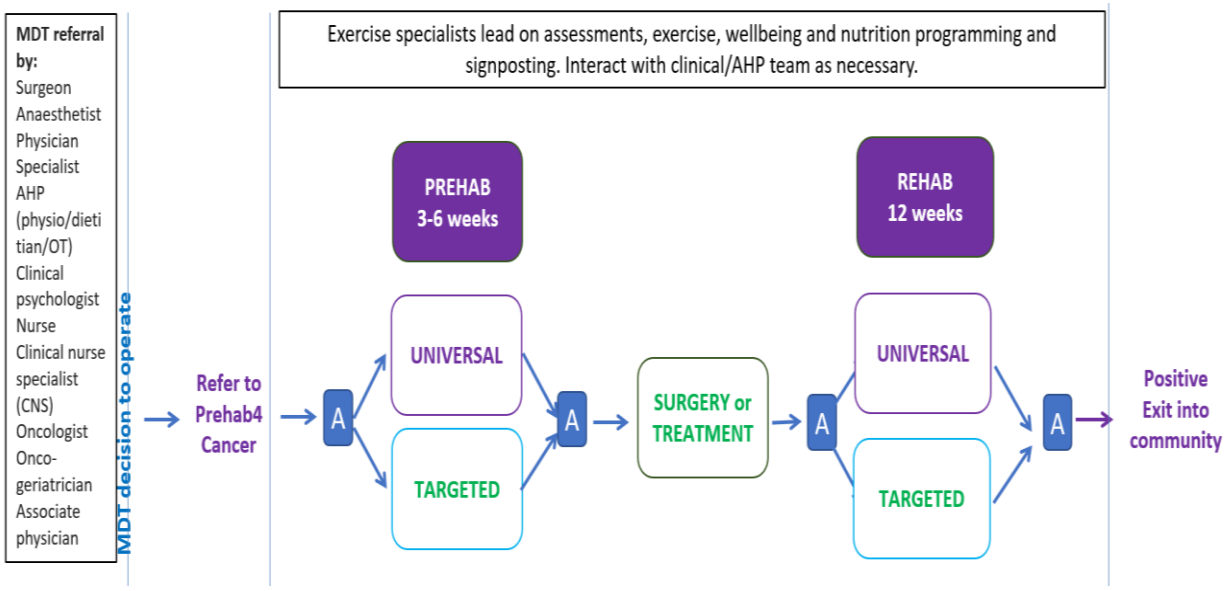


Figure 7.1: Prehab4Cancer referral pathway (Moore et al., 2021)

In phase I, all patients undergoing colorectal, lung and upper GI cancer surgery are offered cancer prehabilitation without restriction. All prehabilitation patients, those at higher risk (targeted) and all data point assessments (highlighted by `A` on the flowchart) were completed by the advanced exercise instructors, whereas lower risk patients undertaking rehabilitation (minimal co-morbidities) or those on the universal arm (low risk stratification) could work with the less qualified or experienced

exercise instructors. Similarly, in the cardiac rehabilitation service BACPR guidelines were followed regarding the stages of care, including patient consent and exercise referral transfer forms from secondary to primary care interventions, demonstrating a consistent adherence to condition-specific referral guidance by both services.

Both service referral processes facilitated interactions between CEPs/advanced exercise instructors and other healthcare professionals such as consultants. These interactions were acknowledged as positively raising the profile of exercise as a treatment modality and increased healthcare professional awareness of exercise staff roles within the wider care pathway in both services. Negative similarities across the two services, however, were occasionally witnessed as skillsets and scope of practice were questioned:

"I think when certain health professionals haven't really been involved with this sort of thing before there's a hesitation as to how this is going to be beneficial and how this is going to help and also just understanding about what exercise is going to be given" (Cancer service staff)

"People (in the NHS) don't feel that we have the skill set to deliver the intervention…but when you start questioning them on how to measure exercise capacity, how to look at patient mobility, outcome measures, prescribing exercise, there's not much knowledge…I think that's a skill set that we have but we haven't got the platform to provide because we're not really recognised" (Cardiac service staff)

2). RCCP-registered CEPs or equivalent delivering exercise components

Both services identified, with unwavering consistency, that exercise specialists were best placed to deliver the exercise consultations, fitness assessments and interpretation, exercise prescription design and delivery, and re-assessments / evaluations at the end of the programme. Yet, as highlighted previously (chapter 3) the unstandardised job titles within clinical exercise services was evident when comparing the two services. The cardiac service employed CEPs by title, whereas the cancer service staff were known as advanced exercise instructors. A common factor, however, was the high level of knowledge, skills and competencies found across the exercise specialist teams, with staff being RCCP-registered CEPs or at a comparable level (according to the CEP-UK equivalence pathway) in both services. This level of training was acknowledged as a benchmark for ensuring exercise staff were qualified to manage all facets of the exercise components, with exercise prescription knowledge and assessment interpretation seen as vital:

"It comes down to the knowledge and skillset…the exercise prescription quality…the knowledge of exercise benefits/goals…I feel the CEP background in terms of exercise prescription is strongest due to their degree training (undergraduate and/or postgraduate)…I think physio`s and nurses look at things in a different way…more recovery focused than improving exercise or health outcomes maybe". (Cardiac service staff)

"Essentially, an undergraduate degree in a sports science or health science-related subject is needed…we have a very clinical approach to exercise prescription so staff need to know how to risk assess, complete an assessment effectively and interpret those results into a meaningful prescription, that's where the skill lies." (Cancer service staff)

3). Clinical workplace learning (craft development)

Workplace learning, or the development of skills and competencies through on-the-job experience, arose as key components for effective clinical exercise service provision in both services. Craft development was cited at various times through staff working lives, notably in the cardiac service during their initial few months within post to gain an understanding of local NHS service protocols (e.g., exercise assessments, one-to-one and group exercise design and delivery requirements) and in the cancer service via frequent internal upskilling sessions led by fellow health professionals in specialist clinical subjects (e.g., cancer treatments). Researcher observations across both services identified that informal craft learning took part daily. Yet, the type of knowledge and skill sharing differed between the services. Both services demonstrated upskilling and shared best practice across the same professions (e.g., CEPs to CEPs), however, the cardiac service displayed more multidisciplinary knowledge sharing across professions (e.g., CEPs to CNS and vice versa) due to the localised nature of the MDT. The importance of these interactions was cited as essential for skill transfer and service optimalisation by both services:

"We have MDT meetings on a regular basis where we come together and talk about our patients, what we`ve learned and how we can push each other in our practice...we`re constantly in collaboration as a team, challenging each other (to improve) and learning from our experiences" (Cardiac service staff)

"We are given the responsibility to develop as an individual…I think it is very important that we try and foster a pathway for everyone in the exercise team to improve their knowledge and skills…I'd be a fool to say that I was an expert in every single area, so we use each other's experiences to grow" (Cancer service staff)

It was noted within the cardiac service that craft knowledge should be fostered during CEP postgraduate education pathways as a priority by embedding clinical work placements into an accredited course framework to ensure that newly-qualified staff were fit for purpose upon employment:

"… it's that hands on experience that`s really important (for CEPs), this is where the learning occurs and that`s missing…I think having a period of supervision (during your training) is really important". (Cardiac service staff).

Conversely, although cancer service staff identified craft learning as essential, they cited standardisation in exercise prescription training as a primary area of concern:

"I think (qualification) standardization is a massive challenge for high quality exercise provision. If you look at training providers, it`s the standardization (of the vocational advanced exercise instructor courses) that would raise the standards of exercise prescription and who is delivering it (Cancer service staff)

4). Behaviour change and communication

A fundamental requirement for staff within both clinical exercise services was an understanding of behaviour change theory its practical application, alongside excellent verbal and non-verbal communication skills. All staff acknowledged training within these areas, predominantly through academic education. Exercise

autonomy was at the forefront of patient-centred care, but for this to be effective staff identified that an understanding of when they could use teachable moments to educate patients regarding exercise benefits and implementing lifestyle changes was essential. There were, however, differences in the way this information was delivered to patients. The cardiac service utilised formal, timetabled education sessions within the exercise intervention, delivered by CEPs and clinical nurse specialists, alongside non-formal, subtle discussions about health behaviours originating at point of referral by the clinical nurse specialists. Conversely, the cancer service used informal conversations, delivered by the advanced exercise instructors, throughout the exercise intervention to relay behaviour change information. Yet, one consistent feature across both approaches was the use of lay language alongside expressions of empathy which enhanced patient engagement and was identified by patients within both services:

"We had support throughout…I couldn`t believe how quick I got started and how thorough it was…they helped me understand my condition and that it was safe to exercise and how it would benefit me" (Cardiac service user)

"…everyone feels comfortable. No one feels judged, you know, staff make you feel like you can participate, you know, under any sort of undue anxiety…I spoke to them about what I've gone through and they listened to me" (Cancer service user)

5). Person-centred, individualised and innovative evidence-based exercise prescription

Exercise staff in both services acknowledged that exercise prescription, either in one-to-one or group formats, including face-to-face or via virtual settings, should be individualised. Further, there was an acknowledgement across both services that the one-size-fits-all approach to exercise prescription and delivery was ineffective. Yet, contrasting approaches to exercise prescription were evident. The cardiac service displayed innovative and research-based (e.g., HiiT or MiiS clinical trial evidence) exercise programmes that challenged patients with higher intensity / duration levels (either interval-based or continuous training) to improve their personal health outcomes, e.g., claudication thresholds. Further, all patient sessions were delivered in group formats (n=15) and monitored by CEPs (n=3) and clinical nurse specialists (n=3) with exercise programme cards adapted by CEPs on/during each visit as required. Such practice was purposive and stemmed from experience within clinical exercise service delivery, high levels of training in exercise prescription and ongoing participation in research within the field of both cardiac provision:

"40-70% heart rate is fine, but it`s not for everyone…patients can work harder, HIIT makes them work harder and allows recovery, it allows them to challenge their cardiac threshold and develop their cardiac health…we prescribe individually, not a one-size-fits-all approach…that`s why I feel we`re effective and other services are not…it`s also what the (scientific) evidence says". (Cardiac service staff)

The cancer service demonstrated a more conservative approach to individualised exercise prescription akin to moderate intensity aerobic training and low resistance / higher repetition strength training, although higher intensities were evident in

prehabilitation programmes aligning with current literature and guidelines. Cancer gym-based sessions were delivered in a one-to-one format, however, once an initial exercise programme was completed the patient was able to exercise unmonitored until the next programme review (usually within 3-4 weeks).

Both services expressed the need for patient autonomy regarding exercise session availability, however, the cancer service was more flexible in its offering. The cardiac service allocated two sessions per week to service users over the 12-week intervention. These sessions were at fixed times chosen by the patient but with minimal option to change once chosen. Cardiac sessions provided gym-based access for patients with large volumes of apparatus such as cardiovascular and resistance machines, and portable equipment primarily in one purpose-built facility. Conversely, the cancer service provided 12-week unlimited access to multiple leisure centre gyms (n=99) within the local area containing similar equipment as the cardiac service. Additionally, the cancer service offered daily online face-to-face group exercise sessions (via Microsoft Teams) on a non-comital drop in basis, covering a variety of exercise types available (e.g., Tai Chi or chair-based exercise).

"…We`re determined to blend the best practices of both models, face-to-face and virtual…we want to offer a menu-based service and enable access…one way being the telephone assessment as it`s a better way of introducing patients to our services, patients not attending is basically non-existent now. We also want to explore live group sessions". (Cancer service staff)

The person-centred approach to care was evident across both services, with one commonality being the need for national exercise guidance updates in the fields of cardiac and cancer exercise provision. The cardiac service delivered innovative

exercise delivery stemming from ongoing research and participation in cardiac-related clinical trials (e.g. McGregor et al., 2016 and Ennis et al., 2022). This exercise prescription frequently conflicted with the current BACPR exercise guidelines as staff lamented the lack of guidance reviews and a failing to optimise exercise prescription based on the most up-to-date real-world research findings:

"National guidance takes so long to catch up… BACPR as our main governing body, guidance is the same as when I did my instructor course 16 years ago…if we weren't involved directly in research and in a team of well qualified, registered CEPs, it'd be easy to tread water…I think that's what's happening across other services". (Cardiac service staff)

Likewise, the cancer service had participated in the production of peer-reviewed, scientific evidence regarding service design and delivery (e.g., Moore et al., 2021). The cancer service acknowledged that exercise prescription guidelines in cancer required more exposure, notably, the different requirements of patients based on their prehabilitation or rehabilitation status:

"Cancer prehabilitation exercise guidelines need recognition…its different to rehabilitation, we use higher intensities, often interval training, to try to improve fitness levels pre-op…these increased levels make the recovery process easier for the patient" (Cancer service staff)

7.4 DISCUSSION

The aim of this study was to generate common themes from both individual clinical exercise service case studies (chapters 5 and 6) and to compare and contrast the common themes that could translate into consistent, evidence-based, and

actionable recommendations for both current/new services and universities providing education for CEPs.

Service referral and uptake

Globally, referral rates into cardiac rehabilitation services have been identified as inconsistent, most notably in certain cardiac-related conditions (e.g., post-bypass graft) where up to 80% of eligible patients do not get referred into clinical exercise services (Niebauer, 2016, Liu et al., 2019, Brouwers et al., 2021). In the UK research shows that only 50% of those eligible for cardiac rehabilitation take up the offer and ≤50% patients entering a programme do not adhere to it (Sharp and Freeman, 2009, NACR, 2020). Along similar lines, a UK study suggested that only 9% of oncology nurses and 19% - 23% of oncology physicians refer patients with cancer to exercise interventions (Webb et al., 2016). High levels of non-referral have led to the international promotion of automated referrals in both conditions, defined by all patients being recommended for exercise rehabilitation (Liu et al., 2019, Schmitz et al., 2021). In both of these best practice exercise services included within this study, referrals were completed by clinical nurse specialists usually during acute care or initial diagnosis, but importantly, all patients were offered exercise rehabilitation leading to high levels of uptake (e.g., 80% in the cancer service (Chapter 5) and 81% in cardiac (chapter 6)). Although not automated *per se*, both staff and service users within the relevant cancer/cardiac services identified that this consistent, streamlined referral process stemmed from the early involvement of clinical nurse specialists who remained a constant point of contact throughout the patient journey, alongside an adherence to nationally recommended condition-specific referral guidelines (BACPR, 2019, Moore et al., 2021).

Furthermore, the inclusion of prehabilitation (cancer) and high-risk cardiac-related conditions (congestive heart failure and early access sternotomy) in the respective referral pathways were based on the latest research evidence. demonstrating that exercise was beneficial at such early stages (Ennis et al., 2018, Moore et al., 2021). CEPs in the cardiac service delivered the exercise components within the Ennis *et al.*, study which demonstrated their ability to successfully work with high-risk patients in early stage recovery (Ennis et al., 2018). The ability of CEPs to generate new research knowledge and apply that upskilling into their practice was the key element in making the cardiac service effective. Such best practice procedures align with UK healthcare recommendations concerning patient-centred care and enhancing the need for MDTs (localised or on a wider scale) (Beswick et al., 2005, Coyne et al., 2018, Fix et al., 2018, Soukup et al., 2018, NHS, 2022a). The need for patient-centred exercise care pathways beginning with the initial contact in hospital (via clinical nurse specialists), through to exercise consultation, assessment, prescription and delivery, and until discharge into community settings, cannot be underestimated across both conditions (Beswick et al., 2005, Coyne et al., 2018, Fix et al., 2018). Generating patient referrals into clinical exercise services can be challenging (Beswick et al., 2005), but based on the observation of two unique, highly organised and effective services across two different long-term conditions, the inclusion of strict and standardised referral protocols devised by the teams that included CEPs demonstrated high levels of consistency in patient referral and uptake, with service users identifying high levels of adherence to exercise provision in both areas.

Registered CEPs

Each service observed in this study identified that for patient safety (the driving force for regulation) and autonomous working to be achieved by CEPs, a high level of training was required. Both services acknowledged that clinical exercise education pathways should include in-depth content to enhance knowledge and skills in areas such as fitness assessment competency and interpretation, exercise prescription design and practical delivery, and behaviour change and communication. Cardiac service staff attributed their ability to practice evidence-based exercise prescription to their postgraduate master's degree level training. Cancer service staff identified that undergraduate degree level training in a sport and exercise science-related discipline was a minimum requirement. The level of education cited differed between the two sets of staff potentially due to inconsistencies (chapter 3) in job titles and the CEP-UK registration process being in its infancy during the cancer study. Moreover, upon exploration cancer service staff were qualified to a level deemed equivalent to a master graduate from an accredited CEP according to the latest CEP-UK guidance, thus meeting the standards to become a registered CEP (and therefore will be known as such from herein during this study). Consequently, most of these highly qualified staff had either conferred registration through RCCP, or were working towards it, potentially making them some of the first RCCP-registered CEPs in the UK (CEP-UK, 2021b). Further, both services supported and encouraged staff to be registered because this provided regulation and recognition akin to other allied health professionals, ensured patient safety and provided the cardiac CEP's with new training and development opportunities within the NHS (CEP-UK, 2021b). Individually, CEPs from the cardiac service acknowledged that having formal registration with a PSA accredited

regulator would assist them in many facets of their job, notably the increased likelihood of acceptance by other health professionals (an area previously highlighted as a concern), recognition of skillsets (which have been questioned due to a lack of awareness by co-workers) and service statue (having a registered workforce).

Craft development

One prominent feature across both services was the necessity of clinical workplace craft development, i.e., shared learnings and experience between colleagues through formal and informal training and discussions (Tribble and Newburg, 1998). Work-based learning has been accredited with the potential to transform health care services by improving patient and service user experiences (Manley et al., 2009). Staff development, which includes the implementation of real-world evidence-based practice, enhances productivity through staff engagement and is attributed to structured workplace learning (Manley et al., 2009). Notably, both services recognised knowledge and skill development of CEPs as paramount, highlighted by the frequency of upskilling opportunities which could be achieved through various techniques such as regular debriefings, supervised learning (e.g., competency quality assurance in delivering fitness assessments) and formal training via healthcare professionals with niche specialisms (e.g., post-surgical colorectal treatments within the cancer service). This learning, however, appeared more diverse in the cardiac service due to the consistent interactions between CEPs and other members of the MDT who were all situated under one roof, enabling a crossover of skills. Time was purposely allocated (by both sets of service management) to the fostering of staff development with an acknowledgement that new starters or less qualified/experienced staff needed additional understanding in real-world skill

implementation (e.g., the ability to deliver exercise progressions and regressions competently). Even though CEP theoretical knowledge levels were high in both services, there was an awareness that current training pathways were limited regarding clinical workplace exposure. Moreover, the cardiac service specifically recognised the need for clinical work placements to be built into education pathways, identifying that on-the-job learning was paramount to ensure all CEPs were aware of best practice (required by service management) in each of the exercise components (e.g., consultations, assessment, programme design and delivery).

Behaviour change and communication

There were contrasting behaviour change strategies across the two services with formal education sessions displayed solely in the cardiac service as recommended within BACPR core component guidelines (BACPR, 2019). Segregated education sessions led by cardiac CEPs and clinical nurse specialists, resulting in the removal of the exercise component that day, led to the one-off session feeling disjointed with patients appearing disengaged, an issue that has been previously noted throughout healthcare services (Kelly and Barker, 2016). Moreover, previous evidence identifies that an empathetic, patient-centred, autonomous approach aids long-term patient behaviour changes compared to externally motivated goals/information delivered in a structured session (Ryan and Deci, 2000, Teixeira et al., 2012, Kelly and Barker, 2016, Teixeira et al., 2020). It was, therefore, interesting to note that the CEPs within the cardiac service were reviewing the format of formal education sessions. This did not detract, however, from pertinent health behaviour information being delivered during exercise sessions in the cardiac service. Similarities between the services existed in their delivery of effective and successful communication techniques through the use of subtle `nudge` points and `teachable

moments` as and when they presented themselves such as during informal conversations when patients were exercising (Buckley et al., 2020). CEPs in both services had the ability to listen, gain trust and confidence, and to communicate suitably with patients about their condition and exercise progress. Empathy, understanding stages of lifestyle change and recognising the need for autonomy for patients, were recognised by both sets of CEPs as essential, coupled with on-the-job experience (learning from peers and previous interactions) (Tribble and Newburg, 1998). Both services acknowledged improved patient engagement during behaviour change discussions through the use of these subtle approaches, therefore, there is an argument for increased focus on these skills within the education pathway for CEPs, especially as governing guidance identifies behaviour change as a core component of personalised care (Kelly and Barker, 2016, NACR, 2022b).

Evidence-based prescription

Recent research has suggested that global and national cardiac rehabilitation guidelines require updating for optimisation (Powell et al., 2018, Hansen et al., 2019, Dibben et al., 2021). In fact, the current delivery of cardiac rehabilitation, as recommended by BACPR, has been cited as ineffective in its current form due a lack of individualised prescription and ineffectual exercise intensity and duration dosage (West et al., 2012, Powell et al., 2018). One area of criticism equates to a one-size-fits-all approach, rather than individualised exercise prescription, with this frequently cited when the cardiac service CEPs compared their exercise prescription protocols to other services, both in the UK and internationally (West et al., 2012, Powell et al., 2018, Squires et al., 2018, Dibben et al., 2021, Hansen et al., 2022). Exercise modality (e.g., Ski Erg, rowing machines and cross trainers) and, more importantly

as it is rarely challenged, exercise intensity methods (e.g., High Intensity Interval Training (HIIT)) used in the cardiac service frequently exceeded existing governing body guidelines (e.g., 40-70% Heart Rate Reserve), yet were safe and arguably more effective in generating improved health outcomes (McGregor et al., 2016). Notably, both services were in unique positions having had active participation in research studies, either patient focused through clinical trials (e.g., McGregor et al., 2016, Ennis et al., 2018) or service design-focused and disseminated across the newer field of cancer prehabilitation (e.g., Moore et al., 2021). Such exposure, alongside an understanding of scientific literature generated by academic education and training and the inclusion of registered CEPs, underpinned the innovative exercise prescription observed in the cardiac service allowing current rehabilitation guidelines to be iteratively modified and optimised (McGregor et al., 2016, Powell et al., 2018, Hansen et al., 2022, Taylor et al., 2022). Cancer service observations regarding exercise guidelines were less controversial, only highlighting that a limited exposure to the differences in intensity/duration requirements for patients undergoing prehabilitation and rehabilitation still existed. Commonalities between the two services existed concerning the consistent use of individualised exercise assessment, prescription and delivery, and an acknowledgement of menu-based exercise options for patient autonomy, specifically provided by the cancer service through online platforms. Such practice and experience allowed the CEPs to identify training gaps across the cancer and cardiac landscapes, for example, a lack of prehabilitation information/qualifications in cancer care led to staff identifying the need for updated information to be built into education pathways. Moreover, both services identified that effective and individualised patient-centred exercise prescription should be

based on real-world, up-to-date research that is embedded in all education provider course content.

7.5 RECOMMENDATIONS

The following recommendations are based on the common themes identified by cardiac and cancer clinical exercise service staff and service users:

1). The level of qualifications and experience shown across the two services were comparable to that of a postgraduate master's degree educated clinical exercise physiologist (according to the RCCP equivalence pathway). Therefore, for effective exercise provision clinical services should employ RCCP-registered CEPs to deliver individualised, evidence-based exercise prescription learnt through exposure to up-to-date real-world research during the education pathway.

2). A patient-centred referral pathway should adhere to nationally recognised, condition-specific guidelines regarding exercise referral from initial point of care to a registered CEP for optimal programme uptake. Not all long-term conditions have guidelines for exercise referral in place or stipulate that CEPs should be involved in the exercise provision, therefore, services should such create a patient pathway based on this research evidence to improve exercise uptake.

3). Clinical exercise service staff should be allocated time for formal or informal upskilling (workplace craft) to take place such as peer to peer observations and discussions, with localised MDTs vital for the sharing of knowledge and experiences between health professions.

4). When contemplating behaviour change delivery strategies, services should focus on using a variety of flexible approaches that enable impactful, teachable moments during informal patient conversations rather than one-off taught education sessions.

5). Education providers should use the CEP-UK scope of practice to ensure they include the requisite fitness assessment competency and interpretation, exercise prescription design and practical delivery, and behaviour change and communication skills to guarantee the future graduate CEP workforce meet the standards required for RCCP registration.

6). Education providers should incorporate clinical work placements that adhere to the CEP-UK curriculum framework within postgraduate CEP qualifications to ensure students obtain suitable real-world experience within exercise services as recommended by the NHS long-term plan.

8 SYNTHESIS OF FINDINGS

The overarching aim of this thesis was to explore clinical exercise service provision prior to, and following the introduction of CEPs, and provide insight and best practice into how to embed CEPs into clinical practice in the UK. This synthesis first briefly summarizes the findings of the four research studies, presented over four chapters (3, 5, 6 and 7) within this thesis. It then draws on the collective findings of the studies to recommend future directions for: a) current/new clinical exercise providers and associated stakeholders in the UK, and b) education providers who deliver clinical exercise physiology master's degrees.

8.1 SUMMARY OF FINDINGS

Study 1 (chapter 3) found that clinical exercise provision in the UK was highly inconsistent and piecemeal concerning job titles, roles and qualification requirements across clinical exercise services for cardiac, respiratory, stroke, falls and cancer in the UK. Job titles of "exercise physiologists" bore little alignment to their qualifications, with a large heterogeneity across services. This study provided evidence that the regulation of exercise job titles, roles and qualifications were required within clinical exercise services. Regulation and registration for CEPs was implemented in Dec 2021 shortly after this study was published. The following studies within this thesis subsequently explored the impact of registered CEPs in exercise service provision.

Study 2 (chapter 5) identified that within a community-based, cancer-specific clinical exercise service, healthcare professional and patient collaboration at the outset enabled the development of an effective referral pathway that generated 80%

uptake into the programme. Advanced exercise instructors in the service were educated and experienced to a level equivalent to RCCP-registered CEPs and were able to deliver and interpret fitness assessments competently, design and deliver appropriate exercise prescription, and demonstrate behaviour change and communication skills that adhered to patient-centred needs based on high levels of cancer-specific knowledge, skills and competency, underpinned by undergraduate degrees plus additional vocational and specific training. Peer learning and CPD-based training delivered by healthcare professionals from the wider MDT was essential for staff upskilling. The findings of this study highlight that the knowledge, training and experience outlined to become a registered CEP via equivalence process is robust in ensuring CEPs can deliver to the required standards. The evidence from this study shows having the appropriately trained workforce to deliver an effective service is essential. These findings are relevant for current and future cancer exercise services in other parts of the country.

Study 3 (chapter 6) identified that RCCP-registered CEPs within a cardiac-specific, hospital and community-based service were essential for the provision of innovative and individualised exercise prescription, underpinned by their participation in real-world clinical research trials. The MDT structure within this service enabled a smooth referral process, staff upskilling through shared peer experiences, observations and collaborative working between CEPs and the other healthcare professionals, ultimately contributing to increased patient uptake and exercise adherence. Registered CEPs were able to take part in impromptu lifestyle conversations and `teachable moments` with patients concerning behaviour change. These findings demonstrated that university educated registered CEP's are the most

appropriate healthcare professional to lead and deliver clinical exercise services. Other cardiac services around the country can learn from this delivery model, with CEP's as part of an onsite MDT of multiple healthcare professionals, to also improve patient uptake and adherence. Key targets within the NHS plan.

Study 4 (chapter 7) provided six recommendations for the development of clinical exercise provision best practice and future accredited CEP education pathway. Clinical exercise services should employ RCCP-registered CEPs to deliver individualised, evidence-based exercise prescription learnt through exposure to up-to-date real-world research during the education pathway. Services should optimise patient uptake by following nationally recognised exercise referral pathways (where applicable) or use this evidence to create referrals to registered CEPs from initial point of care. Workplace craft is essential for the sharing of knowledge and experiences between health professions, with flexible behaviour changes approaches more successful at engaging patients than structured education sessions. Education providers should use the CEP-UK scope of practice and curriculum framework to ensure they include the requisite clinical work placement hours, and exercise prescription and behaviour change knowledge and skills to guarantee future CEP workforce meet the standards required for RCCP registration.

8.2 STRENGTHS AND LIMITATIONS

A notable strength is the large sample size and the rigorous staged processes employed to gather information in chapter three. Nevertheless, the descriptive data collected across five service models does not allow conclusions about these different models' relative effectiveness or impact or any evident disparities. The main strength of chapters five and six was the multi-method exploration of clinical exercise

provision which allowed an in depth look at service effectiveness, including staff knowledge, skills, and competencies from staff and service user perspectives. Each chapter considered what works well and service challenges, staff factors in service delivery and finally, highlights the key observations when creating a `best practice` clinical exercise service model. Each study was, however, conducted as a single service case study focusing on one long-term condition, therefore limited by a small, convenience sample. This was demonstrated by the low duration service user focus group in study two (chapter 5) and led to service user conversation and observation only in study three (chapter 6). It is also important to note the researcher position regarding data interpretation, alongside potential social desirability displayed by staff and service user participants during observations. As an experienced and registered CEP I observed both services using a researcher and practitioner lens, attempting to lessen my pre-conceived ideas of best practice by constructively exploring the data over a suitable timeframe as it was generated. Given the duration of the observation period, I feel that valid outcomes were generated that go some way in explaining the key considerations for effective clinical exercise provision for a long-term condition in the UK. The main strength of chapter seven was the in-depth, synthesized analysis of the multi-method data obtained in study two (chapter 5) and study three (chapter 6) which identified commonalities and contrasting methods for the delivery clinical exercise services in the UK. This chapter reviewed what worked well and the staff factors involved in service delivery across both services, creating a set of generated themes that appeared throughout both services for current service and education providers to review. One limitation is that the data synthesis is representative of two unique services that have been identified as delivering high quality clinical exercise provision within individual long-term conditions. This compare and contrast

synthesis, however, has generated clinical exercise service and education provider recommendations for the development of best practice concerning exercise provision and CEP education.

8.3 REAL-WORLD IMPLICATIONS AND FUTURE DIRECTIONS

This thesis offers insight into the workforce providing clinical exercise services in the UK. Thus, maybe useful to various clinical exercise service stakeholders (e.g., NHS commissioners and NHS service leads). The findings of this thesis highlight the need to standardise clinical exercise provision across the long-term conditions landscape with the appropriately trained workforce, but via observing unique and effective clinical exercise services, the findings of this thesis also provide recommendations for best-practice in terms of referral process, exercise prescription / delivery and behaviour change.

This thesis identifies that RCCP registered CEPs are best placed to deliver high-quality clinical exercise provision for both public and privately funded treatment pathways. CEPs, through regulation, are now recognised as health professionals and experts in their field and should be embedded into MDTs to optimise patient-centred care not only in the five long-term conditions outlined in study one (chapter 3), but in all long-term conditions. Advocacy for CEPs within the NHS has already seen job descriptions/specifications altered to include RCCP registered status as desirable, with current services acknowledging that CEP-UK, through a recognised scope of practice and curriculum framework, can assist in developing a standardised education pathway for future CEPs. Clinical exercise services should advocate for their current workforce to engage in the registration process to enhance service reputation and provide a quality mark for patient safety

akin to the clinical exercise services observed in studies two and three of this thesis. Services that are identified as effective and demonstrating best practice.

Academic institutions need to recognise that current postgraduate master degree CEP courses should align with the CEP-UK curriculum framework, specifically the inclusion of clinical work placements with guided practice-based learning hours, which are essential for enhancing real-world student experiences and adhere to NHS objectives. Such adherence will enable newly qualified (from 2023) CEPs to obtain RCCP registration as gradates and enter the NHS as health professionals, thus raising the credibility of the profession within healthcare services akin to other health professionals (e.g., occupational therapists). Moreover, NHS and higher education funding akin to nursing finance support (previously bursaries), could be applied to accredited courses with stipulations that once qualified, registered CEPs enter the NHS for a minimum timeframe, thus providing the NHS with a highly educated and regulated clinical exercise workforce focused on patient safety within exercise services. Taken together, standardisation of clinical exercise services via the inclusion of registered CEPs and promotion of CEP's to develop more clinical exercise services (i.e., for other long-term conditions and in other parts of health care system such as primary care) can go some way to using exercise and physical activity in the prevention and management of long-term conditions in the UK, which would be a paradigm shift, that could have huge health and economic benefit.

The qualitative exploration within this thesis focused on clinical exercise provision across two long-term conditions. Future research should use qualitative methods to examine clinical exercise provision across differing long-term conditions to broaden the knowledge of clinical exercise service delivery in the UK. Studies

should investigate the structural requirements for condition-specific exercise provision, including staff factors (knowledge, skills and competencies) of those delivering the exercise components, MDT usage and patient care pathways. Further, research studies could explore underperforming clinical exercise services based on national audit reports that highlight those services not meeting guidance standards (e.g., NACR audits). This qualitative exploration would examine common difficulties within clinical exercise provision within lesser performing services (as opposed to high performing within this thesis), highlighting what is needed to create improvements from staff and service user perspectives. Future research could explore clinical exercise service expansion into primary care, for example, the implementation of registered CEPs into GP surgeries to provide exercise and behaviour change advice. Quantitative data could be collected at various patient journey touch points (e.g., referral process, uptake and adherence to exercise and assessment outcomes), while qualitative data could explore patient experiences during the exercise intervention (e.g., motivation and compliance). Additional research could focus on the creation of new services or structural changes within current services outlining how registered CEPs were incorporated. This study could observe the implementation of change / new service design and how this altered the exercise delivery, creating a roadmap for other long-term conditions to follow based on the addition of registered CEPs into MDTs. Likewise, future research could explore the integration of clinical exercise services within academic institutions, i.e., services could be delivered on university campus by employed staff, supported by student CEPs. Quantitative data collection could be used to track referrals, uptake and adherence, alongside physiological and psychological assessments. Qualitative data could explore the novel approach to clinical exercise delivery within university

settings. For example, patients could consider accessibility, perceptions of the facility and supervision and support levels (staff and workplace students), whereas staff and students could provide insight to the barriers and facilitators of such provision from their perspectives.

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10 APPENDICES

APPENDIX 10.1 PARS Taxonomy

Physical Activity Referral Scheme (PARS) Reporting Checklist		
Level 1 PARS classification		
Level 1a: Primary classification The purpose of this taxonomy is to provide a classification system for PARS, including clinically based exercise schemes, exercise referral schemes and social prescribing for physical activity (PA). It is for use in evidence reviews of delivery and effectiveness. It is also an audit and monitoring tool for funders and providers to capture service delivery. The taxonomy is intended for programmes that fulfil all of the following **three criteria**:		Tick all that apply
1. Have a primary aim of increasing PA		
2. Have a formalised referral process		
3. Are for individuals who are inactive and/or sedentary, and/or have (*or are at risk of having)* a health condition.		
If you have not ticked all of these boxes, then the PARS taxonomy is not suitable for your programme.		
Additionally programmes **may** also include the following		Tick any that apply
1. Individual behaviour change consultations *(explicit, planned behaviour change techniques included e.g., goal setting, formalised activity tracking/activity monitoring)*		
2. PARS specialist staff supervised PA sessions or one-to-one supervision		
3. Signposting to a range of generic available activities delivered by non-PARS specialist staff *(e.g., walking football, yoga, Pilates, Zumba)*		
1b Provider	Tick all that apply	Further specify provider
Leisure trust		
Local government		
Other third/community sector organization		
Sport-based (governing bodies or sport clubs)		
Commercial/private provider		
Health (e.g., NHS)		

Other (define)		
1b Setting	Tick all that apply	Specify exact location (e.g., leisure centre name and location, including postcode or web link/app name etc.)
Leisure centre		
Green/outdoor space (define)		
Sports club		
Community facility (define)		
Commercial gym		
Other commercial facility (define)		
Other local government facility (define)		
Home-based		
Clinical setting		
Online/eHealth/mHealth		
Other (define)		
1c Conditions accepted (have or at risk of)	Tick all that apply	Specify exact conditions within each subsection
Cardiovascular primary prevention (e.g., hypertension)		
Cardiovascular secondary prevention (e.g., acute coronary syndrome, heart failure, stroke)		
Respiratory disease (e.g., chronic obstructive pulmonary disease, asthma)		
Metabolic disease (e.g., type 2 diabetes)		
Mental health condition/disability (e.g., anxiety, depression, schizophrenia)		
Learning disability (e.g., autism spectrum disorder)		
Musculoskeletal (e.g., back pain, osteoarthritis)		
Cancer (nonspecific)		
Cancer specific (e.g., breast, bowel)		

Weight loss or weight maintenance		
Falls prevention (primary and secondary prevention)		
Neurodegenerative disease (dementia, Alzheimer's Parkinson's)		
Inactive and/or sedentary		
Other (define)		
1d Activity type	Tick all that apply	Further specify activities
Gym-based (cardiovascular and/or strength)		
PARS specialized class led by PARS qualified staff (e.g., U.K level 3 exercise referral qualification)		
Walking		
Jogging/running		
Swimming		
Outdoor cycling, e-bikes		
Sport (e.g., badminton, walking football)		
Seated fitness class		
Generic fitness class (e.g., yoga, aerobics, Zumba)		
Gardening/green gym or other green health activity		
PA education sessions		
Other (define)		
1e Funding	Tick all that apply	Please state exact funding source, level of funding per participant and length of funding agreement
Fully externally funded		
Partially externally funded		
Fully internally funded (e.g., core organization budget)		
Partially internally funded		

Participants pay for PARS		
Other (define)		
Level 2 PARS Characteristics		
2a Staff structure	Tick all that apply	Define
Contracted staff		
Self-employed		
Volunteers		
Other (define)		
2b Staff qualifications	Tick all that apply	Define exact qualifications held
PARS qualification		
Condition specific qualification		
Other (state)		
2c To the best of your knowledge, is the scheme based on one or more behaviour change theories?		Please state if you know what theory your scheme is based on
Yes		
No		
2d To the best of your knowledge, does the scheme use one or more behaviour change techniques?		Please state if you know what techniques your scheme uses
Yes		
No		
2e Referral Source	Tick all that apply	No. of referrals per year
Primary care		
Secondary care		
Tertiary care		
Self-referral		
Other (state)		

2f Referrers	Tick all that apply	Additional comments
General practitioner		
Practice nurse		
Rehabilitation professional (state profession)		
Self-referral		
Social prescriber (e.g., link worker/health trainer)		
2g Referral process	Tick all that apply	Additional comments
Email		
Printed and mailed to participant		
Printed and given to participant to take to PARS		
Via online portal		
Other (define)		
2h Scheme duration	Tick one	State exact duration
Number of weeks client can attend scheme		
Total number of sessions		
No defined length (open-ended)		n/a
Other		
2i Session frequency	State	
Number of sessions per participant, per week		
2j Session length	State	
Define session length		
2k Session time	Tick all that apply	Define time span of available sessions (e.g., 10.00-12.00pm)
Morning		
Afternoon		
Evening		
Weekday		

Weekend		
2l Physical activity session type	Tick all that apply	Further define session type (e.g., PARS supervised circuit session or independent walking football option)
PARS-supervised group-based sessions		
PARS-supervised individual sessions		
Independent PA following assessment		
Generic PARS-supervised sessions for all conditions		
Condition specific PARS-supervised sessions		
Independent PA choices without assessment		
PA education sessions		
Technology-based support *(e.g., mHealth app or web-based)*		
Other (define)		
2m Exit routes	Tick all that apply	Give details of exit routes activities
Formal exit route (defined sessions for completers)		
Signposting to other activities		
Open-ended (no exit route required)		
None (state why no exit route provided)		
2n Action in case of non-attendance *Is there a standardised procedure for non-attendance?*	Tick all that apply	Specify time points, number of attempts to contact and by whom
Yes		
Participant contacted by letter		
Participant contacted by technology-based support		
Participant contacted by telephone		
Participant contacted by text		
Participant not contacted		

Other (define)		
No		
2o Baseline assessment	Tick one	State when this occurs (e.g., prior to first PA session or at first PA session)
Yes		
No		
2p Exit assessment	Tick one	State when this occurs (e.g., after 12 weeks, or after 24 sessions)
Yes		
No		
2q Feedback provided to referrer	Tick all that apply	State what is included and how feedback is provided (e.g., attendance and via email).
Yes (state what is included)		
How is feedback provided? (state)		
No		
2r Exclusion criteria	Tick all that apply	State specific exclusion criteria
Yes		
No		
Level 3 Participant Measures		
3a Demographics		
3a.1 Sex	Tick if recorded	Define
State categories		
3a.2 Age at the point of referral	Tick if recorded	Define
Individual age recorded		
Minimum age		

Maximum age		
3a.3 Socio-economic status	Tick if recorded	Define
Postcode/zipcode recorded		
3a.4 Ethnicity	Tick if recorded	Define
State ethnic categories		
3a.5 Employment status	Tick if recorded	Define
State employment categories		
3a.6 Education status	Tick if recorded	Define
State education categories		
3a.7 Other demographic measure	Tick if recorded	Define
State what other measures and how they are defined		
3b Monitoring and evaluation		
3b.1 Number of referrals	Tick if recorded	Additional comments
Number of referrals received per annum		
3b.2 Uptake, attendance and adherence (please identify the definitions used)	Tick if recorded	Define measures
Uptake of intervention *(number of referrals who attend baseline assessment)*		
Uptake of PA *(number of referrals that attend at least one PA session)*		
Adherence to intervention *(number of referrals that attend exit assessment)*		
Adherence to PA *(number of referrals that attend an agreed number of sessions e.g., 60% of programme contact time)*		
Attendance *(number of attendances in a defined period)*		
3c Measures of change	Tick if recorded	Define time points (e.g., baseline and week 24).

Change in PA behaviour (define measure)		
Change in wellbeing (define measure)		
Change in physiological measures (e.g., BP, weight, % weight change, BMI)		
Other (define)		

APPENDIX 10.2 Interview / Focus group guide

Introduction

The interview / focus group will last approximately 20-90 minutes and will explore 3-5 main areas (depending on which group you are in); intervention design and evidence, patient needs and resources, structural characteristics of the organization, knowledge and beliefs and planning.

I would like to remind you that the interview / focus group will be audio recorded. The audio recording is essential to your participation but you should be comfortable with the audio recording process. Therefore, you are free to stop the audio recording at any time and therefore withdraw your participation.

CFIR Domain	**CFIR areas to consider**	**Overarching interview question (*prompts and probes will follow based on answers)**
Intervention development & challenges	**Intervention design & evidence**	How was the intervention developed: what were the challenges that needed to be overcome and how was this achieved?
Service users and resources	**Patient needs & resources**	What barriers do the service users face to participating in the intervention and what resources are available to support them? (If any, please provide examples)

Organisation & structures	**Structural characteristics**	How does the structure of your service (staffing, age, size, etc.) impact the implementation of the intervention?
Staff skills & perspectives	**Knowledge and beliefs**	What level of qualifications, skills and competencies do you feel are required to work within this service and make it effective? How does the organizational staff structure foster effective delivery of exercise? What challenges exist in delivering coherent, high quality exercise provision and how are they overcome using existing staff resources?
Service process and effectiveness	**Planning**	Can you describe how and why your feel this service is / is not effective?

Thank you, that's the end of my questions. To finish off, could I summarize my understanding of intervention design and evidence, patient needs and resources, structural characteristics of the organization, knowledge and beliefs and planning (summarize key points depending on which components have been discussed)…..have I understood your views correctly or is there anything you would like to add?

<u>If no</u>

Thank and finish the interview.

*Prompts/Probes are there to be used as a guide for the interviewer. They are flexible questions to try and elicit responses from the participant. They should be used in a conversational manner and only when deemed appropriate.