CARDIAC REHABILITATION PROVISION IN ENGLAND: A NATIONAL SURVEY

A Thesis submitted for the degree of Master of Philosophy

By

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ABSTRACT

Introduction: The context of the known benefits of cardiac rehabilitation, coupled with the requirements of the National Service Framework (NSF) for Coronary Heart Disease (Department of Health, 2000) and the adoption of the Scottish Intercollegiate Guideline Network guideline (SIGN, 2002) should give clear direction to all cardiac rehabilitation (CR) services. Despite the publication of these guidelines, little evidence of implementation has been reported and variation in service models and delivery are shown to exist (Bethell et al, 2001, 2004; Child, 2004). **Objective:** To examine CR programmes in England in detail to investigate trends in current provision. Where deficiencies from the national requirements and guidelines are established, recommendations for improvements in delivery will be made. **Methods:** Three groups of services were targeted: a random selection from each of England's 28 strategic health authorities, and all CR services within two Cardiac Networks, one rural and one urban. The total sample was representative of 16% of the 332 identified CR services in England. Factual information sought through postal questionnaires included: structure and organisation, funding and budget, staffing, patients included, and implementation of the guidelines. **Results:** Provision of CR in England remains variable. Only 26% of services meet national standards for staffing levels with less than half holding their own budget. The NSF priority patients: post myocardial infarction (MI) (97%) and revascularisation (78%) are most likely to be included, whereas other patient groups are not routinely gaining access: transplant (44%), implantable defibrillator (ICD) (32%), heart failure (18%) and angina (14%). In comparison to post MI patients, statistical differences were shown to exist ($p<0.05$) in access to patients who had heart failure, an ICD inserted or angina. Services remain largely hospital-based (49%) with some evidence of integration between primary and secondary care (37%). Overall achievement of the recommended guidelines is poor. Significant difference existed between the three groups of services in terms of recommendations achieved for NSF ($F(2,51)=34.9;p< 0.05$) and SIGN ($F(2,51)=14.2;p<0.05$). The overall relationship between NSF and SIGN achievement was found to be statistically significant ($r=0.65$). **Conclusion:** Limited staffing and resources has contributed to only 60% of the NSF recommendations and 62% of the national adopted guidelines being achieved, resulting in the inability to make management planning decisions locally and lack of quality of care. Recommendations for improvement have been made.

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GLOSSARY OF ABBREVIATIONS

ACC	American Cardiology Committee
ACPICR	Association of Chartered Physiotherapists in Cardiac Rehabilitation
AMI	Acute Myocardial Infarction
BACR	British Association of Cardiac Rehabilitation
BCS	British Cardiac Society
BHF	British Heart Foundation
CHD	Coronary Heart Disease
CPG	Coronary Prevention Group
CR	Cardiac Rehabilitation
DOH	Department of Health
ESC	European Society of Cardiology
HCC	Health Care Commission
HRQUOL	Health Related Quality Of Life
ICD	Implantable Cardioverter Defibrillator
LIT	Local Implementation Team
MDT	Multidisciplinary Team
MI	Myocardial Infarction
NHS	National Health Service
NICE	National Institute of Clinical Excellence
NSF	National Service Framework
OHS	Open Heart Surgery
PCT	Primary Care Trust
PTCA	Percutaneous Coronary Angioplasty
SHA	Strategic Health Authority
SIGN	Scottish Intercollegiate Guideline Network
WHO	World Health Organisation
WTE	Whole Time Equivalent

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1 BACKGROUND

Fourteen years personal experience working within the field of cardiac rehabilitation (CR) and awareness of the literature has provided knowledge and insight into the variable provision and inadequacies of CR services within England. Such disparity was particularly highlighted in 2002 through involvement in a Coronary Heart Disease (CHD) Task Force review of cardiac rehabilitation in North West England to ascertain 'best practice' and how improvements might be achieved. All thirty five North West cardiac rehabilitation services were reviewed against the requirements of the National Service Framework (NSF) for Coronary Heart Disease (Department of Health (DoH), 2000).

The findings from this review supported those which had been reported in other published literature. Deficiencies included:

- Poor access to and uptake of cardiac rehabilitation programmes (Thompson et al, 1997; Bethell et al, 2000; Beswick et al, 2004; Health Care Commission, 2005).
- Ineffective delivery (West et al, 2002).
- Poor record keeping (Thompson et al, 1997).
- Inadequate funding (Thompson et al, 1997, 2002; Beswick et al, 2004).
- Programmes do not follow the accepted guidelines (Thompson et al, 1996; Lewin et al, 1998; Health Care Commission, 2005).

Direction has now been given to CR services to address existing problems regarding the quality, content and access to their CR services through the publication of two key documents: The National Service Framework (NSF) for Coronary Heart Disease (DOH, 2000) which identifies clear standards and goals for cardiac rehabilitation and the Scottish Intercollegiate Guideline Network (SIGN) Number 57 which provides a clinical evidence based guideline for cardiac rehabilitation, making recommendations for best practice.

Despite the publication of these national guidelines and audit standards, little evidence of widespread implementation has been reported (Lewin et al, 1998) and much variation in service models and delivery has been shown to exist (Bethell et al, 2001,2004; Child, 2004).

While previous studies into cardiac rehabilitation in the United Kingdom (UK), Scotland (Campbell et al, 1996) and Ireland (McGee et al, 2001) have indicated the problems with cardiac rehabilitation, such programmes have not been examined in detail. There is particularly a lack of rigorous research solely into the provision of cardiac rehabilitation within England.

For these reasons the Coronary Prevention Group (CPG) in 2004 commissioned a study to examine in detail the content of cardiac rehabilitation programmes in England. This study aimed also to discover whether the recognised standards and guidelines were being achieved and to identify areas of good practice or shortcomings from which recommendations for future provision could be made.

Following the findings of the Coronary Prevention Group study, two further investigations were undertaken to examine the total provision of cardiac rehabilitation within two English Cardiac Networks, one of which was predominantly urban and the other predominantly rural. The design of these two subsequent studies was centred on the main findings from the CPG study. The aim of the comparative studies between the randomised English sample and two Cardiac Networks were two-fold:

1) To validate whether the results from the CPG study were indeed a true reflection of national CR provision
2) To determine whether variations in practice existed between urban and rural localities.

The following represents a selection of the findings from the vast amount of data gathered when researching cardiac rehabilitation provision in England on behalf of the Coronary Prevention Group and from the subsequent investigations into provision within two specific Cardiac

Networks. The aim of this thesis was to present valuable data on current CR practice in England to investigate trends in CR so that variations, deficiencies or areas of good practice may be identified from which recommendations to improve practice may be made. These combined findings form the empirical content of this MPhil thesis.

2 INTRODUCTION

Official national statistics have demonstrated a downward trend in coronary heart disease (CHD) death rates since the 1970s. Even so, coronary heart disease is the most common cause of death in the United Kingdom; one in five men and one in six women will die as a result of it (British Heart Foundation (BHF), 2006a).

CHD morbidity in the United Kingdom is rising; it is currently estimated that there are more than 2 million people suffering from angina, 1.3 million who have sustained a heart attack and 670,000 living with heart failure (British Heart Foundation, 2006a). CHD is a major health problem and represents an immense challenge to the healthcare system. The growing population with coronary disease requires timely expert care and secondary prevention to optimise long-term quality of life and survival.

The government has committed to tackling the high mortality of CHD in the United Kingdom. Through the publication of their white paper *Saving Lives: Our Healthier Nation* (Department of Health (DOH), 1999), they have pledged to reduce death from both coronary heart disease and stroke in people under the age of 75 by at least 40 percent by 2010 through the improvement of services.

A fundamental reason for current government interest in addressing the issue of coronary heart disease is the immense cost apportioned to its management. Treatment and prevention of CHD is reported by the British Heart Foundation to cost the National Health Service £1.7 billion per annum directly. When indirect costs such as lost productivity and informal care are taken into consideration the cost to the economy rises to a staggering £7.9 billion per annum (British Heart Foundation, 2006a).

There have been numerous studies published which have provided the evidence for the benefit of CR to patients with CHD in terms of improving health and longevity. The greatest strength of evidence has been derived from a series of published meta-analyses which have demonstrated

significant reductions in both mortality and morbidity for patients undergoing CR (section 2.2). Cardiac rehabilitation programmes have been established as effective and should therefore be made available to all who could benefit.

CR is a relatively new treatment modality, first being established in the early 1980s (Fearnside et al, 1999). Through the publication of the National Service Framework (NSF) for Coronary Heart Disease (Department of Health, 2000), cardiac rehabilitation has now been included in government policy. Chapter Seven, Standard 12 has recommended that cardiac rehabilitation should be an integral component of long-term comprehensive care and available to all patients with coronary heart disease, a recommendation that has been made by several other organisations in the previous decade: British Cardiac Society (Horgan et al, 1992); the World Health Organisation (WHO, 1993); the Royal College of Physicians (Thompson et al, 1997).

As a result, cardiac rehabilitation provision is expanding. To date there are currently 332 identified cardiac rehabilitation programmes in England (BHF, 2006b), an increase of thirty programmes since the start of this project in 2004. The question is; are these programmes evidence based and following the recommended guidelines?

2.1. Content of cardiac rehabilitation

Comprehensive cardiac rehabilitation is the accepted mode of delivery of cardiac rehabilitation services. Comprehensive cardiac rehabilitation is multifactorial and includes: medical therapy, exercise training, education and counselling, risk factor modification and secondary prevention (Thompson et al, 1999) and is delivered by a multidisciplinary team of professionals (Bethell et al, 2001). The NSF does not state which profession should provide the various aspects of comprehensive cardiac rehabilitation. Instead it advises that staff should be trained in the following:

- The provision of advice about exercise and exercise supervision and the skills to modify exercises appropriately on an individual basis to take account of co-morbidity
- Lifestyle interventions (e.g. smoking cessation and healthy eating)
- Psychological treatments (e.g. cognitive behavioural therapy)
- Defibrillation and advanced life support

The SIGN Guideline (SIGN, 2000) gives an estimate of staff resources in whole time equivalents (WTE) and states that 6.2 WTE's are required to deliver comprehensive cardiac rehabilitation to a range of 500 cardiac patients (see table 4, page 51).

The World Health Organisation (WHO, 1993) describes CR as:
'…the sum of activities required to influence favourably the underlying cause of the disease, as well as the best possible physical, mental and social conditions, so that they may, by their own efforts preserve or resume when lost, as normal a place as possible in the community. Rehabilitation cannot be regarded as an isolated form of therapy but must be integrated with the whole treatment of which it forms only one facet.'

The ultimate role of the rehabilitation practitioner therefore is to empower the patient through knowledge and education, facilitating long term self management of their condition with the ultimate aim of reducing coronary events and deaths, whilst improving symptoms and quality of life.

The process of cardiac rehabilitation is described as four phases (SIGN, 2002): progressing from the acute event to long-term maintenance of lifestyle changes:

Phase 1	In-patient phase or after a 'step change' in the patient's condition
Phase 2	The early post discharge period
Phase 3	Structured exercise, education and psychological programme
Phase 4	Long term maintenance of physical activity and lifestyle change

It must be noted, however, that a systematic journey through all these phases is not representative of all patient experiences. Omissions of phases may be due to either patient choice, poor referral mechanisms or deficient provision (Bethell, 2001).

2.2 Evidence of benefit

Cardiac rehabilitation is a complex, multifactorial intervention undertaken by a broad base of patient groups:

- post open heart surgery (OHS)
- post myocardial infarction (MI)
- post angioplasty
- angina
- heart failure
- post implantable cardioverter defibrillator (ICD)

Coupled with widespread variations in provision, this has created some difficulty for researchers in proving the evidence for cardiac rehabilitation as an effective treatment. Despite this, the evidence base for cardiac rehabilitation as an intervention for secondary prevention is now increasing (Dalal and Evans, 2003).

Alongside positive outcomes in terms of mortality and morbidity, an improvement in quality of life is also considered to be an important goal

by many cardiac rehabilitation providers. A review of the literature has demonstrated that when provided appropriately in accordance with clinical guidelines, cardiac rehabilitation has provided many health benefits:

- improved physical functioning (Leon, 2000; McArdle et al, 2001; Gassner et al, 2003)
- improved health related quality of life (Frasure-Smith, 1993,1995; O'Rourke et al, 1999; Lavorato et al, 2003)
- risk factor profile improvements (Taylor et al, 2006)
- reduction in hospital admissions (Goble and Worcester, 1999)
- enhanced patient knowledge and psychosocial wellbeing (NHS, 1998)
- improved return to work / vocation (Goble and Worcester, 1999)
- improved long-term survival (Joliffe et al, 2004)

Despite a wealth of published data, a large proportion of the evidence for cardiac rehabilitation effectiveness is from uncontrolled observational trials (NHS, 2002). Cardiac rehabilitation studies give little detail regarding methods of randomisation, sample size calculations or blinding methods. Hence, several aspects of the cardiac rehabilitation process have not yet been substantiated through rigorous scientific study (Joliffe et al, 2000). In addition, many trials have been based on a different health care model from that provided in the United Kingdom. For this reason, Joliffe et al (2004) advised that good quality randomised controlled trials should be undertaken to provide evidence relative to current service provision in order to determine the effectiveness of various service components.

	Oldridge et al, (1988)	O'Connor et al, (1989)	Joliffe et al, (2002)	Taylor et al, (2004)	Clark et al, (2005)
Patient Group	MI	MI	CHD	CHD	CHD
Randomised Control Trials (number)	10	22	34	48	63
CCR /exercise only	_	_	20/14	27/19	19/17 (counselling only 23) (counselling and exercise 4)
Patient number	4347	4554	8440	8940	21295
Outcomes	Mortality Morbidity	Mortality Morbidity	Mortality Morbidity Risk factors HRQUOL	Mortality Morbidity Risk factors HRQUOL	Mortality Morbidity
Comments	Low risk, middle aged white male. Supervised exercise versus no exercise	Low risk, middle aged white male. Supervised exercise versus no exercise	More inclusive. Hospital and community rehab. All CHD but heart failure and transplant excluded.	More inclusive of today's CR patient groups.	Inclusive of all types of secondary prevention programmes.

Table 1 – Cardiac rehabilitation meta-analyses

It is widely recognised that the greatest strength of evidence for judging the effectiveness of a treatment interventions is from meta-analyses of well conducted randomised control trials. With the exclusion of heart failure specific reviews, to date there have been five published meta-analyses which have shown cardiac rehabilitation to be effective (see table 1).

The earliest two cardiac rehabilitation meta-analyses (Oldridge et al, 1988; O'Connor et al, 1989) each included approximately 4,500 patients. Despite the consistency of the conclusions from both meta-analyses demonstrating a significant reduction in all-cause mortality and cardiovascular death in the rehabilitation group, there are limitations to consider. Early research had been focused primarily in Phase 3 around middle-aged, white male patients, post myocardial infarction (Goble and Worcester, 1999). Comparisons had been investigated between those who had undertaken supervised exercise against those who had received no exercise advice. Some caution should be taken, as the results therefore cannot be readily extrapolated to the differing population profile of cardiac rehabilitation participants and programmes seen today.

Jolliffe et al (2002) conducted a more thorough systematic review of the literature for cardiac rehabilitation effect, doubling the patient numbers of previous meta-analyses to 8440. Jolliffe and her colleagues were more comprehensive in their approach and included studies which reported on both men and women of all ages, in both hospital and community settings. In addition to mortality and morbidity data, Jolliffe et al (2001) also investigated outcomes for health related quality of life and modifiable risk factors. The meta-analysis reported a pooled effect estimate of reduction in total mortality of 31% in the exercise only rehabilitation compared to 26% comprehensive cardiac rehabilitation alongside improvements in total cholesterol in the comprehensive groups. Despite the more inclusive approach, studies reviewed had once again included predominantly male, middle aged, low risk patient groups with little reporting of ethnic origin. Poor quality reporting prevented

conclusive reporting on the effect on blood pressure, smoking status and revasularisation rates.

A more recent Cochrane review included 48 randomised control trials involving 8940 patients (Taylor et al, 2004) and compared exercise only versus comprehensive cardiac rehabilitation. The results demonstrated a 27% reduction in all cause mortality through participation in an exercise-based rehabilitation programme with an improvement in a number of modifiable risk factors and health related quality of life. The effect of CR on total mortality was demonstrated to be independent of coronary heart disease diagnosis, type of rehabilitation and dose of intervention. This review was more inclusive of present cardiac rehabilitee activity and is therefore commonly cited as evidence of efficacy of cardiac rehabilitation.

Finally, Clark et al (2005) conducted a systematic review and meta-analysis to update previously reported work. This study aimed to determine the effect of different types of secondary prevention programmes currently being offered, including: individual counselling and exercise; individual counselling only; group education only; supervised exercise only and comprehensive cardiac rehabilitation. Reported benefits were: patients who participated in cardiac rehabilitation programmes had better survival, functional status and quality of life than patients who did not participate. The benefit gained appeared to be regardless of whether supervised exercise was included, although the results did suggest that supervised exercise resulted in a larger benefit than programmes that did not include exercise. Some caution must be taken in using these results as the review contained no large, high quality studies which directly compared programmes with exercise and those without. Myocardial infarction was reported to be reduced by 17% over 12 months with a mortality benefit of 15% overall and 47% at 2 years. As with the previous meta-analyses, there was under representation of elderly, women and low income groups. Data were also insufficient to comment conclusively on cost effectiveness and further independent studies would be useful in this area.

2.3 Reported discrepancies in cardiac rehabilitation provision

The early 1990s saw a large increase in cardiac rehabilitation programmes in the United Kingdom following the availability of start-up grants from the British Heart Foundation. Since then, cardiac rehabilitation services have increased four fold. In 1989 the British Cardiac Society Working Party Report (Horgan et al, 1992) showed just 99 programmes. This had increased to 151 in 1992 (British Cardiac Society, 1992), to 273 in 1996 (Lewin et al, 1998), to 300 in 1997 (Bethell et al, 2001) and to date 420 programmes have been identified (British Heart Foundation, 2006).

Cardiac rehabilitation service expansion has been haphazard (Bethell et al, 2005). Most services have been established by committed nurses or physiotherapists, rarely commissioned by purchasers, some through charitable funding. The growth in the number of programmes has not necessarily been matched by a growth in quality; considerable variations in provision have been reported. (Horgan et al, 1992; Pell J, 1997). Discrepancies and inadequacies in provision may have been partly due to a lack of national direction of a standard cardiac rehabilitation structure.

The recommended model of United Kingdom cardiac rehabilitation care was only addressed for the first time with the publication of British Association of Cardiac Rehabilitation guidelines (Coates et al, 1995). Updated national evidence based service models of care have since followed: National Service Framework for Coronary Heart Disease (Department of Health, 2000) and Scottish Intercollegiate Guideline Network (SIGN, 2002). Through implementation of these guidelines the aim is to improve outcomes, address variations in provision and standardise care. The question is, have service providers managed to put these recommendations into operation?

Canvassing of programme co-ordinators has revealed several problems within cardiac rehabilitation services. In a questionnaire survey by Bethell

et al (2005) the following difficulties were identified: funding (87%), staff shortages (90%), lack of space (74%), lack of sessions (74%), inability to include all eligible patients (66%), attendance problems (71%) and waiting lists (55%).

The main failings identified by the co-ordinators fall into three main themes:

- Staffing
- Patients
- Funding

2.4 Professions and skills of the multidisciplinary team

The World Health Organisation (WHO) Expert Committee report (1993) stated that cardiac rehabilitation should be provided by trained health professionals with experience of caring for cardiac patients.

Expert opinion recommends that one member of the team should be designated as co-ordinator to ensure organisation of the programme. This position may be suitable for any team member with the appropriate organisational, management and interpersonal skills (Goble and Worcester, 1999). The appointment of a co-ordinator has since shown to influence referral and uptake into cardiac rehabilitation services and timely referral for required diagnostic tests (Martin et al, 2000).

Comprehensive cardiac rehabilitation requires a multidisciplinary approach for effective delivery of cardiac rehabilitation services, where the 'sum of the parts is better than the whole' (Goble and Worcester, 1999).

Within the multidisciplinary team special areas of expertise should be recognised and specific roles identified, thus minimising conflict and duplication to ensure smooth operation towards one common goal. Failure to allocate tasks has been shown to lead to tension within the team (Goble and Worcester, 1999).

British Guidelines recommended that the team should have the following combined skills, competencies and knowledge base (Coats et al, 1995):

- anatomy and physiology of cardiac function
- the process of cardiovascular disease
- health psychology
- theories of adult education
- theories of motivation and change
- counselling skills
- exercise physiology
- individual exercise prescription
- management of emergencies
- nutrition and weight loss
- vocational advice
- audit, evaluation and research
- management and administration.

To provide such diverse care, multitasking is commonplace. However, the specific tasks require specific training and expertise which should be carried out by the appropriate health care professional (NSF, 2000).

The professions which make up the members of the cardiac rehabilitation team vary form service to service. There is no absolute consensus on which professions should be involved in the delivery of the cardiac rehabilitation process, nor is there any level of scientific evidence for the contribution of each healthcare profession. The recommendations for the input of each profession into cardiac rehabilitation are derived mainly from expert opinion. SIGN (2002) recommend that service costs should involve nurses, physiotherapists, pharmacist, dietician, clerical worker and psychologist. Whereas, Beswick et al (2004) referred to key rehabilitation staff as physician, nurse, physiotherapist / sports scientist, occupational therapist, psychologist, dietician, pharmacist.

Through a series of studies conducted into the staffing of cardiac rehabilitation programmes (Lewin et al, 1998; Thompson et al, 1999:

Bethell et al 2001, 2004) great variation in professional contribution has been uncovered. Two main and consistent clinical groups identified to be involved in the delivery of cardiac rehabilitation are nurses followed by physiotherapists (Bethell et al, 2001).

The nurse is seen as a key member who fulfils a range of functions within cardiac rehabilitation and secondary prevention (Noy, 1998). A postal questionnaire survey by Thow et al (2006) showed nurses to be primarily involved in the first three phases of the rehabilitation process, were Grade 'G' or above, mostly in static posts and had skills especially for patient education on diagnosis, treatment and risk factor modification, programme management and onward referral. Although the reported number of hours worked were significantly higher in comparison to the input of other professionals, the hours worked did not meet recommended SIGN staff guidelines.

The training of the physiotherapist provides the skills and competencies primarily to assess the physical needs of the patient, to devise a structured exercise programme tailored to meet individual needs and supervise the exercise programme (Goble and Worcester, 1999). Through a postal survey of physiotherapists working in cardiac rehabilitation, Thow et al (2004) established that the majority (71%) worked less than 18 hours a week in cardiac rehabilitation, most (84%) were non-rotational and 79% were senior 1 grade or above. The main perceived responsibilities by physiotherapy respondents were risk stratification, exercise prescription, exercise delivery and onward referral. Again, the number of physiotherapists involved fell far short of the SIGN recommended staffing targets.

Information in the literature on the contribution from other professionals is scarce, where cited; the input has again shown to be variable:

- The dietician is best placed to be responsible for group or individual requirements of nutrition and dietary habits. Dieticians have been

reported to be involved in a majority of services, ranging from 60% (Thompson et al, 1999) to 84% (Lewin et al, 1998).

- The pharmacist has an important role to play in providing education and advice on medications and encouraging compliance. However, a literature review (White and Anderson, 2005) has concluded that there is insufficient evidence on which to base firm conclusions about the effectiveness of pharmacist involvement in cardiac rehabilitation, which has implications for future models of service delivery.

- The occupational therapist is skilled in facilitating return to work, to assist independent and effective functioning and to deliver stress management and relaxation techniques (Cronin, 1992). Occupational therapists have been reported to participate in around 40% of programmes (Lewin et al, 1998).

- The contribution of physicians as core members of the multidisciplinary team appears to be waning. In 1998 the reported involvement fell from 39% (Lewin et al, 1998) to 19% over three years (Bethell et al, 2001). While cardiologists seldom play an active role within the cardiac rehabilitation programme (Thompson et al, 1997), they can make significant contribution by referring patients, encouraging them to attend and checking on progress (Chesney, 1985). As patients perceive the cardiologist as an authoritative figure, their encouragement gives acceptance of the programme as being important to their recovery and can contribute to compliance (Beswick et al, 2004).

The number of those professions which make up the multidisciplinary team differs between services. A telephone survey of co-ordinators established that 70% of programmes reported more than five health care professionals within their team (Lewin et al, 1998). This survey, however had not taken into account the allocation of each health care professional's time, which could have a significant impact on service delivery. The actual hours spent per week working in cardiac

rehabilitation will have a significant impact on service delivery and overall costs. It has also been suggested that few programmes have adequate funding for a true multiprofessional team and professional services are often 'borrowed', mostly for the benefit of the education programme (Lewin et al, 2004). Figures later published in a more thorough investigation of cardiac rehabilitation staffing reported more reliably that only 20% of teams had more than five key staff, the majority of which had between three and five key staff (73%) and just 7% of programmes had less than two (Beswick et al, 2004).

2.5 Cardiac rehabilitation patients

Traditionally, cardiac rehabilitation programmes have been offered to post myocardial infarction (MI) patients and more recently to revascularisation patients (SIGN, 2002). A review of pertinent literature reveals that a wealth of established evidence exists relating to the benefit gained in these patient groups; most notably through a series of meta-analyses (Oldridge et al, 1988; O'Connor et al, 1999; Joliffe et al, 2004; Taylor et al, 2004; Clark et al, 2005). Evidence is now accumulating to support cardiac rehabilitation intervention for all groups of cardiac patients including those with stable angina, heart failure and post transplantation, as recommended in the National Service Framework for Coronary Heart Disease (Department of Health, 2000).

Class B scientific evidence has been published to support the inclusion of stable angina patients into cardiac rehabilitation. Systematic literature reviews have demonstrated improvements in exercise capacity, symptoms, ischaemia and quality of life in this population group (Wenger et al, 1995; NHS, 1998; Thompson and Bowman, 1998). One randomised control trial showed fewer cardiac events in the rehabilitation group in comparison to the controls (Ornish et al, 1998). However the results from this trial were from rehabilitation undertaken which was far more intensive than usual cardiac rehabilitation care.

Published studies have provided evidence of benefit for the inclusion of heart failure patients in cardiac rehabilitation programmes. Benefits identified have included; improved exercise capacity (Lloyd-Williams et al, 2002), reduced symptoms (Bellardinelli et al,1999) improved quality of life (European Heart Failure Group, 1998) and reduced hospital admissions (Rich et al, 1999).

Systematic reviews and meta-analyses have further provided evidence for chronic heart failure patient inclusion in terms of improvements in mortality and health related quality of life. In 2004, three such meta-analyses were published (Smoke et al, 2004; Rees et al, 2004; Piepoli et al, 2004) which concluded that for those heart failure patients who participated in exercise based cardiac rehabilitation their mortality was less than matched controls. The National Institute of Clinical Excellence (NICE) (NICE, 2003) recommended that heart failure patients should be encouraged to adopt regular aerobic and/or resistive exercise as part of a rehabilitation programme.

As expected, fewer studies have been examined in the post transplantation group due to much smaller available patient numbers. Trials which include one small randomised control trial (Kobashigawa et al, 1999) have reported that improvements in this group are due mainly to improved exercise tolerance.

Considerable scientific evidence is being gathered to support the benefits gained from cardiac rehabilitation participation in terms of mortality, morbidity, quality of life, secondary prevention and return to work. Hence, all such eligible patients should be actively recruited and encouraged to attend (Thompson et al, 1999).

Despite evidence for the benefit of cardiac rehabilitation, poor participation rates and inequities in access to cardiac rehabilitation in the United Kingdom are common (Bethell, 2001, 2004, 2005; Milligan F, 2003, Pell et al, 2003). Attendance rates have been reported to be as little as 6% post percutaneous transluminal coronary angioplasty (Bethell

et al, 2001), 17% post myocardial infarction (Evans et al, 2002) and 35% post coronary artery bypass surgery (Bethell et al, 2001).

Limited data is available regarding the actual population need for cardiac rehabilitation matched against current provision. Such information is necessary to indicate accurate provision shortfall figures. One comprehensive investigation has attempted to assess this through a comparison of the number of patients attending cardiac rehabilitation programmes with published Hospital Episode Statistics (Beswick et al, 2004). Disappointing figures were reported. Of the identified priorities 45% to 67% of post myocardial infarction and revascularisation patients were referred to cardiac rehabilitation and only 27% to 41% joined. These figures reduced to 22% to 33% and 13% to 20% respectively when all CHD patients were included. This has highlighted worse uptake figures for the other more recently recommended cardiac patient groups. Hence, despite the National Service Framework (Department of Health, 2000) recommendations that all cardiac patients should be included in cardiac rehabilitation provision, improvements in uptake figures have not occurred.

Also in 2004, the Health Care Commission (Department of Health, 2006a) conducted a survey to question patients about their cardiac care. The results showed that an incredible 63% of eligible patients reported that they did not participate in cardiac rehabilitation; the main reason being was that it was not offered to them. As only a quarter of eligible patients are being offered a service to which they are entitled, the National Service Framework targets are a long way from being achieved.

The challenge for cardiac rehabilitation providers now is to increase participation rates and provide reliable data regarding their throughput. If the policy targets are to be met, substantial investment is required to overcome the identified failings in inclusive delivery (Bethell et al, 2005).

2.6 Cardiac rehabilitation funding

Neither the SIGN Guideline (SIGN, 2002) nor the NSF (Department of Health, 2000) comment on the funding of cardiac rehabilitation, nor who should hold the budget. The issue of adequate funding has frequently been reported to be a problem for cardiac rehabilitation providers (Horgan et al, 1992; Fearnside et al, 1999; Bethell, 2001, 2005; Griebsch et al, 2004, Beswick et al, 2004). There appears to be little consistency in the allocation of programme funding (Horgan et al, 1992). Some of the programmes which were established through the British Heart Foundation Grant have struggled to maintain their funding (Bethell et al, 2004). This is in common with many other established programmes which have reported difficulties in securing ongoing resources to maintain their services (Griebsch et al, 2004).

Cardiac rehabilitation providers have difficulty in competing for funding in a climate of continual increasing pressure on healthcare funds (McPherson et al, 2000). Cardiac rehabilitation, has been previously referred to as a 'cinderella service' (Thompson, 2002) and misconceived as a luxury as opposed to a necessity. As a result cardiac rehabilitation has lost out as a funding priority to more urgent pressures such as acute admissions and reducing waiting lists (McPherson et al, 2000). It has only been relatively recently through meta-analyses of systematic reviews that cardiac rehabilitation has been able to demonstrate strong evidence of benefit in terms of survival (Taylor et al, 2004; Clark et al, 2005) and cost-effectiveness (Beswick et al, 2004). This has disadvantaged providers when competing for scarce resources. Strong evidence-based proof of both mortality outcomes and cost effectiveness are crucial to ensure continued service delivery (Department of Health, 1996). In order to make judgements regarding policy decisions, the highest level of evidence is necessary to prove intervention effectiveness policy decisions are made. Expert opinion, although important is not recognised at a policy making level, therefore cardiac rehabilitation specialists must continue to provide evidence of their benefit through well constructed randomised control trials.

Prevalence of insufficient funds has necessitated cardiac rehabilitation providers to prioritise their limited resources to those individual patients who have the most need (Fearnside et al, 1999) rather than spread them too thinly with diminished effect (DeBono, 1998).

The recommendation that all groups of cardiac patients should receive cardiac rehabilitation (Department of Health, 2000) will necessitate a huge influx of funds if recommended targets are to be met. The British Heart Foundation (2006) has estimated that approximately two million people in the United Kingdom presently suffer with or have experienced angina. As the current uptake into cardiac rehabilitation has shown to be so poor, there will be huge financial implications to offer services to all patients who will benefit. Beswick et al (2004) through a comprehensive investigation and analysis into English cardiac rehabilitation programmes have predicted that a massive 630% increase in budget to £115 million would be required in order to fulfil the stated targets.

The majority of papers which have been published on cardiac rehabilitation funding have reported mainly on staff costs (Turner, 1993; Bethell et al 2001, 2004; Griebsch et al, 2004) and have not been inclusive of all costs involved in the service provision. In order to calculate accurate figures to fund necessary service provision or developments, a more rigorous assessment of programme cost is required. Further cost–efficiency studies should be undertaken to investigate actual costs, such studies are provision related and therefore will be reflective of all patients.

2.7 Cardiac rehabilitation cost

Cost information on cardiac rehabilitation services in the United Kingdom have been infrequently reported in the literature. Where costs have been analysed, marked variation has been shown to exist between services. In 1994, the mean cost per patient for cardiac rehabilitation was reported to be £371 (Gray et al, 1997). Six years later it was reported to be as little

as £256 and a great range was demonstrated from £50 to £712 (Evans et al, 2002). The discrepancies in the reported figures were probably due to the fact that both these studies relied on data provided by individual programme co-ordinators, many of whom did not have a formalised budget and had reported primarily on staff costs.

The study by Beswick et al (2004) into the cost of cardiac rehabilitation is a much more important study. Lessons were learnt from previous study flaws. In this more comprehensive study, general capital costs had been analysed and were included in the costing. An estimated 11% had been calculated to cover all overheads and were taken into consideration alongside staff grade and hours worked when analysing the data. Beswick et al (2004) concluded that cost per patient of completed cardiac rehabilitation in 2000 was in the region of £354 (staff) and £490 (total).

Indeed, staff salaries make up the larger part of cardiac rehabilitation budgets and have been estimated between 60% (Turner, 1993) and 89% (Beswick et al, 2004) of the total costs. However, there are many other factors which must be taken into consideration when analysing the cost of services. Beswick et al (2004) hypothesised that the mean figures reported in previous studies concealed a wide variation in cost and was dependant upon the number of staff providing the service. On deeper analysis, Beswick et al (2004) deduced that in services which had three or fewer key staff, the cost per patient was calculated at as little as £186; where services had five or more key staff, this figure rose to £542. Most importantly, when referenced to current provision, it has been estimated that if a service was modelled on three to five key staff, there could be approximately 13% more throughput for the same budget. This has important implications for mode of delivery as well as funding.

As yet no one programme design has been proven to be superior in effectiveness over another, and huge variations are known to exist (Bethell et al, 2001, 2004; Child 2004). In order to establish the most effective and cost efficient approach, it is essential that further comprehensive trials are commissioned to compare the cost effectiveness

of differing models of care (Beswick et al, 2004). With this in mind, consideration must be given to the direct correlation of salary costs to format or mode of delivery (Gray et al, 1997).

Factors identified by Beswick et al (2004) which influence staffing costs are:

- Number of sessions attended
- Group size for exercise, education and psychological components
- Intensity and degree of monitoring
- Cost of initial and discharge assessments
- Cost of co-ordination, referral, organisation and documentation
- Overheads including venue and equipment
- Number and grade of staff

2.8 Cost effectiveness

Although overall cost is important, analysis of cost effectiveness, cost utility and cost-benefit are essential to establish outcomes in terms of monetary gain or loss. Such economic evaluations are important as a tool to demonstrate cardiac rehabilitation cost effectiveness, a necessity when competing for limited healthcare resources.

Evidence to substantiate cardiac rehabilitation cost benefit has been provided through data on the impact which cardiac rehabilitation has on cost savings. Prior to 1997 a systemic review of the literature (Joliffe et al, 2000) had revealed only three published economic evaluations of cardiac rehabilitation. The first trial was a cost analysis by Levin et al (1991) which concluded that cardiac rehabilitation was highly cost effective. This five year follow up study identified the impact that cardiac rehabilitation had on reducing anxiety and enabling symptom self management which resulted in reducing hospital admissions and therefore costs in the long term. Similar findings were reported the following year in the second reported trial by Ades et al (1992) where reduced cardiac events and shorter length of stay additionally demonstrated savings to medical costs.

The data from the third randomised control trial (Oldridge et al, 1993) was considered to reflect United Kingdom costs by Taylor and Kirby (1997). In this study, the cost of a life year gained through cardiac rehabilitation was calculated to be £6,900, which compared favourably to the costs for the treatment of severe hypertension (£9,300) with statins (£38,300) and coronary artery bypass surgery (£41,000). The long term effect on number of life-years saved by his study indicated cardiac rehabilitation as a cost-effective use of health care resources.

Through these randomised controlled trials a small evidence base of cardiac rehabilitation cost effectiveness was established. Not only has cardiac rehabilitation been shown to generate direct cost savings through reduced hospital admissions, fewer events, shorter hospital stays and the need for less medication, but it has also been demonstrated to be as cost effective as angioplasty for single vessel disease and greater than bypass surgery or the prescription of statins (Goble and Worcester, 1999).

Additionally, cardiac rehabilitation has also been proven to indirectly produce cost savings through reduced disability pensions and support services, and by influencing return to work. Figures produced by Tunstall-Pedoe (1991) reported that coronary artery disease was responsible for 12% of the country's sick leave which then accounted for £1800 million in lost productivity. Costs have steadily risen, the most recent figures by the British Heart Foundation (2005) report that loss of productivity accounts for 40% of the overall cost of coronary heart disease to the country. In 2003, United Kingdom production losses through a combination of both mortality and morbidity were shown to be £3,100 million with the additional cost of informal care estimated to be £1,250 million.

The limited data presented suggests multifactorial cardiac rehabilitation is a cost effective use of medical care resources through impacting on the huge burden of coronary heart disease costs. However, having studied previous economic evaluations into cardiac rehabilitation, Papadakis et al

(2005) concluded that published trials were poorly undertaken and further well designed trials would be essential to substantiate current evidence. Hence, although evidence supports cardiac rehabilitation as a cost effective intervention, additional randomised trials and effectiveness trials will be required particularly to reveal the relative cost-effectiveness of the varied cardiac rehabilitation programme models (Griebsch et al, 2004).

2.9 Cardiac rehabilitation guidelines

One of the ongoing problems in cardiac rehabilitation is that programmes have been established in the absence of national standardised evidence based guidelines (Bethell et al, 2004). The first British guidelines for cardiac rehabilitation (Coats et al, 1995) were published after the boom in cardiac rehabilitation programme development (Fearnside et al, 1999). Hence, cardiac rehabilitation practitioners have evolved their programmes individually around the perceived needs of their patients rather than from evidence of sound scientific studies.

In 1999, Goble and Worcester published the Australian Best Practice Guidelines for Cardiac Rehabilitation and Secondary Prevention. This evidence based document made recommendations for optimal standards whilst remaining cost effective. The contents of this document were so impressive and comprehensive that future United Kingdom guidelines appear to have been based on this model (SIGN, 2002). Not only have the authors used systematic, scientific evidence on which to base their recommendations, they have also used consensus opinions from health care providers. This approach has brought together the best of science and experience of clinical practice on which to make judgements on quality cost effective care.

The first time that recommended models of cardiac rehabilitation delivery have featured in United Kingdom government policy is through the publication of National Service Framework for Coronary Heart Disease (Department of Health, 2000). Chapter 7, Standard Twelve focuses on

cardiac rehabilitation service delivery models with interventions based on lifestyle change to set national standards for systematic provision of quality care. This document has reviewed the evidence, from which phased milestones and goals have been set. Services are to be audited against these predetermined targets to judge progress and performance. Cardiac rehabilitation providers now have expected goals to achieve and are to be held accountable for their care. The publication of the National Service Framework has charged Primary Care Trusts with commissioning cardiac rehabilitation services for all eligible coronary heart disease patients. Primary Care Trusts are now the gatekeepers to funding and are responsible for ensuring ongoing quality care.

Although newly accountable for ensuring quality in cardiac rehabilitation provision, many Primary Care Trust commissioners are so far removed from cardiac rehabilitation provision that adequate resources to meet the quality targets are rarely allocated. Cardiac rehabilitation providers must take some blame for this, as requested audit data is often incomplete (Bethell, 2001, 2004). Completeness and accuracy of outcome data are essential if resource judgements are to be made based on the programme results (Beswick et al, 2004). Data completion is particularly pertinent as achievement of current targets is likely to require considerable additional resources (Griebsch et al, 2004).

Hence, despite high expectations for the improved quality of cardiac rehabilitation services in the light of the National Service Framework, outcomes have not been as expected. Many studies have reported poor adherence to the guidelines (Bethell et al, 2004, 2005; Beswick et al, 2004; Griebsch et al, 2004; Department of Health, 2006) with suboptimal implementation (Dalal et al, 2004). Areas of identified failings against the National Service Framework expectations have been previously discussed in sections; 2.4 Professions and skills of the multidisciplinary team, 2.5 Cardiac rehabilitation patients, 2.6 Cardiac rehabilitation funding.

The most recent United Kingdom clinical evidence-based cardiac rehabilitation guideline to be published is the Scottish Intercollegiate

Guideline Network Guideline Number 57 (2002). Although this is a Scottish document, the contents have been endorsed by the British Association of Cardiac Rehabilitation (BACR). Many of the recommendations in this guideline have been replicated from the Australian Best Practice Guidelines (Goble and Worcester, 1999) and cover the delivery of all components of comprehensive cardiac rehabilitation provision. Publications reviewing cardiac rehabilitation practice against these guidelines are scarce. Available evidence suggests similar failings as the NSF for implementation of this guideline (Bethell et al, 2005). However, this document does at least acknowledge that implementation of the guidelines cannot happen immediately on their production and advise that mechanisms should be put in place to address service priorities.

2.10 Organisation of cardiac rehabilitation services

The World Health Organisation Expert Committee report (WHO, 1993) stated that responsibility for implementation of cardiac rehabilitation should be given to a designated health professional, trained as a co-ordinator who should in turn be responsible to an appropriate physician, department or hospital. Since 1993, models of cardiac rehabilitation have evolved. In an attempt to rectify the poor uptake into cardiac rehabilitation, alternative models to the traditional hospital programme have been developed and now include community and home based delivery. To improve outcomes further, SIGN (2002) recommended a move to a district-wide approach to ensure seamless care throughout the rehabilitation pathway. In this instance, the cardiac rehabilitation co-ordinator is now more likely to be responsible to Primary Care Trusts.

Giving patients more choice about how, when and where they receive treatment is a cornerstone of the government's health strategy (Department of Health 2003, 2005b). Home and community cardiac rehabilitation have independent evidence of their effectiveness through both randomised control trials (Sparks et al, 1993, Bell, 1998) and large observational studies (Kodis et al, 2001). Following a review of the

available evidence SIGN (2002) recommended that aerobic, low to moderate intensity training can be undertaken safely and effectively in the community setting.

The rationale for community based care is an attempt to increase uptake through offering services which are more conveniently accessible. Local leisure services offer ideal venues, providing excellent and often underused facilities (Child, 2004). In this move to community provision, the British Heart foundation (2006) has supported community cardiac rehabilitation initiatives through a £4.7 million Big Lottery Fund. As a result more community initiatives are expected to be established.

Another alternative approach for cardiac rehabilitation provision is a home self help manual and nurse led primary care secondary prevention clinic. The Heart Manual has been designed to facilitate recovery post myocardial infarction and has been estimated to be in use in approximately 10% of cardiac rehabilitation programmes (British Heart Foundation Cardiac Care and Education Research Group, 2005).

This home based approach has shown to be clinically effective in three randomised control trials which concluded outcomes were as good as hospital based programmes, one trial having demonstrated a greater effect on reducing hospital admissions (Lewin et al, 1992; Lee et al 2004). Following the success of the Heart Manual, the Angina Plan (Lewin et al, 2002) and Angioplasty Plan have followed. Importantly, a systematic review and meta-analysis by Jolly et al (2006) deduced that outcomes on mortality, health related quality of life and modifiable risk factors were similar for both home and centre based rehabilitation. A little caution should be applied though when taking these results at face value, as fewer studies had been published around home-based rehabilitation in comparison to traditional hospital group care.

Despite evidence being available for the effectiveness of the various modes of delivery, there is a lack of scientific evidence to evaluate which model of cardiac rehabilitation works best (Beswick et al, 2004). Further

research is required to establish the best and most cost effective versions (Wenger et al, 1995; NHS, 1998; Goble and Worcester, 1999), as in clinical practice it is recognised that patients have a variety of needs and therefore the availability of a variety of approaches is recommended.

Rather than isolated provision, a district wide approach is recommended, involving collaboration between primary, secondary and leisure services to ensure effective communications, reduce treatment gaps and build on established models of integrated care which been proven to be effective (Dalal et al, 2004). An example of which is East Riding cardiac rehabilitation service where a menu-based, seamless service has been created from inpatient discharge to 12 month NSF review clinic, using a computer generated triage system to ensure all individual patient needs are met (Jolly et al, 2006).

Cardiac Networks have been established in response to the National Health Service Heart Improvement Programme (DOH, 2005) with the aim of facilitating district-wide standardised care. There are currently thirty two Cardiac Networks in England (Dancy M, 2006). The intention of which is to continue service improvements by developing a co-ordinated and integrated approach to cardiac services, resulting in better patient experience and outcomes throughout the whole patient care pathway as set out in the National Service Framework for Coronary Heart Disease.

Geographical factors have been shown to influence the uptake into cardiac rehabilitation programme (Thompson, 1997). For people who live in rural locations, provision is often limited to the nearest large hospital, creating an inequality in access (Parker et al, 2002). Although community and home packages of cardiac rehabilitation care have been developed in response to access issues with the aim of providing equitable care, there is currently no available evidence to compare cardiac rehabilitation provision between different English communities.

2.11 Research question

A review of the literature has revealed that several studies have suggested problems within the cardiac rehabilitation services in the United Kingdom, particularly in relation to staffing, patients receiving treatment and funding (Bethell et al 2001, 2004; Lewin et al 1998; Thompson et al 1997, 1998; West and Beswick, 2002). The publication of both Chapter Seven of the National Service Framework for Coronary Heart Disease and the Scottish Intercollegiate Guideline Network Number 57 intended to address such variations in practice by improving provision through standardisation of cardiac rehabilitation services.

The question that arose was:
To what extent do variations in cardiac rehabilitation provision continue to exist in England following the publication and implementation of the national guidelines?

2.12 Study aim

The primary aim of this study is to gain valuable data on current cardiac rehabilitation service provision in England in order to identify variations or deficiencies in cardiac rehabilitation provision. Details will be obtained through examination of service aspects which have been previously reported as deficiencies in published literature:

- profession and skills of the multidisciplinary team
- patients included
- funding, budget and costs

All areas of the cardiac rehabilitation pathway will be examined in the process.

2.13 Study objectives

In order to meet this aim, specific objectives included:

1) To obtain quantitative and qualitative data on the selected rehabilitation programmes.

2) To discover to what extent the recommendations of the SIGN Guideline No 57 have been implemented
3) To discover whether the standards and goals of National Service Framework for CHD have been achieved.
4) To discover whether geographical factors exist which lead to variations in service provision.
5) To identify deficiencies with service provision

The intention of investigating deficiencies and areas of good practice is to make recommendations of best practice for future service provision.

2.14 Dissemination of results

This work has already been presented regionally, nationally and internationally through both poster and oral presentations:

Regional

- Greater Manchester and Cheshire Cardiac Rehabilitation Practitioners Group meeting March 2005
- North Yorkshire Cardiac Network Cardiac Rehabilitation Practitioners Group meeting March 2005

National

- Poster presentation at BACR conferences, Stratford 2004 and Glasgow 2005
- Oral presentation at the Coronary Prevention Group Symposium, London, February 2005

International

- Oral presentation at the Cardiac Rehabilitation World Congress Dublin, 2004

Aspects of this thesis have also been published in the European Journal of Cardiovascular Rehabilitation and Prevention (Brodie et al, 2006), and the findings have been discussed with the Health Commissioners. Examples of these outputs are shown in Appendix 14.

3 METHODOLOGY

3.1 Study design

A research proposal was drafted outlining the need for information to be gathered on cardiac rehabilitation services in England. The planned study design was subsequently submitted to the Coronary Prevention Group for commissioning. Once approval of the study design had been granted, a detailed questionnaire was formulated with the intention of gaining information on the cardiac rehabilitation programmes through both qualitative and quantitative methods using a mixture of closed and open ended questions.

The questionnaire design of the original Coronary Prevention Group study researched all areas of cardiac rehabilitation provision. This particular project focuses and reports solely on the following specific aspects within the cardiac rehabilitation process:

- Structure and organisation of the cardiac rehabilitation service
- Funding and budget
- Profession and skills of the multidisciplinary team
- Patients included
- Implementation of the recommendations of the SIGN Guideline No 57 and achievement of National Service Framework for CHD standards

3.2 Sampling and recruitment

The co-ordinators of cardiac rehabilitation programmes were the target population for this study. Previous investigation on behalf of the Coronary Prevention Group ascertained that co-ordinators were the staff members most knowledgeable about their cardiac programmes and therefore the most likely to provide information on them.

Three groups of cardiac rehabilitation services were targeted: The first group involved a random selection of cardiac rehabilitation services within each of the 28 Strategic Health Authorities in England.

The second and third groups involved all the cardiac rehabilitation services within specific geographical Cardiac Networks; one being predominantly rural and the other predominantly urban. The inclusion of every service within a specific Cardiac Network was necessary in order to establish whether there were trends in provision within a particular region. As differences in CR access and provision between geographical areas have been alluded to in previous literature (Thompson, 1997; Parker et al, 2002), the author has chosen to look at extremes of location i.e. rural versus urban to investigate whether such variations exist. The number of services included in these two subsequent studies matched the sample number from the randomized sample (n=26).

The recruitment selection processes for each of the three groups varied and were undertaken as follows:

3.2.1 Cardiac rehabilitation programmes in England.

This sample was obtained from each of the 28 Strategic Health Authorities (SHA) in England. Random selection for inclusion in the study was through computer-generated random numbers linked to each service within each SHA. This selection process ensured one CR service was recruited from each SHA and therefore geographically covered England. This sample represented 9% of the 332 English CR programmes identified from the BHF register. As services within this sample were within tertiary centers, district general hospitals, community and leisure services; it was deemed by the author to be inclusive of the variety of locations for provision as detailed in both the NSF and SIGN guideline.

The contact details of the 28 cardiac rehabilitation co-ordinators were taken from the British Association of Cardiac Rehabilitation / British Heart

Foundation (BHF) register of cardiac rehabilitation programmes (BHF, 2006b).

Once selection had been made, a telephone call to the co-ordinator of each cardiac rehabilitation service was made to explain the purpose of the study and gain permission for their participation. Questionnaires were subsequently posted with prepaid envelopes included for reply. Where questionnaires were not returned by the requested date co-ordinators were contacted and a further copy was sent.

3.2.2 Anglia Cardiac Network cardiac rehabilitation programmes

Anglia Cardiac Network covers Norfolk, Suffolk and Cambridge, covering a population of 2.5 million. The network includes seventeen Primary Care Trusts, one Ambulance Trust and a tertiary centre. The residents of this network are served by twelve cardiac rehabilitation services.

The geographical area of the Anglia Cardiac Network is predominantly rural and has a lower than national average prevalence of CHD. The age-standardised death rates from CHD per 100,000 population in 2003 for this region were 151 for men and 47 for women. These figures compare favourably with the England national average of 181 for men and 60 for women (BHF, 2006). Such factors place the Anglia region on the lower thresholds for both CHD prevalence and population and therefore as an ideal area for inclusion within the study.

Agreement for participation in the study of all 12 cardiac rehabilitation programmes within the Anglia Cardiac Network was sought on behalf of the researcher through the Anglia Cardiac Network cardiac rehabilitation practitioners group. The Network members were keen to audit their cardiac rehabilitation services using an audit tool that had already been designed and tested. In return for using the Coronary Prevention Group questionnaire, agreement was made for copies of all questionnaires to be sent to the researcher for inclusion in the analysis for this project. One member of the Anglia group was responsible for posting out, collecting

and returning the questionnaires from the Network cardiac rehabilitation co-ordinators to the researcher.

3.2.3 Greater Manchester and Cheshire Cardiac Network cardiac rehabilitation programmes

The geographical area of the Greater Manchester and Cheshire Cardiac Network is predominantly urban and has a higher than national average prevalence of CHD. The age-standardised death rates from CHD per 100,000 population in 2003 for this region were 220 for men and 72 for women. These figures compare unfavourably with the England national average of 181 for men and 60 for women (BHF, 2006). The North West has the second highest age-standardised death rate in England for both men and women with CHD, second only to the North East of England. Such figures place this Cardiac Network on the higher threshold for both CHD prevalence and population and therefore are an ideal area for comparison to the Anglia region.

Agreement for participation in the study by all 14 cardiac rehabilitation programmes was sought through the Greater Manchester and Cheshire Cardiac Network Cardiac Rehabilitation Practitioner's Group quarterly meeting. The Network covers Greater Manchester, Trafford, Central and Eastern Cheshire, covering a population of 3.2 million. The network includes 15 Primary Care Trusts, 14 District General hospitals and two tertiary centres. All services had previously been involved in the 2002 North West Taskforce for Coronary Heart Disease (CHD) study into the provision of cardiac rehabilitation services across the North West Region. Practitioners were keen to re-audit their services to identify improvements or continued failings and therefore were keen to participate.

Questionnaires were given to the co-ordinators of each service at the quarterly meeting with a date to return the completed questionnaires to the researcher in the supplied pre-paid envelope. Where questionnaires

were not returned by the requested date co-ordinators were contacted and a further copy was sent.

To improve the questionnaire response rate, all co-ordinators were contacted prior to receiving the questionnaire in order to give information about the study and gain agreement for participation.

3.3 Questionnaire construction

The questionnaire had been constructed to gain both qualitative and quantitative information from the co-ordinator responsible for each cardiac rehabilitation service. Areas of investigation were based around the following:

a) cardiac rehabilitation service organisation
b) cardiac rehabilitation team
c) funding
d) patients included
e) NSF / SIGN recommendations for each Phase of the rehabilitation pathway

The questionnaire design was tested by selecting a local cardiac rehabilitation service willing to participate in the study to test the relevance and robustness of the questionnaire. Minor amendments were made in response to questions that had been found to be ambiguous or misleading by the pilot respondent and further questions were added if further information was required.

The finalised questionnaire consisted of 69 questions directed to examine in detail the content of all four phases of the cardiac rehabilitation process (See appendix 1). The questions selected for analysis in this particular report are highlighted in yellow and were determined from the main themes from the CPG study findings. Questions relating to physical assessment and monitoring (see appendix 1, questions 32, 33, 35 and 36), although not being directly discussed in this thesis were important to

include in order to establish whether the SIGN Guidelines and NSF recommendations have been achieved (see appendices 7 and 8).

The questionnaires concluded with a SWOT analysis to seek opinions of the co-ordinator on the strengths, weaknesses, opportunities and threats of their service. The intention of this type of analysis was to understand current service position through a review of internal resources and capabilities (strengths and weaknesses) and external factors (opportunities and threats). Such analysis is a recognised method of organisation audit. The researcher considered this to be a valuable exercise for each participating co-ordinator to identify key areas for strategic planning by giving an indication of potential future direction.

3.4 Ethics

The protocol for the Coronary Prevention Group study had been submitted to the South East multi-centre research ethics committee (MREC) who confirmed that the design of the study was an audit and therefore did not require ethical approval.

3.5 Data analysis

Independent analysis of each group of cardiac rehabilitation programmes was initially carried out using descriptive statistics based on Microsoft Office Excel (2003) and SPSS software, version 14 (SPSS, 2005). Baseline data were described in terms of mean, standard deviation, median and range. When data from all groups was pooled, the investigation represented 18% of all cardiac rehabilitation centres in England.

Comparison analysis between the groups was undertaken to:

- Identify whether the original sample was a true overall reflection of English cardiac rehabilitation programmes
- Highlight differentials in service design
- Identify specific patient needs / variances within a particular geographical area.

A one way analysis of variance (ANOVA) was carried out to assess whether the differences found were of statistical significance.

Once tendencies had been revealed through processing the descriptive data using Microsoft office, further analysis was undertaken using the SPSS statistical package to assess whether the discrepancies found were of statistical significance. The plan was to use parametric statistical techniques throughout. The mean and standard deviation (SD) were calculated and used to describe the central tendencies and summarise the data.

Prior to any statistical analysis the appropriate tests for homogeneity of variance were carried out. If variances were unequal a non-parametric alternative was sought. Analysis of variance (ANOVA) was used as the main comparative analysis with *post hoc* follow up using Bonferroni adjustments. This is a strict adjustment that increases the acceptance level beyond p=0.05 in respect of the number of comparisons made.

4 RESULTS

For ease of discussion purposes, the three groups of cardiac rehabilitation services studied will be referred to as follows:

Sample from each SHA in England	= England
Greater Manchester and Cheshire Cardiac Network	=Manchester
Anglia Cardiac Network	= Anglia

4.1 The process

Of the 28 services which had been identified from the British Heart Foundation register of cardiac rehabilitation programmes, seven (25%) co-ordinators had changed since their service had registered on the database in 2003, indicating a high turnover of pivotal staff. Unfortunately, during the time frame of the study it was impossible to gain access to data from one service. This was reportedly due to long-term sickness within the cardiac rehabilitation team and subsequent staff pressures. Another cardiac rehabilitation service from that particular Strategic Health Authority was randomly selected for inclusion. All 28 completed questionnaires were returned for this group.

All 12 Anglia cardiac rehabilitation services and all 14 services within the Manchester Network returned their questionnaires.

Analysis was carried out on the above 28 (England), 12 (Anglia) and 14 (Manchester) sets of responses which represent a 100% return. The results presented are representative of all phases of the rehabilitation pathway.

4.2 Budget

SIGN (2002) enumerates the number of staff needed to run a cardiac rehabilitation programme, but neither the NSF nor SIGN comment on the budget, nor who should hold it.

In total 43% of the services held a budget that ranged from £11,000 to £370,000. The £11,000 budget was exclusively for staffing of a severely undermanned district general hospital service, whereas the latter provided for a busy tertiary centre with a large Phase 1 input. Where rehabilitation teams did not hold budgets, the predicted amount was difficult to quantify and therefore these costings were not included in the analysis. Staff from these services were either funded through their separate professional or divisional budgets, or offered their services to cardiac rehabilitation as a good-will gesture.

Of the 23 (43%) services which held their own budget, the average resources were £150,870 per annum. An average of 600 patients accessed the programmes at a mean cost of £252 per patient (Table 2).

When comparison was made between regions, the cost per patient through cardiac rehabilitation showed a variation in range of £198 to £332 per episode (Table 3). Manchester had the lowest cost per patient at £198 compared to Anglia which had the highest at £332 per patient. As the mean was taken from such a small sample in the Manchester and Anglia regions, this cannot be considered as an accurate reflection of cost of cardiac rehabilitation for each patient.

Anglia cardiac rehabilitation services were half as likely to hold their own budget as the random England sample of services.

Parametric analysis using one way analysis of variance (ANOVA) was carried out following homogeneity of variance tests which revealed that all data distributions had comparable variances. ANOVA demonstrated that the F values were all non-significant for budget ($F(2,20)=.266$; $p>0.05$), throughput ($F(2,20)=.790$;$p>0.05$) and cost per patient ($F(2,20)=.433$; $p>0.05$) (see appendix 2). It is therefore concluded that budget, throughput and cost per patient does not differ significantly between services or between regions studied. For this reason, no further sub analysis has been undertaken.

Service	Total budget - in ascending order	Throughput	Cost per patient
England 1	£32,000	313	£102
England 2	£60,000	468	£128
England 3	£63,000	771	£82
England 4	£80,000	440	£182
England 5	£89,000	610	£146
England 6	£138,000	563	£245
England 7	£142,000	703*	£202
England 8	£144,000	363	£397
England 9	£149,000	711	£210
England 10	£153,000	663	£231
England 11	£158,000	935	£169
England 12	£170,000	474	£359
England 13	£330,000	554	£596
England 14	£345,000	372	£927
England 15	£370,000	1400*	£264
Manchester 1	£11,000	67	£164
Manchester 2	£69,000	992	£70
Manchester 3	£150,000	711	£211
Manchester 4	£176,000	895	£197
Manchester 5	£234,000	558	£419
Anglia 1	£101,000	355	£285
Anglia 2	£150,000	528	£284
Anglia 3	£156,000	345	£452
Total	**£3,470,000**	**13,791**	**£252 (mean)**

Table 2 Services with an identifiable budget: budget and cost per patient per annum

*Tertiary Centres

Region	% hold budget	Mean budget	Mean Throughput	Cost per patient
England	54%	£172,000	597	£288
Manchester	36%	£128,000	645	£198
Anglia	25%	£136,000	409	£332

Table 3 Budget and cost per patient by region

4.3 Cardiac rehabilitation multi-disciplinary team

The NSF does not state which profession should provide the various aspects of comprehensive cardiac rehabilitation. Instead it advises that staff should be trained in the following:

- The provision of advice about exercise and exercise supervision and the skills to modify exercises appropriately on an individual basis to take account of co-morbidity
- Lifestyle interventions (e.g. smoking cessation and healthy eating)
- Psychological treatments (e.g. cognitive behavioural therapy)
- Defibrillation and advanced life support

In total there were 13 professions identified working within the field of cardiac rehabilitation (figure 1). Every service had a nurse, and most also employed a physiotherapist (93%) and dietician (81%). Approximately half the services employed pharmacists, health care assistants, occupational therapists and administrative staff. Doctors were rarely core members of the team and featured in only two per cent of services. Where the relevant professionals were not part of the core team, there was evidence of multi-tasking and role extension.

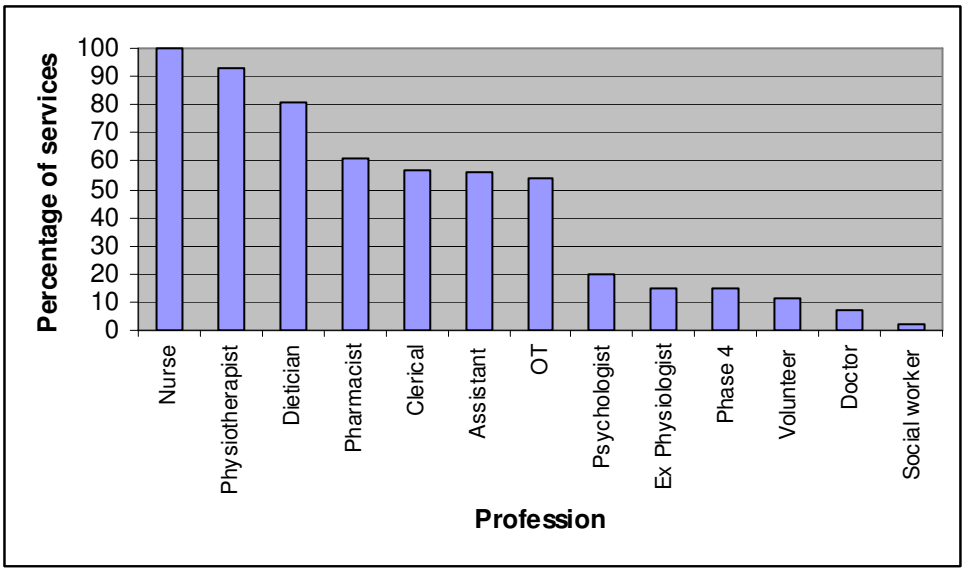

Figure 1 – Core team members

Figure 2 shows the diversity of staff employed between the study groups. A nurse and physiotherapist were most consistently employed. Manchester employed fewer dieticians (57%), whereas Anglia employed fewer clerical and assistant staff (25%).

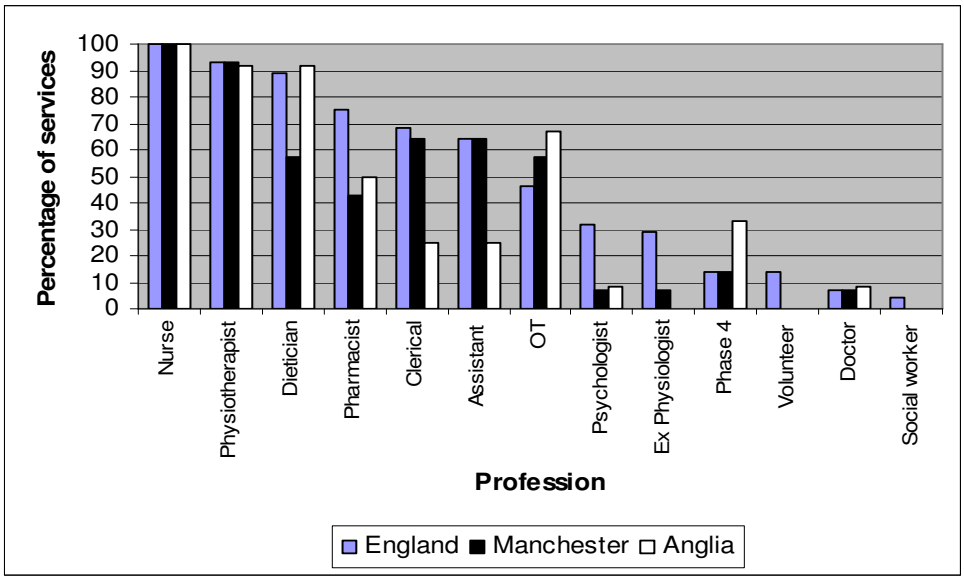

Figure 2 – Graph to show core team members

Overall 71% of services reported multi-professional teams of greater than five healthcare workers. The range of professionals was between three and ten with a mode of six disciplines employed within each team. The extent to which the professionals contributed to the cardiac rehabilitation service varied a great deal. An average of two workers were seconded to the teams to provide education sessions only.

On closer inspection there were variations between the disciplines and number of professions which contributed to the multidisciplinary teams (table 3). The England sample reported better staffing levels. Overall, they employed 13 different healthcare professions with a mode of seven in each service. This compared favourably to the Manchester and Anglia regions which employed only 10 professions with a mode of six and five disciplines respectively working within each service. Ninety-six percent of England services had a multidisciplinary team comprising of five or more

professions, compared to two thirds within Manchester and only half within Anglia services.

	England	Manchester	Anglia
Number of disciplines providing CR	13	10	10
MDT > 5 professions	96%	68%	50%
MDT number range (mode)	4 – 10 (7)	3 – 9 (6)	3 – 8 (5)
Mean number seconded to team for education session	3	2	2

Table 3 Multidisciplinary Team (MDT)

The percentage of professionals making up a CR programme differed descriptively between the regions in favour of England having the higher percentage (49%). ANOVA revealed no significant difference ($F(2,18)=0.328$; $p>0.05$) between regions (see appendix 3).

4.4 Comparison with SIGN Guideline staff estimate

The SIGN Guideline (SIGN, 2000) gives an estimate of staff resources in whole time equivalents (WTE) required to deliver comprehensive cardiac rehabilitation to a range of 500 cardiac patients (Table 4).

Staff	WTE
G Grade nurse	3.0
Senior 1 Physiotherapist	2.0
Senior 1 dietician	0.3
D grade pharmacist	0.2
Clinical Psychologist (Grade A)	0.2
Audit and clerical	0.5
Total	**6.2**

Table 4 Estimate of staff resources for 500 patients

Two comparisons have been made between the staffing investments in the centres surveyed against the SIGN Guideline recommendations.

1. Comparison of staff nominated in the SIGN Guideline staff estimate.
2. Comparison of all staff involved in CR against the SIGN Guideline staff estimate

Both comparisons have been used since the SIGN Guideline staff estimate names only six cardiac rehabilitation disciplines. In this study, there were 13 different professions involved.

To make the comparison, the number of patients treated by each service has been calculated and the staff figures adjusted to represent 500 patients. The validity of these calculations is dependent upon the accuracy of the information supplied by the cardiac rehabilitation co-ordinator on staff figures and patient numbers.

The SIGN Guideline estimates that 6.2 Whole Time Equivalents (WTE) are required to provide cardiac rehabilitation to 500 patients of varying needs. Only 14 (26%) services met this estimate when all multidisciplinary members were included.

The average WTE staff employed from the overall sample survey using the first comparison was 3.2 staff, a shortfall of 3 WTE (48%). When using the second comparison that includes all cardiac rehabilitation personnel, the figure rises very slightly to an average of 3.7 WTE staff per service, a shortfall of 2.5 WTE (40%). Cardiac rehabilitation services are grossly under-staffed.

On closer inspection there were variations in staffing levels between the study groups (table 5). Not only were the Manchester cardiac rehabilitation services the least well staffed, with a 45% staff shortfall from recommended levels; they also showed the greatest difference between the SIGN staff guideline and actual professions who worked in their services. Twenty per cent of the staff working in cardiac

rehabilitation services in Manchester were not from the professions recommended in the SIGN staff guideline. Anglia, although similarly understaffed, employed professions in their services which correlated closest to the recommended guidelines. Only two percent of the reported Anglia cardiac rehabilitation staff were not recognised by SIGN.

	WTE SIGN staff	Per cent shortfall	WTE All staff	Percent shortfall
England	3.9	37%	4.6	26%
Manchester	2.2	65%	3.4	45%
Anglia	3.5	44%	3.6	42%

Table 5 WTE's and percentage staff shortfall by study group

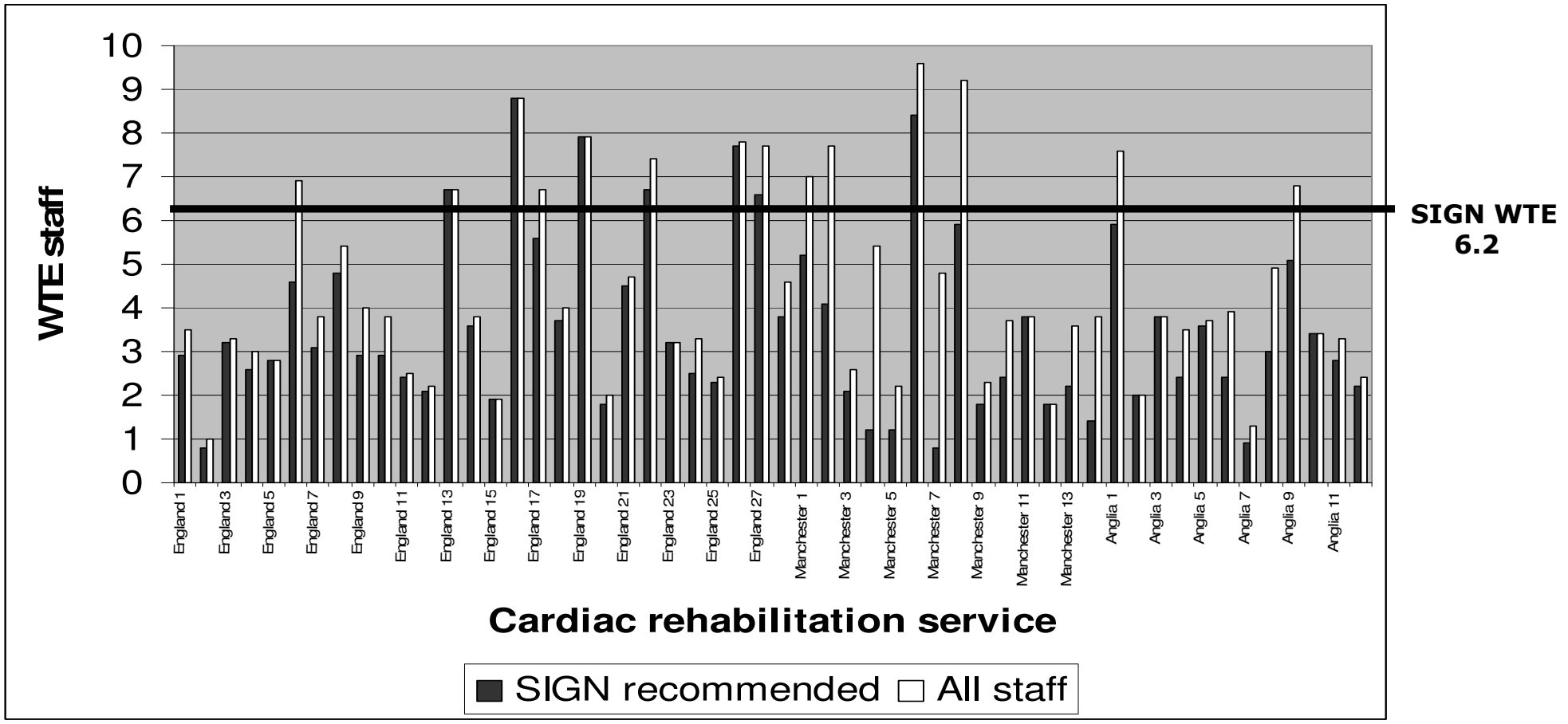

Figure 3 – Graph to show staffing levels in comparison to SIGN guideline

All professions are significantly under-represented (figure 4). When compared to the SIGN estimate, nursing staff are the best represented overall, achieving on average 70% of their recommended level. Other disciplines include clerical staff (60%), psychologists (35%), physiotherapists (26%), pharmacists and dieticians being least represented achieving only 12% of the expected target. When all exercise professionals are grouped together, physiotherapists, exercise physiologists and exercise instructors, there remains a shortfall of 60%. Descriptively the trend was similar for each profession within each region. Statistically there were no significant differences found between regions ($F(2,15)=0.34$; $p>0.05$) (see appendix 4).

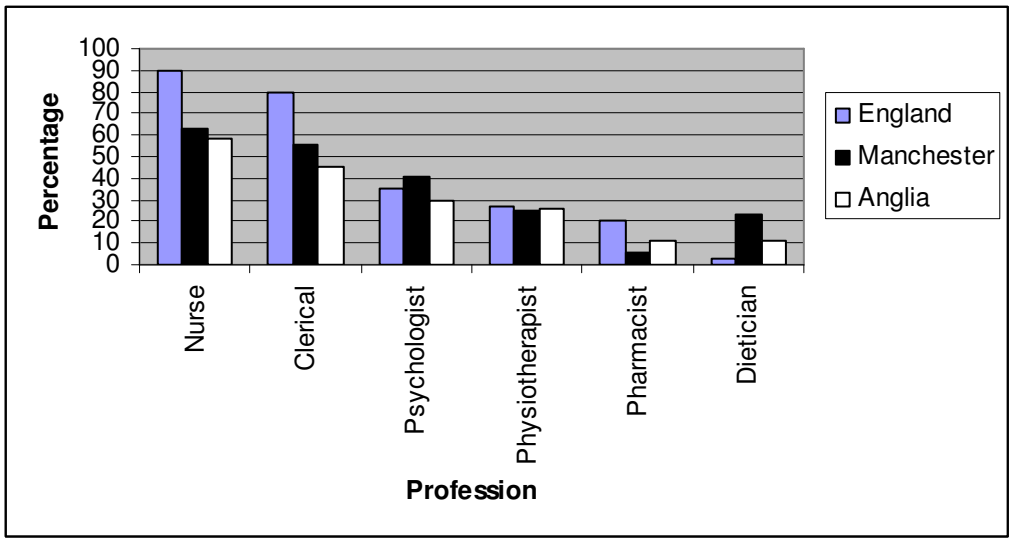

Figure 4 Graph to show percentage of profession employed in relation to SIGN Guideline recommendations

Within each profession there has shown to be a great variation in the number of WTE's employed to provide cardiac rehabilitation to 500 patients (table 6). In the England study group, the expected SIGN staff target WTE for each individual profession had been met by at least one service. In the Manchester region, the target WTE for physiotherapist, pharmacist and dietician had not been met by a single service. In the Anglia group, only the clerical WTE target had been achieved. Target WTE's for the nurse, physiotherapist, pharmacist, psychologist or dietician had not been met by any services within this region.

	England	Manchester	Anglia
Nurse	0.625 to 6.25	0.78 to 7.6	0.1 to 2.3
Physiotherapist	0 to 2.1	0 to 1.97	0 to 1.25
Dietician	0 to 1.38	0 to 0.2	0 to 0.125
Pharmacist	0 to 0.27	0 to 0.02	0 to 0.04
Psychologist	0 to 1.34	0 to 0.33	0 to 0.007
Clerical	0 to 1.25	0 to 0.57	0 to 1.0

Table 6 Profession WTE range

4.5 Staff / skill shortages

Figure 5 shows the staff / skill shortages as perceived by the programme co-ordinators. Professionals to deliver the psychological interventions were most sought after. Half the co-ordinators wanted access to a psychologist (50%) and approximately a third wanted a counsellor (36%) or an occupational therapist (29%) on their team.

Although 93% of programmes had physiotherapists involved in their service delivery, almost half (43%) wanted more physiotherapy input. In several cases the sole physiotherapist member was rotational, which caused problems with continuity and service development.

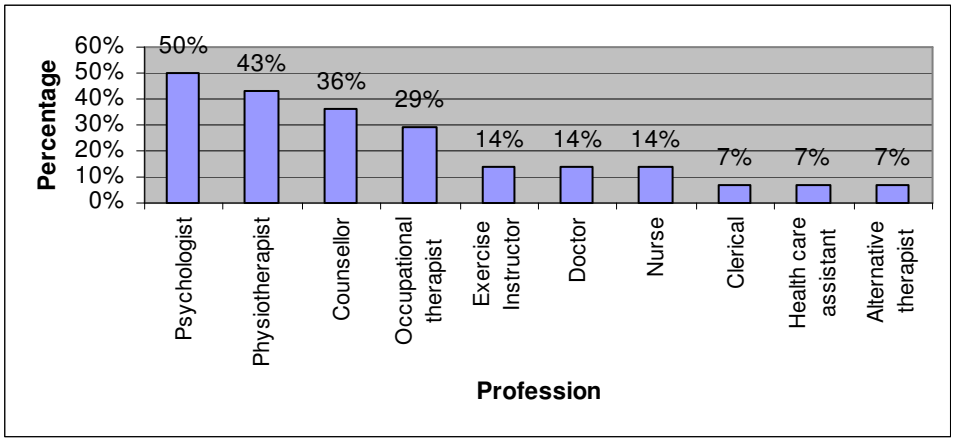

Figure 5 Graph to show percentage of services reporting staff shortages

4.6 Cardiac rehabilitation patients

The National Service Framework (DoH, 2000) recognises that patients who can be helped by cardiac rehabilitation include: "following acute myocardial infarction, before and after revascularisation procedures, with stable angina, with heart failure and following other specialized interventions such as cardiac transplant." The priority groups are those who have survived MI and those who have undergone revascularisation. Once these groups have been recruited to "high quality cardiac rehabilitation" the service should be offered to people admitted to hospital with other manifestations of coronary heart disease e.g. angina and heart failure.

SIGN (2002) recommends comprehensive cardiac rehabilitation for patients following acute myocardial infarction and for patients who have undergone coronary revascularisation. It suggests that patients with stable angina or with chronic heart failure be considered if they have limiting symptoms.

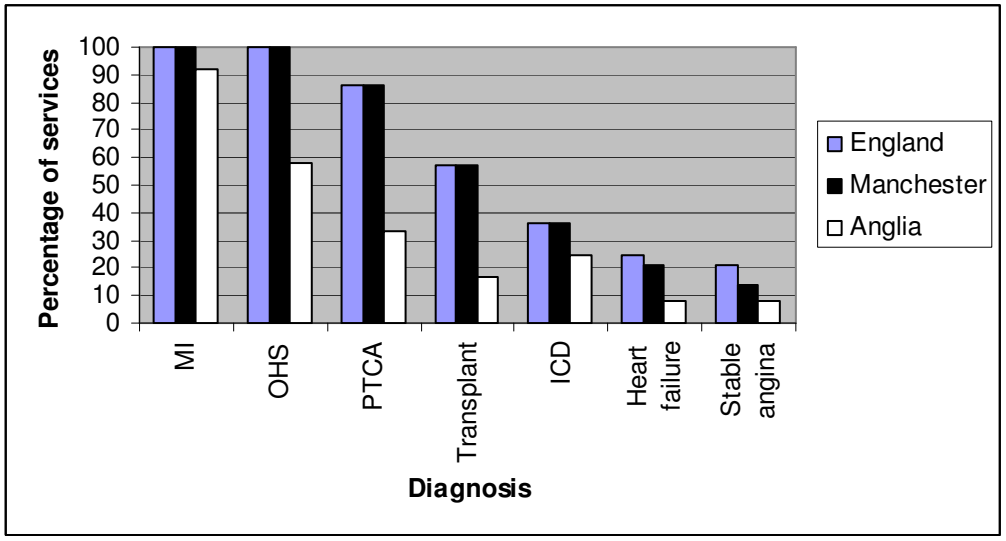

Figure 6 Patients offered cardiac rehabilitation

Figure 6 shows the percentage of cardiac rehabilitation programmes which accept patients into their service by diagnosis. All services within

the England and Manchester study accepted patients following acute myocardial infarction and post open heart surgery (OHS) with 86% in both offering rehabilitation to patients following percutaneous transluminal coronary angioplasty (PTCA). Hence, the priorities of the NSF have almost been met within these networks in terms of access to patients post MI and revascularisation procedures. The Anglia region, on the other hand was a long way from meeting the priority targets. All except one service (92%) offered rehabilitation to post MI patients, but only 58% included patients post OHS and only a third (33%) accepted patients post PTCA.

Other patients to benefit from cardiac rehabilitation are shown not to routinely gaining access to services. Just under half (44%) included patients who had undergone heart transplantation, a third (32%) post implantable cardioverter defibrillator (ICD) insertion, and very few would accept patients with either heart failure (18%) or stable angina (14%).

Statistical analysis of patient groups offered cardiac rehabilitation by diagnosis via between-subjects effects demonstrated significant differences ($F(1,14)=10.164$; $p<0.05$). Further analysis using multiple comparison (Bonferroni) concluded that statistical differences existed at $p<0.05$ between the following groups: MI and ICD, MI and heart failure, MI and angina and to a lesser degree between OHS and heart failure and OHS and angina. (see appendix 5).

In the Anglia region all diagnosis categories fell far below the inclusion rate of the two other areas studied. Only 17% accepted patients post transplantation and a mere eight percent accepted patients with stable angina. Although a limited number of services stated that they would include patients with an ICD (25%), and heart failure (8%), these patients were in fact only included if they had also had an MI or revascularisation procedure i.e. they also fulfilled their priority criteria.

Despite the identified lower levels of inclusion through descriptive data, one way ANOVA concluded that no statistical difference existed between inclusion of CHD patients by region, therefore no further sub analysis was undertaken ($F(2,18)=1.307$; $p>0.05$) (see appendix 6).

In the researcher's locality of the Manchester region an investigation of the actual uptake into cardiac rehabilitation was undertaken. Although co-ordinators in this region reported that they accepted patients post MI and revascularisation onto their programmes, the actual uptake into Phase 2 and 3 was varied for the different diagnostic groups (see Table 7). Comparison of the network reported figures with those reported by the service co-ordinators showed three quarters (76%) of patients post MI were accessing Phase 2 but this dropped to almost half (43%) at Phase 3. Conversely, patients post open heart surgery were most likely to access Phase 3 (87%) but less likely to access Phase 2 (45%). Patients following PTCA were least included in either phase: only 20 % accessed Phase 2 and 37% accessed Phase 3.

This particular analysis had not been replicated in the England or Anglia study groups due to the difficulty in obtaining actual regional diagnosis figures.

Diagnosis	Total number Reported by network	Percentage uptake Phase 2	Percentage uptake Phase 3
MI	5830	76%	43%
OHS	1193	45%	87%
PTCA	2619	20%	37%

Table 7 Percentage uptake into cardiac rehabilitation by diagnosis category

4.7 Location

The NSF (DoH, 2000) suggests that taught sessions could be provided "in a hospital or elsewhere e.g. in a Local Authority sports centre" … or use.. "the Heart Manual or a home based exercise plan." SIGN comments that low to moderate exercise training can be undertaken safely and effectively in the home but that exercise training for high-risk patients and high intensity training should be hospital-based or in a venue with full resuscitation facilities.

Table 8 demonstrates the locality of the investigated cardiac rehabilitation programmes. Half (49%) the programmes have shown to be run solely within hospital settings, whereas 20% have moved to the more accessible community settings with almost a third (30%) offering a choice between both hospital and community locations. Twenty (37%) of these services belonged to a district wide programme, in which integrated working had been established between primary care, secondary care and leisure services. Additionally in 18 (31%) services, hospital cardiac rehabilitation professionals also worked in community settings and provided training to community staff.

	England	Manchester	Anglia
Hospital only	55%	50%	42%
Community only	25%	7%	25%
Hospital and community	21%	43%	25%
District wide	43%	36%	25%

Table 8 Location of cardiac rehabilitation programmes

4.8 Meeting NSF milestones

Milestone 1

"By October 2000, every hospital should have:

- *An effective means for setting hospital-wide clinical standards for common conditions.*
- *A systematic approach to determining whether agreed clinical standards are being met."*

This survey did not find any evidence that there are hospital-wide clinical standards for managing coronary heart disease. Even if there were agreed standards, the standard of record keeping in most cardiac rehabilitation services would make it impossible to determine whether they were being met.

Milestone 2

"*By April 2001, every hospital should have:*
An agreed hospital-wide protocol for the identification, assessment and management of people who are likely to benefit from cardiac rehabilitation."

Milestone 2 had been reported to be achieved universally. Milestone 2 had been much easier to implement as the necessary adaptations to practice have been more easily accessible to the cardiac rehabilitation teams. Co-ordinators have worked hard to ensure that systems have been introduced for the identification, assessment and management of patients likely to benefit from cardiac rehabilitation.

Milestone 3

"By April 2002, every hospital should have:
Clinical audit data no more than 12 months old which describe:

- *number and % of patients discharged from hospital after coronary revascularisation OR with a primary diagnosis of AMI with documentation of arrangements for CR in discharge communication to GP…*

- *total number and % of those recruited to CR who, one year after discharge, report:*
  1. *regular physical activity of at least 30 minutes duration on average five times a week*
  2. *not smoking*
  3. *BMI < 30kg.m-^{2}*

Only 5 (9%) services had been able to achieve the 12 month audit from Milestone 3. Four of which had achieved this by calling the patients back to attend a nurse-led 12-month follow-up clinic; the remaining service had co-ordinated closely with the Primary Care Trust (PCT) and had access to their database to obtain this information.

Eight (15%) services had attempted to facilitate this audit by sending to the primary care teams details of patients due for 12 month follow-up. None had received any communication to confirm whether or not the targets had been met.

Perhaps the main reason for the failure to achieve the 12-month NSF Goal is the fact that, in many cases, there has been no identified person responsible to ensure that the standards laid down are being achieved. Over a third (36%) of co-ordinators did not know who was responsible for the implementation of Standard Twelve.

This survey uncovered that co-ordinators were mostly responsible (19%), followed by the local implementation team (17%), and the CHD lead (14%), then service development manager in equal numbers (7%).

4.9 Achieving the guidelines

An attempt has been made to assess overall how well each service has been able to implement the recommendations of the NSF and SIGN Guideline (figure 7). The researcher has developed a basic point system, awarding one point for each recommendation successfully put into

practice. Although realistically each recommendation would be weighted differently, in this instance each has been weighted the same.

Twenty-five NSF recommendations were identified (see appendix 7). Overall there was evidence that on average 60% of these had been put into practice, with a wide achievement range of 40% to 92%. On comparison of these figures, it was interesting to find that being part of a district-wide programme (76% versus 60%) improved the likelihood of the NSF recommendations being implemented. Again differences in success of implementation were shown when the regions were assessed individually. The England sample had most success achieving 64% of the recommendations, followed by Manchester (52%), then Anglia (48%).

Twenty-one recommendations were identified from the SIGN Guideline (Appendix 8). There was evidence that on average 62% had been put into practice, with an achievement range of 48% to 76%. Again differences in success of implementation were shown when the regions were assessed individually. The England sample had most success achieving 67% of the recommendations, followed by Manchester (62%), then Anglia (52%). There appeared to be no outstanding factors that seemed to influence the success of implementation from correlation of the figures with service features.

However, when making a comparison between the ability to implement the NSF and SIGN Guideline, the similarity in both graphs suggest that those programmes which have successfully implemented the SIGN guideline, have also effectively implemented the recommendations of the NSF (figure 7). Therefore, it can be hypothesised that barriers to implementation that exist are common for both.

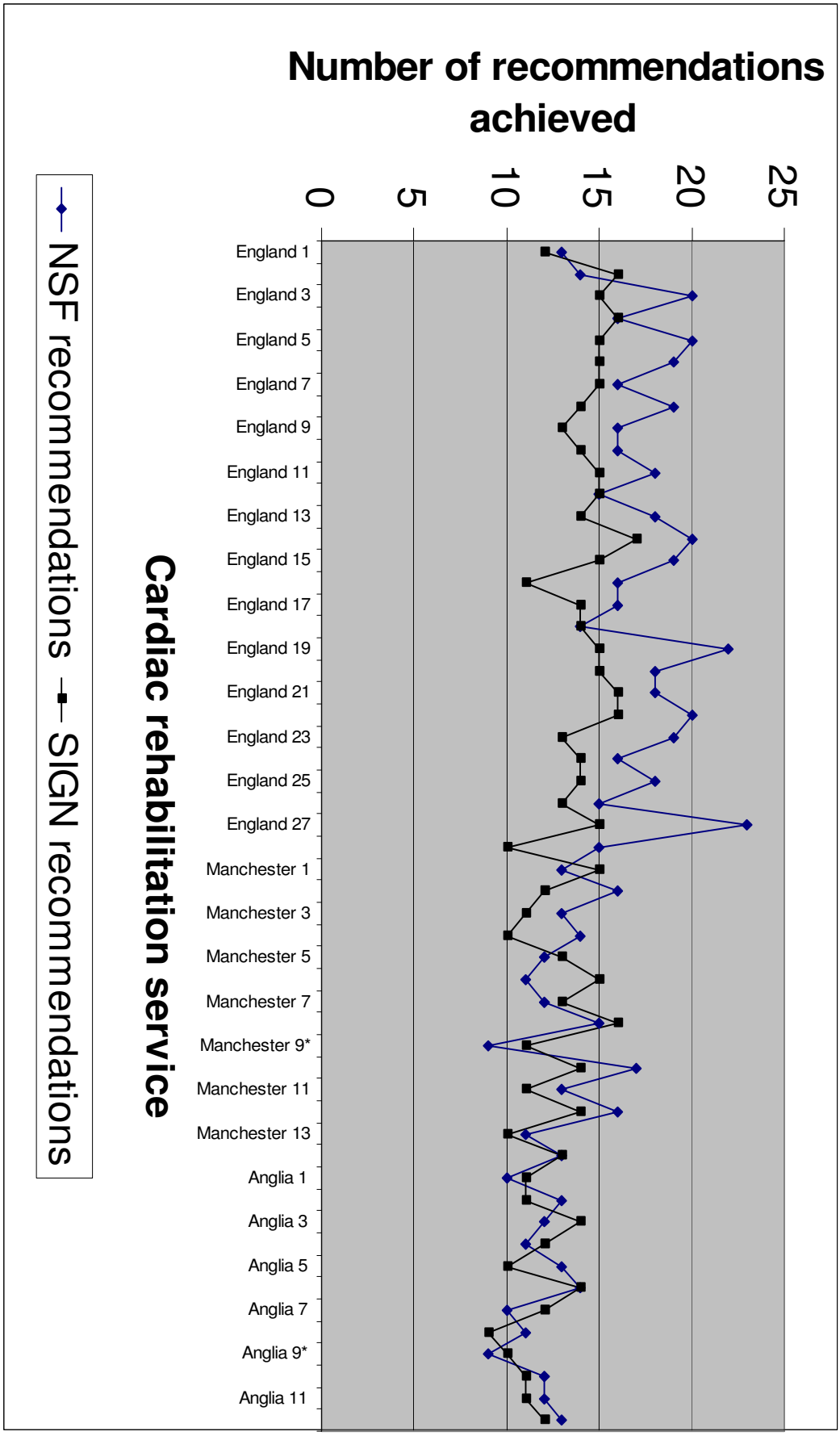

Figure 7 Implementation of NSF and SIGN guidelines

ANOVA revealed that there was a significant difference between the three regions in terms of recommendations achieved for both NSF ($F(2,51)=34.9$; $p<0.05$) and SIGN ($F(2,51)=14.2$; $p<0.05$) (see appendix 9).

Post hoc follow up with Bonferroni found that England differed significantly from both Anglia and Manchester ($p<0.05$). No significant difference was found between Anglia and Manchester.

The overall relationship (figure 8) between SIGN and NSF was found to be statistically significant ($r=0.65$) and the explained variance within this correlation was moderate ($R^2=0.42$).

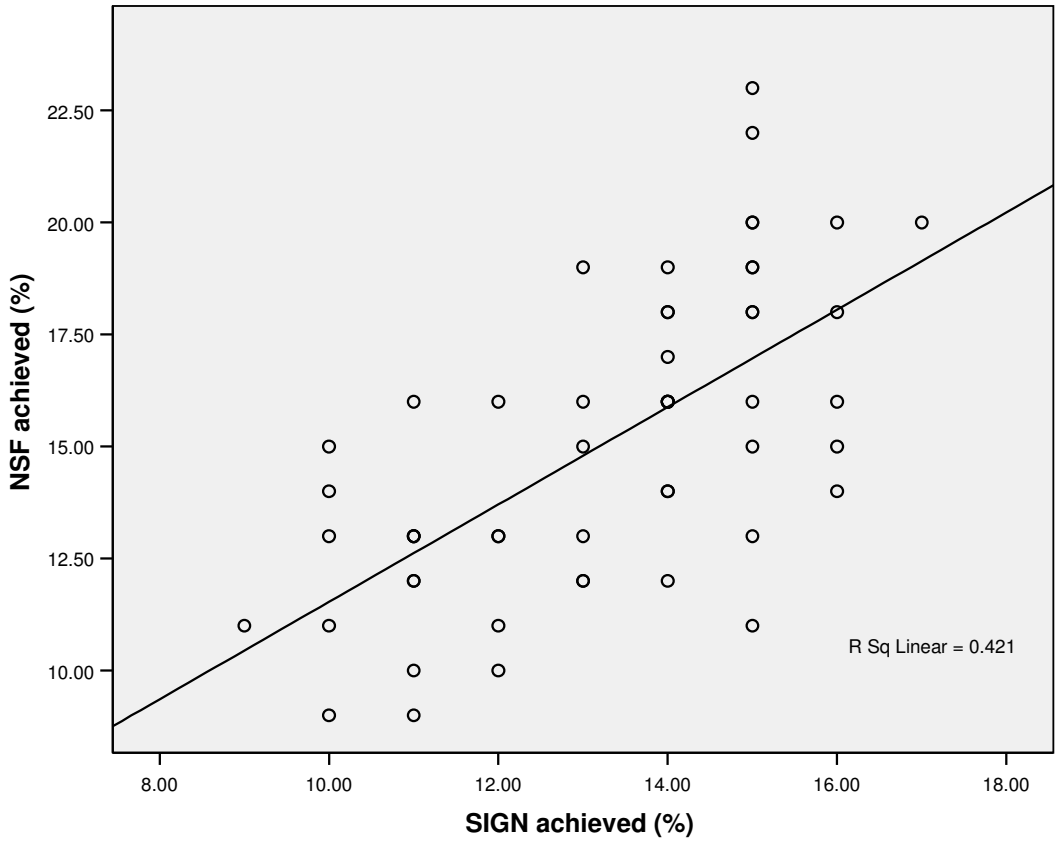

Figure 8 Correlation of achievement between national recommendations

4.10 SWOT analysis

4.10.1 Strengths

The co-ordinators reported a huge variety of strengths (28) of their cardiac rehabilitation programmes (see appendix 10). The multi-disciplinary team was the most often reported strength (63%), followed by good communication between primary and secondary care (41%), good Phase 4 network (17%), a menu-based approach (19%), a district-wide programme (17%), budget (15%), a good Phase 4 network (15%), good facilities (11%), doctor support (11%), inclusion of all CHD patients (9%), shared multi-disciplinary team offices (7%) and good IT links (6%). Seventeen other strengths were reported by one or two services.

4.10.2 Weaknesses

Twenty-seven weaknesses were reported by co-ordinators of which four major failings were identified (see appendix 11): lack of funding (56%), lack of dedicated facilities (43%), poor staffing (26%) and the inability to include all patients with CHD (24%). Other weaknesses reported included: inadequate Phase 2 (13%), inability to collect 12 month NSF data (13%), waiting list (11%), lack of doctor support (9%), inadequate psychological input (9%), poor Phase 4 (7%) and poor tertiary referral (7%). Thirteen other weaknesses were identified by one or two services.

4.10.3 Opportunities

By far the greatest opportunities reported were for CR services to evolve to include other CHD patients (61%) (see appendix 12). Other opportunities reported were in relation to improving access to services: moving services into community locations (13%), developing a menu based approach (9%), introducing prehabilitation (6%), offering an evening service (6%). The opportunity for a database to conduct clinical audit and monitor service activity was acknowledged by seventeen percent. Fifteen other opportunities were reported by one or two services.

4.10.4 Threats

Reported threats to the service were varied with some being similar to the major weaknesses reported but to a lesser degree (see appendix 13): financial (39%), staffing (20%), facilities (13%), lack of consultant support (11%), lack of cover for sickness or annual leave (7%) and a waiting list (7%). Seven other threats were cited by one or two services.

5. DISCUSSION

5.1 Organisation of CR services

Despite some reported improvements compared with the literature, it is obvious that major deficiencies continue to exist within the organisation of cardiac rehabilitation services.

Cardiac rehabilitation practitioners appear to be working in isolation from their immediate chain of command rather than collaboratively and supportively. The level of support that a number of cardiac rehabilitation services are receiving is questionable.

The publication of the NSF (DoH, 2000) is the first time that cardiac rehabilitation has been included in government policy, setting out milestones and goals for each service to achieve. This study has uncovered confusion as to who holds ultimate responsibility for ensuring their attainment. Although the majority of personnel acknowledged that the responsibility lay with either the co-ordinator or the Local Implementation Team (LIT), more than a third (36%) of co-ordinators were unable to state who was accountable in their trust.

As far back as 1993, the WHO expert committee (WHO, 1993) recommended that the responsibility of cardiac rehabilitation should be given to a designated healthcare professional to ensure implementation. It would appear that the current lack of identified responsibility, uncovered through this study has resulted cardiac rehabilitation professionals being hindered in achieving the milestones and goals set out in the NSF. To overcome this barrier, it is suggested that one person within each trust be given the accountability of ensuring recommended cardiac rehabilitation guideline implementation. This would guarantee a more focussed approach. It is essential that this person be clearly identifiable and accountable for any future service failings.

Ideally cardiac rehabilitation practitioners should work in close liaison with cardiology services across both primary and secondary care (DoH, 2000; Dalal et al, 2004). This study has revealed that just over a third of services (37%) have made changes towards this aim. A district-wide approach enables barriers to be broken down, promoting seamless care through improved communication, referral systems and service standardisation. Such practice also ensures that staff skills are transferable throughout the whole service, rather than being restricted to isolated pockets. Service drivers should steer services towards an integrated approach. Unless changes are made to the structure of cardiac rehabilitation services towards a district-wide model, inequity, isolation and inefficient delivery will continue. Service progression will be more effective through a cohesive trust-wide approach, rather than a bottom-led crusade, dependant upon the determination of individual co-ordinators, which has happened so often in the past.

Between the three areas of investigation, differences were shown to exist in the location of cardiac rehabilitation services. The Anglia region (25%) was half as likely to be organised as a district-wide service as the England sample (43%), a third of services in the Manchester region (36%) were structured in this way.

The majority of the selected cardiac rehabilitation services (81%) offered a hospital based programme. This compares favourably with the results of a national survey undertaken by Thompson et al (1997) in which 88% were hospital-based, providing evidence that the study sample reflected normal service distribution.

Evidence for cardiac rehabilitation classes to be delivered in the community setting is increasing (Sparks et al, 1993; Bell, 1998; Kodis et al, 2001; Child, 2004). It was disappointing, therefore, to find that almost half of English services remain solely hospital based (49%) and therefore potentially inaccessible to many who may benefit. Such practice potentially limits access, perpetuates the sick role, and restricts service design due to antiquated and outdated equipment and / or facilities. To

improve access, both the NSF (2000) and SIGN guideline (2002) have recommended that a district wide cardiac rehabilitation programme should be constructed from locally available services and included in long-term service agreements. These guidelines comply with current government strategies to give patients' choice about where they receive their treatment (Department of Health, 2005a).

In this study 26 (48%) services were provided within community venues. Local leisure services offer ideal venues for rehabilitation classes: they are more easily accessible, provide excellent modern facilities which are mostly underused, particularly in the daytime when the majority of cardiac rehabilitation programmes run. One of the aims of cardiac rehabilitation is to facilitate individuals to return to normal function; to promote activities where the "well" also exercises will assist in this objective. As the patient may be already familiar with their local leisure centre there is potential to remove barriers to long-term physical activity maintenance. The health care professionals should therefore seek to extend their practice outside the confines of the hospital setting through collaborative liaison with leisure services. Close working with leisure staff in existing purpose built exercise accommodation will improve the patient experience and enable continuing professional development for both health and leisure staff.

The evidence has yet to establish the best way to deliver cardiac rehabilitation services. In order to meet the increasing demand, it is sensible that a variety of venues and modes of delivery should be considered. The British Heart Foundation (2006a) are currently supporting the development of community based initiatives through the Big Lottery Fund, hence a growth in more accessible venues are expected to be offered in the near future.

Offering community based cardiac rehabilitation will improve access and allow hospital workers to concentrate their skills on the higher risk patient groups. If community provision is developed as part of a district-

wide staffing model, knowledge, training and communication will be enhanced, promoting a better patient experience.

5.2 Staffing

This study has shown a general trend of a greater staff involvement in cardiac rehabilitation when compared to previous published literature (Lewin et al, 1998; Thompson et al, 1999; Bethell et al 2001, 2004, 2005). Staff increases which were most noticeable were through the introduction of clerical staff and health care assistants. Support staff are crucial to the smooth running of a rehabilitation service as their input allows pressure to be relieved on the usually overstretched health care professional, releasing time to use their expertise to treat and educate patients. In particular, the administrative support is paramount to ensure timely referrals and accurate data input for meaningful audit. In this study, administrative staff and health care assistants had each been appointed in 43% of services, which suggests that almost half the programmes are still continuing to rely on medically trained staff to perform administrative duties. This time would be better spent assisting patients in their recovery, using their skills for which they had been trained. Ultimately, the employment of support staff would enable a more efficient service in terms of cost and skill application.

The NSF (DoH, 2000) does not state which profession should provide the individual modalities of comprehensive cardiac rehabilitation. It advises that staff have sufficient training to deliver the recognised components. Comprehensive cardiac rehabilitation should include the skills of a range of professionals in order to deliver a variety of interventions (Lewin et al, 1998). The SIGN Guideline (2002) is limited in its indication of professionals involved in cardiac rehabilitation, acknowledging just six core staff. Other specialists are frequently employed to facilitate patient recovery and deliver secondary prevention (Bethell et al, 2001, 2004). Some have been employed for their expertise; others have employed to provide a service where there have been difficulties in the recruitment of certain professions. Many teams have turned to multi-tasking, extending

their own skills by undertaking training which would usually be considered outside their own professional boundaries. This adaptable style of practice enables teams to bridge the gaps in service delivery to benefit the patient.

Altogether 13 different professions were identified working within the cardiac rehabilitation services in England. All programmes employed a nurse and most employed a physiotherapist (93%) and dietician (81%). Other members of the multi-disciplinary team were employed in varying amounts.

Overall 71% of services have reported multidisciplinary teams of five or more disciplines, with a mode of 4 professions involved. This is comparable with the 70% reported previously by Lewin et al (1998). To have several different professions as core members of the multidisciplinary team affords positive benefits to patient care. The diverse range of skills from the different professions enables a greater knowledge base and skill set from which patient intervention can be applied, the sum of the parts is better than the whole (Goble and Worcester, 1999). Furthermore, the opportunity to work interdisciplinarily and learn the skills of other professions is much easier and more straightforward if working with a substantial multidisciplinary team. Not all teams had the natural skill set from which to provide comprehensive cardiac rehabilitation. To overcome this, many teams have turned to multi-tasking, extending their own skills by undertaking training which would usually be considered outside their own professional boundaries. This adaptable style of practice has enabled teams to bridge the gaps in service delivery in order to benefit the patient.

Unfortunately, the growth in number of programmes has not been matched by the development of formal training which would ultimately contribute to standardising provision (Hevey et al, 2000). Although there has been a growth in post graduate cardiac rehabilitation modules and courses offered through professional associations (British Association of Cardiac Rehabilitation (BACR) and Association of Chartered

Physiotherapists in Cardiac Rehabilitation (ACPICR), there is currently no national direction, common pathway or system of accreditation to become a cardiac rehabilitation provider.

Despite the trend of greater staffing numbers being employed in cardiac rehabilitation, there still remains a shortfall when compared to the recommended guidelines. When the staffing levels for each service were compared to the SIGN staffing guideline of 6.2 WTE, a shortfall of 3 WTE's (48%) was demonstrated. When all professions working within cardiac rehabilitation are considered, this figure rises slightly to 2.3 WTE's (37%). In real terms, in comparison to SIGN recommendations, cardiac rehabilitation is understaffed by more than a third. As approximately 90% of cardiac rehabilitation budgets are responsible for staffing costs, substantial financial investment will be required to ensure that staffing levels can be raised to the recommended levels. Such findings in relation to the SIGN Guideline (2002) staffing recommendations have been difficult to place in the context of the literature. More rigorous investigations are required to ascertain whether the SIGN recommended staffing levels are appropriate for the current content of cardiac rehabilitation programmes and also whether the input of certain professions / staff skill competencies will affect the long-term outcomes of service users.

When staffing levels were considered separately for each individual study group, the Manchester region showed the worst staffing levels with a WTE shortfall of 65% for SIGN recommended staff and 45% when all professions were included. As this region has shown to have a higher than national average of CHD it could be assumed that the allocation of resources for the treatment and prevention of cardiac disease in this region should follow accordingly. If this has indeed been the case, despite the known benefits, the allocated funds have not filtered down into rehabilitation programmes. Commissioners should investigate areas of need and inequalities of provision or staffing and assign funding accordingly.

On closer examination of the figures some professions are extremely under-represented (figure 4). When compared to the SIGN estimate; nursing staff are the best represented achieving 70% of the recommended level, clerical staff 60%, psychologists 37%, physiotherapists 27%, pharmacists 15% and dieticians being least represented achieving only 12% of the expected target. Statistical analysis has revealed that the employment of a nurse differed significantly from the employment of the other professionals. Proportionally a much greater number of nurses are employed in cardiac rehabilitation suggesting that this profession has extended its role the most. This may possibly be due to the shortage of other professional groups or the naivety of the stakeholders of what other professionals can offer.

Comprehensive cardiac rehabilitation includes exercise training, education and psychological intervention, all of which are important components for the delivery of effective care. This study has uncovered significant staff shortages in areas of both exercise and psychological intervention.

Employed physiotherapists only met 27% of the expected SIGN staffing target. Over half (58%) the co-ordinators identified skill in exercise training or named physiotherapy staff to be most needed. It is recognised that there is a national shortage of physiotherapists working within cardiac rehabilitation programmes (Thow, 2004), many of whom are working part time only with another speciality as the major part of their working day (Thompson 1997; Bethell 2001; Thow 2004.). Attendance at speciality courses is expensive and less likely to be supported by management where cardiac rehabilitation involvement is only a small proportion of the day. The priority for staff to attend these courses working in this situation is expected to be low.

Within cardiac networks there are undoubtedly staff with expertise in areas of identified inadequacies who could share their knowledge with other services. Regional training courses delivered by local staff with skills in the areas of identified shortcomings would be a positive step

forward, promoting local continued professional development at a lower cost. Furthermore, the use of peer review against recognised standards within the network could be an ideal tool by which deficiencies in service design could be uncovered and feedback given to assist in introducing the recommended improvements. The development of a peer review template to examine services objectively would be beneficial to achieve improvements in effectiveness with relatively small cost.

Psychologists met only 37% of the SIGN staffing target. It is acknowledged that not all patients will require such specialist psychological intervention (Goble and Worcester, 1999; Giannuzzi et al, 2003). Occupational therapists during their training have acquired skills to assist patients with mild to moderate psychological difficulties (Hagendorn, 2001). Just over half of the programmes employed an occupational therapist (58%) and a further 29% stated that they would benefit from employing their services. In addition, half (50%) of the co-ordinators stated their programme would benefit from the input of a psychologist. Unfortunately, the experience in clinical practice is that access to a psychologist is often scarce with long waiting lists for consultation. Co-ordinators must therefore look towards implementing adequate screening and utilise existing resources within available professions in order to address psychological issues in the first instance. For the minority that this level of intervention is unable to help, appropriate screening and referral routes must be sought.

Psychological interventions are an essential component of recovery and prognosis. A meta-analysis (Dusseldopp et al, 1999) has demonstrated a 34% reduction in cardiac mortality when psychological interventions have been included. Of interest from this study is that co-ordinators have recognised the importance of this intervention and staff with these psychological skills are most sought after. Fifty percent of co-ordinators wanted access to a psychologist, 36% to a counsellor and 29% to an occupational therapist. Such findings demonstrate that this essential part of the rehabilitation process may have previously received a lower priority. In future, core staff should be employed or receive further

training to address this failing. If difficulties continue in accessing these professionals, national training programmes should be established for existing staff to bridge this gap and ensure standardised, high quality care.

Due to lack of sound scientific evidence there is no agreement on which professions should provide the various aspects of the rehabilitation process (SIGN, 2002; Beswick, 2004). Co-ordinators must therefore assess the skills which they have within the current members of the team and identify any shortcomings. Decisions must then be made to either compete for funding to employ staff with skills in deficient areas or to train staff to gain the required competencies for delivery.

Cardiac rehabilitation does not seem to have a clear position within cardiology services. Cardiologists are increasingly less likely to be involved as a core member of the multi-disciplinary team. Doctors are the only profession shown to have reduced their input into cardiac rehabilitation. The reported physician involvement of 39% in 1998 (Lewin et al) had fallen to 19% in 2001 (Bethell et al) and this study has shown to currently stand at just seven per cent. This supports observations by Thompson (1997) who noted that physicians were unlikely to be involved. This situation compares unfavourably with the position of many other European countries, where cardiologists are always involved in the programme (Vanhees et al, 1999).

Interestingly, only eight programmes (14%) identified that the lack of a doctor was a skill shortage of their programme. Therefore it can be assumed that co-ordinators are generally happy with the current level of involvement and have evolved their knowledge and roles of their teams accordingly. Although doctors are mostly not directly involved in the day to day running of the rehabilitation programme, they need to be on the periphery should a patient experience any difficulties or become unwell.

Co-ordinators appear to be largely satisfied with this arrangement but nevertheless should ensure that they have good communication links

with an identified medical lead for their programme. Not only does a doctor have an important part to play in the medical treatment of rehabilitation patients but they are essential to raise the profile of cardiac rehabilitation both within the health service and to the patients who are accessing the services. Furthermore, a study into cardiac rehabilitation referral patterns (Yalfani et al, 2006) found that 62% of co-ordinators felt that participation would be increased if offered by a medical practitioner. SWOT analysis has revealed that lack of physician support is considered to be both a weakness (9%) and threat (11%) to cardiac rehabilitation provision. Although the majority of cardiac rehabilitation practitioners have adapted their practice to deliver their service without direct physician involvement, it is essential that the programme receives the full support of the cardiologist. Beswick et al (2004) cited that patients perceive cardiologists to be an authoritative figure and that their encouragement gives acceptance of the programme as being important to their recovery. The support and involvement of the cardiologist not only improves the cardiac rehabilitation profile, but closer links will improve the care pathway for those patients who continue to have medical complications.

Referral of patients, provision of proper facilities and support for co-ordinators to improve their service depends upon the cardiac rehabilitation service occupying a respected and valued place within the pathway of care travelled by cardiac patients.

5.3 Budget

Cardiac rehabilitation practitioners have difficulty in competing for funding in a climate of ever increasing pressure on health care budgets. Despite the NSF for CHD setting milestones and goals to be achieved by rehabilitation services, the National Health Service has not backed them with financial support. Cardiac rehabilitation receives a low priority within Trusts, possibly due to being excluded from influencing the trust star ratings. The incentive for financial input to support service improvement is therefore lacking.

Should cardiac rehabilitation outcomes be included in the Trust star rating system, more credibility would be given to assist providers both financially and strategically to achieve their targets.

Just under half of the services (43%) held their own budget. The majority of which were held by the co-ordinator (74%). Those without a budget had recruited staff through the separate professional groups, many of whom have provided their input through good will rather than contract. Such practice demonstrates the way in which many services have developed in order to progress.

The allocation of budget has shown to be inconsistent between services and ranged from £11,000 for a severely understaffed District General Hospital to £370,000 for a busy tertiary centre. The budget amount is only meaningful when put into the context of the number of patients for which it is expected to provide a service. When divided by the number of patients treated the mean cost per patient for cardiac rehabilitation provision was £251.61. Enormous variation in cost per head was evident, ranging from £70 - £927. Despite the demonstration of such variations in costs, mean analysis between the three study groups found no significant differences; concluding that neither budget nor cost per patient differed significantly between services or regions. This will in part be due to the large variation in funding within any one area.

The mean figure from this survey reflects a lower cost per head than those quoted in several recent studies: the BACR / BHF survey (2004) found that, for those who held a budget, the allowance per patient treated ranged from £50 to £712 with a mean of £256 (Griebsch et al, 2004). The SIGN Guideline 57 (2002) suggested a level of staffing which would, in 2004, cost between £347 and £396 per patient with a mid-point of £363. A more recent study investigated the cost of providing cardiac rehabilitation in England and found the average cost per patient to between £354 and £486 (Beswick et al, 2004). However these figures conceal a very wide variation in staff costs – from £186 per patient for

centres with three or fewer key staff to £542 for centres with five or more.

On this evidence those co-ordinators who do not hold their own budget are receiving about 80% of what they need to cover staff costs. Unfortunately, under-funded cardiac rehabilitation centres are the least likely to have the time and resources to seek improvements in their funding. Lack of funds not only contributes to poor staffing levels, but also to the lack of sessions available, adequate facilities and opportunities to enhance staff training (Bethell et al, 2004; Griebsch, et al, 2004).

The position is worse than it seems because the current level of funding is not only inadequate to allow proper rehabilitation for those who receive it, but it also ignores the 70% of eligible patients who are not included in rehabilitation programmes (Bethell et al, 2007). In this survey, expenditure per patient rose in line with total budget, suggesting that the worst funded centres were choosing to reduce standards rather than reduce their patient throughput. It has been calculated that the level of spending on cardiac rehabilitation needs to rise by approximately 60% from its current level of about £15 million per annum if all these patients are to be enrolled (Beswick et al, 2004).

Future funding for cardiac rehabilitation programmes is uncertain. Using SWOT analysis, over half (56%) of the co-ordinators stated funding issues to be a service weakness, and more than a third (39%) perceived lack of funding to be a threat to their provision. Although budgetary consideration for rehabilitation services seems to be a crucial concern, financial security in this area will be dependant on the priority assigned to rehabilitation and support from the hierarchy.

Cardiac rehabilitation practitioners must work hard to raise the profile of their services both within their trust and the Strategic Health Authority. Co-ordinators must prove their need for an identified budget. Objective evidence of inequality of access to recommended care and failure in the achievement of the NSF goals, directly related to inadequate resources is

crucial to petition for adequate funds. Appropriate audits should be regularly undertaken and presented to appropriate bodies to show their achievements and highlight the negative impact of poor resources. A business plan should be written and submitted to a number of key personnel: chairpersons of the local implementation team (LIT) and medical division governance board, cardiologist, CHD lead for the trust, director of public health and the PCT commissioning manager. As the funding pathway from the Department of Health is complex, submission to all would increase the chances of success.

Co-ordinators should also ensure their place on all relevant committees through which they can continue to lobby for increased funding, these include: the LIT, rehabilitation subgroup of the Cardiac Network and the Medical Division Governance Board. They must present their evidence to lobby for a sufficient budget with budgetary responsibility in order to implement the recommendations for the NSF and achieve effective, equitable care. The allocation of a designated budget held by each co-ordinator would allow the development and design of services to match the identified needs of the service users. All budget holders reported that approximately ninety percent of the budget specified was for staffing costs which is much higher than those previously reported (Turner, 1993: Beswick et al, 2004). As overall staffing levels of rehabilitation services are severely lacking with a 38% shortfall from the recommended levels, a proportionate increase in funding is necessary to optimise delivery of patient care.

When compared to more quantifiable national targets such as improving door to needle times (DoH, 2000), cardiac rehabilitation services seems to have once again become the 'Cinderella Service', as it has so often been described (Thompson, 2002). Despite Standard Twelve of the NSF being the first time that cardiac rehabilitation has been included in government policy and undoubtedly raised its profile, there is obviously still a long way to go before the standards laid down can be achieved. Primary care teams, through the NSF have been given the role of commissioning cardiac rehabilitation services for all patients with

coronary heart disease. Commissioners should ensure that sufficient resources are allocated to allow practitioners to meet these national targets and enable their services to be evidence based, menu-driven and properly audited. Cardiac rehabilitation policy targets in the United Kingdom can only be met through substantial investment to address the identified barriers to care (Bethell et al, 2004, 2007). Without a clearly defined budget it is difficult to see how a programme can be organised without properly structured financial support.

5.4 Cardiac rehabilitation patients

The number of patients eligible for cardiac rehabilitation has dramatically increased. Revascularisation procedures have recently risen by as much as 30 percent in response to government targets to reduce waiting lists (BHF, 2006a). This rise in such activity inevitably has had the resultant effect of increasing cardiac rehabilitation throughput. Unlike cardiac revascularisation, cardiac rehabilitation has not been given the resources to cope with this extra demand. The findings from this study are comparable with those in previous published literature in showing that cardiac rehabilitation provision does not meet the demand.

The re-definition of myocardial infarction by the European Society of Cardiology (ESC)/American College of Cardiology (ACC) joint committee, using the more sensitive troponin marker has resulted in the diagnosis of a greater number of patients with an AMI. Under the previous World Health Organisation (WHO) criteria, a large number of these would have been diagnosed as having unstable angina and therefore ineligible for cardiac rehabilitation. One study has demonstrated an 80% increase in MI patients of using the ESC/ACC definition (Snowden et al, 2004). Such an increase in MI and revascularisation numbers will undoubtedly have a dramatic impact on the workload of already overstretched cardiac rehabilitation services.

The NSF priorities for inclusion of post MI and open heart surgery has been met by 100 percent of services included within the England and Manchester studies, with 86% also offering rehabilitation to patients post angioplasty. These co-ordinators should be applauded in achieving access for the NSF priority patients into their care pathways. The Anglia region, on the other hand, includes MI patients in most (92%) of their services, but surprisingly only to just over half (58%) post open heart surgery (58%) and a just a third (33%) of post angioplasty patients. Co-ordinators in Anglia must look at ways to organise their services to be more inclusive of the NSF priority groups.

Cardiac rehabilitation provision is a long way from the next stage of providing comprehensive cover to include all other CHD patients who are likely to benefit. Just under a half (44%) currently offer cardiac rehabilitation to post transplant patients, a third to those with an implantable defibrillator (32%), and with very few include heart failure (18%) and stable angina (14%) patients. Statistical analysis identified that differences in provision which existed between the same groups of CHD patients was statistically significant: between MI and ICD, MI and heart failure, MI and angina, and to a lesser degree between open heart surgery and heart failure, and open heart surgery and angina. Such a finding should not be surprising as cardiac rehabilitation was initially established to meet the needs of post MI and revascularization patients. Guidelines (SIGN, 2002, NICE 2003, 2005) and frameworks (NSF, 2000) and policy statements exist as drivers to put provision strategies for such patients in place, whereas drivers for other CHD patient groups are not yet well established. As priority needs are on the way to being met, drivers and policy statements for other CHD patient groups should be introduced to ensure that cardiac rehabilitation is fully inclusive of all patients who will benefit.

This generates the question as to whether cardiac rehabilitation for MI and revascularisation groups is influenced by funding and resources.

Unfortunately, funding data exists only for overall service and is not broken down by condition; therefore further research would be necessary to quantify this. Although descriptive data (figure 6) suggests regional differences between Anglia and the other two areas of study in terms of provision to the various CHD conditions, sub-analysis using one–way ANOVA demonstrated that no significant difference existed between the regions in their provision of cardiac rehabilitation to the various groups of CHD patients. It therefore appears that patient condition determines variations in cardiac rehabilitation service provision irrespective of region. Where service provision is not meeting the targets or demands, funding should be given for condition irrespective of region. It must be noted, however that the spread of scores between conditions within regions were so vast within any one region that the results may have been confounded.

The CHD patients who are currently unable to access services are consequently receiving second rate care as they are unable to access care pathways from which they can benefit. Barriers to inclusion for these patient groups may be partly attributable to the demonstrated gross understaffing identified in these services. On the other hand, lack of access may also be due to a lack of knowledge of the treatment modalities for these specific cardiac groups. The implementation of regional training programmes and sharing of practice by professionals with skills in these areas may again be a cost effective way forward in overcoming this hurdle. Certainly the cardiac network could support the organisation of network-wide training programmes and peer review activities. Managers should support time away from the work place to visit other centres to learn skills where these specific patient groups are receiving treatments.

In the researcher's locality of Manchester, a further investigation had been undertaken through comparison of co-ordinator and network figures of actual MI diagnosis and revascularisation procedures. This revealed

that the co-ordinators reported that they accepted the NSF identified priority patients onto their programme. However, when the co-ordinator uptake figures were compared with the network figures of actual MI diagnosis and revascularisation procedures, a shortfall was identified: only three quarters (76%) of MI patients accessed Phase 2, with fewer (43%) accessing Phase 3. Post open heart surgery patients, on the other hand, had almost all accessed Phase 3 (87%) but just under half (45%) accessed Phase 2 services.

For Phase 2, it is unclear whether the lower uptake for post open heart surgery patients is due to restricted access to this diagnostic group or whether referral pathways to Phase 2 are inadequate. More investigation is required to understand this more. For Phase 3, it is surprising to find that less than half of the post MI patients are accessing this stage. It is unclear whether this is because patients had already met their goals in Phase 2, or whether there are recruitment problems to this Phase. Inadequate record keeping may partly account for the difference in uptake between the phases, in which case, co-ordinators should revisit how they collect and report data on numbers accessing each part of the care pathway to ensure a standardised approach. Further work is required to identify specific reasons for uptake discrepancies. In the mean time, co-ordinators must look at their provision and put strategies in place to ensure equitable access to the priority patient groups.

Patients following angioplasty were less likely to access either phase, with only 20% reported to access Phase 2 and 37% Phase 3. Although all programmes except for two (86%) reported that they accepted angioplasty patients into their programmes, this group is a relatively new for inclusion in comparison to post MI and post OHS patients. Perhaps the referral pathways are not as robust as expected and co-ordinators should revisit this with a view to improving access. Doctor referral to cardiac rehabilitation may substantially improve patient participation (Yafami et al, 2006); it is recommended that a study to investigate this should be

undertaken. This simple strategy could potentially improve uptake without huge additional costs.

It can be assumed that similar discrepancies exist within the other sample studies and therefore inclusion figures are far less than those reported. It is recommended that further in-depth investigation should be undertaken to compare geographical diagnosis figures with those reported by programme co-ordinators to ascertain a true picture of cardiac rehabilitation uptake.

Difficulties have been identified within the current funding constraints for services to be inclusive of all cardiac patients likely to benefit from cardiac rehabilitation. Co-ordinators must be open minded to alternative methods of delivery. The opportunity to fast track patients into community schemes should be considered as a serious option. Once patients have achieved their goals and been assessed as safe and independent exercisers, they should be moved on to community leisure service schemes. This would free up much needed space for the patients who are struggling to access services to which they are entitled.

5.5 Meeting NSF milestones

In order to assess therapeutic effectiveness, establish benchmarks and aid comparison of models of care, sufficient data collection mechanisms and information systems are required. Clinical audit is an essential component of clinical governance and quality care. Systematic recording of patient data has many advantages as it enables measurement of access and of quality care, monitoring of patient status and progress, and monitoring and comparisons of service activity. This study was hindered by the CR programmes' inadequate data collection systems making it difficult to ascertain whether the given milestones had been achieved.

Despite the NSF defining the role for clinical audit in cardiac rehabilitation, it has been difficult to establish whether a clear systematic approach for achievement of cardiac rehabilitation standards (Milestone

1) has been met because the data collection from individual patients was inadequate. The findings of this study have confirmed results from previous published surveys (Bethell et al, 2004; Taylor et al, 2004) where approximately 50% of services rely on outdated paper data collection systems. This unco-ordinated method of data collection within English cardiac rehabilitation services has hindered accurate reporting of uptake and activity. A national commitment to accurate, complete and appropriate data collection which can be shared between services is essential in order for clinical decisions relating to funding and service development. The implementation of a national policy driven audit tool, such as the National Audit Cardiac Rehabilitation (NACR) is advisable if the recommended cardiac rehabilitation guidelines are to be achieved.

It is encouraging that all co-ordinators in this study reported that they had robust mechanisms in place for the identification and recruitment of relevant patients (Milestone 2). However, this is contrary to the findings of a survey of 4,000 heart patients published by the Health Care Commission (June 2005) where approximately half the patients reported they had not been spoken to about lifestyle issues prior to their discharge.

Changes in cardiology practice have been implemented since the publication of the NSF (2000). The use of troponin has enabled medics to establish which patients carry a greater prognostic risk. Consequently, such patients are receiving percutaneous coronary intervention (PCI) within a short time of admission. The average length of stay for post MI patients at the time of the NSF was approximately seven days; currently this is much shorter with some patients being discharged within three days of admission. Such a reduced length of stay has diminished the time available to provide in-patient care requirements detailed in the NSF. Due to the impact of the shorter hospitalisation, it has been shown that many patients retain only a small amount of information that has been given at this time (Health Care Commission, 2005). It is therefore questionable whether this short inpatient stay is the ideal time to begin this intensive rehabilitation.

Furthermore, the in-patient stage post an acute event or revascularisation procedure can be a highly anxious time which can reduce the capacity to absorb new information. This, coupled with the reduced length of stay, brings to question the appropriateness of the depth of requirements of the NSF and SIGN guideline at this initial stage in the recovery process. Perhaps the early recovery phase post hospitalisation would be the better place to receive this information. With this in mind the health care professionals should consider reorganising their services to optimise the effects of their intervention. Cardiac rehabilitation involvement during Phase 1 should prioritise identification of eligible patients with brief intervention to provide appropriate literature and correct misconceptions.

The NSF Goal to collect 12-month clinical audit has been almost impossible to carry out with achievement by only 11% of services. These findings agree well with the findings by Taylor et al (2005) who reported similar poor achievements of 9% of the NSF 12-month goal. Unlike Canada and America, cardiac rehabilitation in England is offered to patients for between four and twelve weeks. Patients typically have no contact with CR services at 12 months. A huge downfall in data collection arises from current inadequate methods of information sharing between primary and secondary care. Should integrated IT systems be available to allow shared access to patient information, this approach could easily be co-ordinated. This long-term goal would be more appropriate to be set as a target for Primary Care (Dalal et al, 2004), as it compliments the care already provided using the CHD registers. In the meantime, only three services had achieved implementing the 12 month audit requirements; two through the establishment of a 12 month nurse led follow up clinic and the other through close collaboration with the PCT.

In the mean-time, some services (14%) have attempted to facilitate this audit by sending primary care details of patients who are ready for their 12-month follow-up. Unfortunately, no communication has been fed back

to them to ascertain whether these targets have been achieved. There certainly needs to be better communication links between primary care services and cardiac rehabilitation services if these requirements are to be fulfilled. An efficient database that can preferably be accessed by both primary and secondary care professionals is urgently required. Only once this is in place can cardiac rehabilitation professionals carry out effective audits on their clinical care and allow comparisons to be made between services in order to identify best-practice.

The point system which was developed by the researcher to ascertain how well each service had managed to implement the recommendations of the NSF (DoH, 2000) and SIGN (2002) guidelines (figure 7) showed differences existed between services. Achievement of the NSF and SIGN recommendations varied widely and ranged from 40% to 90% and 48% to 76% respectively.

When making the comparison between the ability to implement both SIGN and NSF, the similarity in both graphs suggests that those programmes that had successfully implemented the SIGN guideline, have also implemented the recommendations of the NSF (figure 7). Statistical analysis of the overall relationship between SIGN and NSF was found to be statistically significant and the explained variance within this correlation was moderate ($R^2=0.42$).

Further analysis using one-way ANOVA revealed that there was a significant difference between the three regions in terms of recommendations achieved for both NSF and SIGN. *Post hoc* follow up found that England differed significantly from both Anglia and Manchester, although no significant difference was found between Anglia and Manchester. Throughout the survey the England study group were shown to have better funding and staffing, which may explain their greater achievement of the recommendations There appeared to be no outstanding factors which seemed to influence the success of implementation from the relationship of the figures with service features. As such, it is recommended that future analysis should be undertaken

into the achievement of national guidelines. Particular reference should be made to the service features which are more likely to provide effective outcomes in relation to the recommendations.

5.6 Geographical considerations

Although descriptive differences were noted between the three areas of investigation in terms of staffing, patients, organisation and funding, no statistically significant differences between the geographical areas were found. This suggests that the cardiac rehabilitation variations demonstrated through this study for these service features are not region specific.

The only area in which statistical significant difference was found was between the regions in the ability to achieve the recommendations set out in the NSF (2000) and SIGN Guideline (2002). *Post hoc* analysis found that England differed significantly from both Anglia and Manchester, although no significant difference was found between the Manchester and Anglia regions (see appendix 9). It is suggested that the alarmingly low cardiac rehabilitation staffing figures for the number of treated patients in both the Manchester and Anglia regions of 45% and 42% respectively may be partly responsible for this.

The poor funding allocation in the Anglia region may be potentially explained by a lower than national average incidence of heart disease in this region. Cardiac rehabilitation may not therefore be perceived as such an important pressure when funding has been allocated. The incentive for financial input to support service improvement may therefore be lacking. According to published statistics (BHF, 2006a) the number of patients hospitalised for heart attack, CABG or angioplasty in the Eastern Region of England was 15,856, which accounted for 10% of all hospital admissions in England with these diagnostic codes. In the same year official statistics (BHF, 2006a) reported that 3,233 (20%) received cardiac rehabilitation in this area, which is as little as 20% of the eligible

priority patients. This figure would be significantly less if figures for all eligible CHD patients would have been included.

The converse however is true for the Manchester region which has the second highest incidence of heart disease in England. According to published statistics (BHF, 2006a) the number of patients hospitalised for heart attack, CABG or angioplasty in the North West Region of England was 24,452. This figure accounted for 16% of all hospital admissions in England with these diagnostic codes. In the same year official statistics (BACR, 2006a) reported that 9,117 (37%) received cardiac rehabilitation in this area. Despite the worst reported staffing levels, the Manchester region seems to have achieved a higher uptake for the priority groups.

It should be remembered, however, that figures for this study have been reliant on accurate reporting by cardiac rehabilitation co-ordinators. As data collection systems have been shown to be so poor, figures reported by co-ordinators on staffing and throughput may potentially be inconsistent and inaccurate. To ensure true figures are reported further robust analysis should be undertaken in these areas. Cardiac Networks should audit their services against the recommended guidelines and use their findings to lobby for additional funding. Allocation of resources for cardiac rehabilitation services should reflect the needs of the service users.

As Anglia is predominantly rural, with over sixty percent of patients living 40 miles away from the tertiary centre, it is suggested that access to the rehabilitation sessions may be difficult. Anglia, in this study has demonstrated the lowest uptake figures for all patient groups into cardiac rehabilitation services.

The tertiary centre in the Anglia region can be commended on the initiation of its beacon 'Outreach' programme, launched in 1996 to overcome this hurdle. This six-week, supported home-based cardiac rehabilitation package with telephone contact had been developed to enable post open heart surgery patients to participate in cardiac

rehabilitation activities at home when their rural location prevented easy access to the locally hospital based services. This home-based model was established to improve uptake, as it is well documented that participation rates are poor when the venue is a distance from the patient's home (Dominic et al, 2005; Worcester et al, 2006).

Despite the development of the Outreach programme, only fifty eight percent of Anglia services have reported that they accept post open heart surgery patients onto their programmes. Perhaps the success of the Outreach programme, which receiving Beacon status from the BHF in 2000 has had a negative effect on the funding opportunities for local cardiac rehabilitation programmes or it may have reduced the perceived need for cardiac rehabilitation services to offer their services to these patients. In the ideal world patients should have the choice to attend their local rehabilitation programme as some patients may benefit from the advantages of group contact (Department of Health, 2006b). Co-ordinators should revisit their entry criteria and make plans to ensure that access is equitable for all patients.

Differences were found, although not significant between the cost per patient for cardiac rehabilitation between each region, with Anglia being the most costly at £332 per head, in comparison to Manchester whose figures worked out at £198 per patient. As the services within the Manchester region were found to be the least well staffed against the SIGN recommendations, and staffing shown to make up the majority of service costs, the difference in cost per head cannot be explained this way. Manchester was the furthest away from matching the professions recommended by SIGN, whereas Anglia most closely resembled this staffing model. This may suggest that the professions recommended by SIGN may be a more costly way of providing cardiac rehabilitation over other professions who may have extended their roles. On the other hand, it could be speculated that Manchester services may have compromised their service standards in order to increase throughput. As both the Manchester and Anglia cardiac rehabilitation services had so few services which held their own budget, the small number of services included to

determine cost per patient may have confounded the analysis. The reasons for such a difference in reported cost per head between these regions can only be established through further in-depth investigations. This is an area for future research.

5.7 Study limitations

With regards to methodological issues relating to data collection, it is recognised that self reporting questionnaires may be vulnerable to self-representational bias (Conner and Sparks, 2005). This coupled with inadequate data collection systems may have increased the potential for inaccurate reporting. One possible solution to be considered for future studies may be to visit each programme to conduct a semi-structured interview with the co-ordinator of the programme. This approach will reduce data inaccuracies through providing the researcher with an opportunity to explain ambiguous questions and to establish that the researcher has interpreted the data in the questionnaire correctly.

During the analysis of cost of cardiac rehabilitation per patient, the low number of programmes which held their own budget, particularly in the Manchester and Anglia regions may have confounded the results. Future studies would benefit from additionally examining in detail the true cost of cardiac rehabilitation services without an identifiable budget for inclusion in the cost analysis. Such measures will ensure that a more accurate projection of cardiac rehabilitation costs can be established.

Lastly, in the attempt to ascertain how well each service has managed to implement the recommendations of the NSF (2000) and SIGN Guideline (2002), the researcher has awarded an unbiased point system. In hindsight, it might have been more appropriate to weight each point according to the importance of its achievement. As cardiology practice has changed since the implementation of these guidelines, in particular the reduced timescales for intervention in Phase 1, revised weighting of the recommendations would judge the services more appropriately against the currently more relevant criteria.

6 RECOMMENDATIONS

From the findings of this study, the researcher has made the following recommendations to Strategic Health Authorities, Trusts and Cardiac Networks and to cardiac rehabilitation practitioners with the aim of improving service delivery. A square bracket has been added to the end of each bullet point in this section which provides a signpost to the text within the thesis that supports the statement.

6.1 To Strategic Health Authorities

- A clear cardiac rehabilitation structure within the SHA should be established [section 4.10.2 page 66, section 4.10.4 page 67 and section 5.12 page 77 refers].
- Joint strategies with trusts, social and leisure services should be implemented to improve opportunities and access to patients with CHD [section 4.7 page 60 and section 5.1 page 77 refers].
- Chapter seven, standard twelve of the NSF should be re-visited and the milestones and goals revised to reflect current practice [section 4.8 pages 61-62 and section 4.9 pages 62-63 refers].
- Systems must be introduced to enable monitoring of cardiac rehabilitation activity with clear mechanisms for feeding back outcomes to the SHA [section 4.8 pages 61-62, section 5.3 page 79 and section 5.5 page 86 refers].

6.2 To Trusts and Cardiac Networks

- Trusts must provide adequate resources to cardiac rehabilitation services through an identifiable budget [section 4.2 page 46 refers].
- An identified CR lead must be appointed who is responsible for ensuring evidence-based practice and that national guidelines are being followed. Ideally this person will be the budget holder [section4.8 pages 61-62 refers].
- The cardiac rehabilitation lead should be a member of the LIT or equivalent to ensure two-way communication of cardiac rehabilitation activity and policy [section 5.3 page 80 refers].

- Communication must be improved between primary and secondary care to provide a seamless transference of care and improve equity of service provision [section 4.8 page 62, section 5.1 page 69 and section 5.5 page 85 refers].
- Systems must be established to enable low to moderate risk patients to be treated in the community setting [section4.7 page 60 refers].
- Working patterns should be established which permit CR providers to work across all sectors; hospital trust, primary care trusts and leisure centres [section 5.1 page 64 refers].
- Training packages must be implemented, so that CR practitioners can share their knowledge and models of care with each other [section 5.2 page 74 and section 5.4 page 83 refers].
- Regular district-wide cardiac rehabilitation meetings should be established to improve communication and systems of care [section 4.7 page 60 and section 5.1 page 70 refers].
- Adequate IT systems should be installed to improve data collection and audit. Ideally both primary and secondary care should be able to access the information [section 4.8 page 61-62 and section 5.5 page 86 refers].
- Develop peer review activities to share and improve practice [section 5.2 page75 refers].

6.3 To Cardiac Rehabilitation Practitioners

- To improve communication across primary and secondary care boundaries [section 4.7 page 60, section 5.1 page 69 and section 5.5 page 87 refers].
- To work closely with leisure services to optimize long-term provision of cardiac rehabilitation [section 4.10 page 66 and section 5.1 page 70 refers].
- To audit the CR programme against national guidelines and standards to identify any failings and gaps in provision [section 4.9 pages 62-63, section 5.5 page 86 refers].
- To develop flexible approaches to enhance access, participation and adherence [section 4.7 page 60 refers].

- To communicate service activity to the trust and SHA [section 5.3 page 80 refers].
- To work with the PCT to find a workable solution to collect the long-term cardiac rehabilitation data, forging links with the CHD registers [section 4.8 pages 61-62 refers].
- CR practitioners should gain national agreement on qualifications and competencies required to carry out the specific components of cardiac rehabilitation; exercise, education and psychological health [section 5.2 pages 72 and 73 refers].

7 CONCLUSION

Many studies have revealed variations and deficiencies within cardiac rehabilitation services in England. This study was undertaken to examine current cardiac rehabilitation provision in England following the publication of the NSF for coronary heart disease (DoH, 2000) and SIGN Guideline (2002) in which clear standards and guidelines have been identified and recommendations made for best practice.

This study had focused on investigating three areas of reported discrepancies: cardiac rehabilitation patients, staffing and funding. Geographical variations between the regions investigated although evident, were not found to be of statistical significance. It therefore appears from this study that patient condition determines variations in service provision, not locality. The findings from this study confirm that although some improvements have been made, disparity and deficiencies continue to exist despite the publication of national recommendations.

The number of patients eligible for cardiac rehabilitation has dramatically increased in recent years, particularly due to the revised definition of myocardial infarction and use of troponin for diagnosis. Evidence for other CHD patient groups to benefit from cardiac rehabilitation has also been established and recommendations for their inclusion have been made (DoH, 2000). The findings from this study indicate that although inclusion of the priority groups of post MI and revascularisaton patients are being offered by the majority of services, uptake continues to be poor when actual geographical diagnosis figures are compared with service throughput. Cardiac rehabilitation practitioners must develop robust mechanisms to ensure that all patients are referred and included in their programmes. Accurate data collection systems must be implemented to establish accurate reporting of figures and outcomes of clinical care.

Cardiac rehabilitation provision remains a long way from the next stage of providing comprehensive cover to include all CHD patients.

Practitioners are struggling to offer services to the priority groups within the current funding restrictions; therefore it should not be surprising that many centres have been unable to be fully inclusive of all who will benefit from their clinical care. Policy statements and drivers for these groups have not yet been well established, therefore cardiac rehabilitation providers must lobby for funding and strategies to assist their inclusion in future service delivery. Such strategies may include opportunities for the fast tracking of patients into leisure services or alternative modes of delivery.

Despite the trend for greater staff involvement in cardiac rehabilitation in comparison to what has been previously reported, there continues to remain a huge shortfall from the recommended level. Professions such as dieticians, pharmacists, and physiotherapists fall a long way below the recognised requirements. To overcome this teams have turned to multi-tasking and skill extension. Co-ordinators must ensure that where staff skills fall outside the normal professional boundaries, additional professional qualifications and competencies are sought. Cardiac Networks and professional groups can assist in this process through establishing relevant standardised courses through which these skills can be gained.

Despite the government setting out goals and milestones to be achieved through the NSF for CHD, it has not backed them with financial support. Cardiac rehabilitation services continue to receive low priority within hospital trusts. This study has revealed that less than half the services (43%) hold their own budget. The majority of programmes were shown to provide their care through the less cohesive approach of employing staff from separate professional budgets or through professional 'goodwill'. Where services had identified a specific cardiac rehabilitation budget, inconsistencies have been uncovered. Enormous variations in cost per head have been evident and funding has not been matched to service need. The current level of funding has been shown not only to be inadequate to allow proper rehabilitation to those who receive it, but it also ignores the 70% of eligible patients who are not included in

rehabilitation programmes. It is estimated that the current level of spending on cardiac rehabilitation of approximately £15 million per annum must rise by 60 percent if all patients are to be enrolled.

Co-ordinators must prove their need for an adequate, identifiable budget. Appropriate audits should be regularly carried out to provide objective evidence of inequality of access to recommended care and failure of achievements of national recommendations for practice. Cardiac rehabilitation policy targets in England can only be met through substantial investment to address the identified barriers to care. The allocation of a designated budget held by each co-ordinator would allow development and design of services matched to the needs of the service users. For this to be achieved, cardiac rehabilitation must be embedded in public health and social policy initiatives.

Inadequate data collection systems have confounded the findings of this study and question the accuracy of the information supplied by the co-ordinators. In particular, difficulties have been caused in establishing whether the milestones and goals of the NSF for CHD have been achieved. The findings of this study have revealed only an 11% achievement of the NSF 12-month goal. An efficient data base which can be accessed by both primary and secondary care professionals is urgently required. This, coupled with improved communication between the sectors will assist practitioners in reporting future achievements.

Although not part of the original study intention, the findings of this study have uncovered deficiencies in the organisation of cardiac rehabilitation services. Cardiac rehabilitation practitioners appear to be working in isolation from their immediate chain of command, rather than hand in hand with their support. Lack of identified responsibility and confusion as to who holds ultimate responsibility has resulted in hindering professionals achieving the recommended guidelines. One identified person within each trust should be given the responsibility to ensure guideline implementation and be accountable for any future service failings, thereby guaranteeing a more focused approach.

The deficiencies in cardiac rehabilitation services in England which have been reported in the literature and substantiated by this study should be disseminated more widely. Most importantly, the government needs to be aware of this unacceptable situation and should pledge through their NSF Progress Reports (e.g. DoH 2005, 2006) a rectification of this. The identified areas of future research and the recommendations made from the findings of this study will assist practitioners, Trusts and Cardiac Networks to deliver improvements in future cardiac rehabilitation care.

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10 APPENDICES

Appendix 1. Questionnaire

The team	
1. Coordinator [*name or identifier*]	
2. Profession and grade of co-ordinator	
3. Cardiac Rehabilitation (CR) Service [*name*]	
4. Main hospital to which Cardiac Rehabilitation Service relates [*name*]	
5. Which Phases* of the rehabilitation process are you responsible for providing?	
6. PCT's covering catchment population of CR service [*names*]	
7. Do you have a defined budget? [*yes*/no]	
8. If answer to question 7 is yes What is it? [£ *number*] What proportion is for staffing? [*number*]	
9. Who manages the fund? [*title*]	
10. If answer to question 7 is no, what is your estimate of the cost of your CR Service? [*number*]	
11. Describe voluntary sector / charitable donations received in the past 2 years.	
12. Is the co-ordinator a member of the LIT?	
13. Describe any funded posts vacant	
14. Identify recruitment / retention difficulties	

15. What is the provision for staff cover for annual leave and sickness?	
16. How is staff training funded?	
17. Identify the training needs of current staff.	
18. Identify staff / skills that would make your service 'perfect' should you have the funds available.	

Phase 1

19. What troponin levels do you use to diagnose MI?	
20. Is there a protocol in place for the active recruitment of patients to the CR programme? [*yes/no*]	
21. In Phase 1 do you assess the following patients needs? (i) Physical (ii) Psychological (iii) Social	
22. Does a member of your team visit the MI patients in (i) CCU (ii) Other wards? [*yes/*no]	
23. Is a written plan of the patients identified needs copied to (i) the GP (ii) the patient?	
24. What written information is given to the patient? (i) BHF (ii) Local (iii) other	
25. Is the carer actively involved in Phase 1? [*yes/no*]	

Phase 2

26. Does your team have contact with MI patients in Phase 2*? [*yes/no*]	
27. What input do the patients receive in Phase 2? (i) Home visit (ii) Telephone contact (iii) Heart manual (iv) Group education	
The patients	
28. How many MI patients did your service treat in the most recent year for which you have figures ? [*number*] [*April – March]* (i) Phase 1 (ii) Phase 2 (iii) Phase 3	
29. Can you enrol MI patients into Phase 3* cardiac rehabilitation without a referral? [*yes/*no]	
30. How are the MI patients identified and recruited /referred? [*short statement*]	
31. How many CABG patients did your service treat in the most recent 12 month period for which you have complete data [*number*] *[April – March*] (i) Phase 1 (ii) Phase 2 (iii) Phase 3	
32. How are the CABG patients Identified and recruited/referred? [*short statement*]	
33. How many PTCA patients did your service treat in the most recent 12 month period for which you have complete data [*number*] [*April – March*] (i) Phase 1 (ii) Phase 2 (iii) Phase 3	
21. How are the PTCA patients identified and recruited/referred? [*Short statement*]	

Do you offer CR to the following patients? (i) Heart failure (ii) Transplant (iii) Angina (iv) ICD (with MI/ revasc) (v) All ICD	

Phase 3

22. Is your Phase 3 (i) hospital only (ii) community only (iii) hospital and community (iv) home based	
23. If community based, where do you hold your classes?	
24. Do you have a waiting list for Phase 3* CR [*yes/no*]	
25. If answer to question 23 is yes, how long is it?	
26. Who leads the exercise programme?	
27. What is the maximum number of patients that you can accommodate in Phase 3 * programmes each year [*number*]	
28. How many patients successfully completed a Phase 3 * programme in the last year for which you have complete data [*number*]	
29. Do you risk stratify patients before they start Phase 3* CR [*yes/no*]	
30. If so which system do you use?	(i) ACSM (ii) AACVPR (iii) Other

31. Do you have any special arrangements to take account of the following needs of patients: [*yes/no*]		
	Age	
	Gender	
	Impairment-	visual
		hearing
		mobility
	Literacy	
	Ethnicity	
	Religious practice	
	Cultural diversity	
	Income	
	Employment	
	Assisted travel	
	Dependents	
	Carers	
The exercise programme		
32. Are patients formally exercise tested in any way before starting CR [*yes/ no*]		
33. If the answer to question 30 is yes, do you have access to that information? [*yes/no*]		
34. Do you perform a functional capacity assessment prior to the exercise programme? [*yes/no*]		
33. If the answer to question 32 is yes, do you use:		
a) Treadmill test [*yes/no*]		
b) Cycle test [*yes/no*]		
c) Walk test [*yes/no*]		
d) Other [*short statement*]		
34. What type of exercise training do you use? a) Circuit training [*yes/no*]		
b) Walking [*yes/no*]		
c) Cycling [*yes/no*]		
d) Other [*Short statement*]		

35. Do you monitor exercise intensity by: (a)Heart rate response [*yes/no*] If yes, to what level do you exercise the patients? [*short statement*]	
b) RPE [*yes/no*] (i) CR-10 (ii) 6-20 (iii) other If yes, to what level do you exercise the patient?	

36. Indicate the course programme content

	Exercise	Education	Psychological Health
Length of sessions			
Number of sessions/week			
Number of weeks/course			
Exit Criteria			
Percentage Attendance			

37. Indicate the Education Programme content [Please tick]

(a) Cardiac Misconceptions	
(b) How the Heart works	
(c) Risk factors	
(d) Benefits / Effects of Exercise	
(e) Cardiac Medication	
(f) Diet	
(g) Relaxation	
(h) Recommendations for Active Living	
(i) Others [*please state*]	

How are the exercise and education programme integrated?

Psychological Component

38. Are patients screened for anxiety or depression? [*yes/no*]	
39. If yes to question 38, what screening tool do you use? [short statement]	
40. Are patients screened for quality of life? [*yes/no*]	

41. If yes to question 40, what screening tool do you use? [*short statement*]	
42. Do your patients have access to: (i) Stress Management Programme? (ii) Relaxation training? (iii) Individual Councelling? [*yes/no*]	
43. Who leads the psychological component?	

Indicate the involvement of other professionals in your programme:

Discipline	**Number of whole time equivalents (WTE)**	**Grades**
Nurse		
Physiotherapist		
Occupational Therapist		
Exercise Physiologist		
Psychologist		
Doctor		
Dietician		
Pharmacist		
Social Worker		
Clerical Support		
Volunteer		
Other [*define*]		

44. Number of patients per supervising member of staff during exercise sessions [*number*]	
45. Do you always have an ALS trained staff member present? [*yes/no*]	
46. Do you have a defibrillator at exercise sessions? [yes/no]	

47. Are the premises which you use adequate for: a) Exercise sessions [*yes/no*]	
b) Education sessions [*yes/no*]	
c) Psychological health sessions [*yes/no*]	
d) One-to-one sessions [*yes/no*]	
Records and communication	
48. Do you record patient information? a) On paper [*yes/no*]	
b) On computer [*yes/no*]	
If yes to question 48b, which database do you use? [*short statement*]	
49. Do you send a discharge note to the general practitioner? [*yes/no*]	
50. Do you refer patients on to specialist services? [*yes/no*]	
51. Do you refer patients on to Phase 4*? [*yes/no*]	
52. If yes to question 50, do you feel that the Phase 4* provision is adequate? [*yes/no*]	
53. Do you liase closely with Phase 4?	
54. Describe how patient information is documemted and communicated between the 4 phases.	
55. Describe hold ups in the patient journey.	
56. What systems do you have in place to collect 12m data required by the NSF?	
57. Who holds the responsibility to ensure that NSF CR targets are met in your service?	

Outcomes	
58. Do you measure and record outcomes from your programme: (a) Exercise capacity [*yes/no*]	
How [*short statement*]	
(b) Psychological [*yes/no*]	
How [*short statement*]	
(c) Other [*short statement*]	
59. Do you record patient medication ?[*yes/no*]	
60. Do you record patient smoking habit? [*yes/no*]	
61. Do you record patient's blood pressures? [*yes/no*]	
62. Do you record patient's cholesterol? [*yes/no*]	
63. Do you record patient's body mass index? (BMI) [*yes/no]*	
64. Do you record the patient's physical activity? [*yes/no*]	
65. Do you record patient's symptoms? {*yes/no*]	
66. What are the strengths of your local Trust's CR service?]	

67. What are the weaknesses of your local Trust's CR service?	
68. What are the opportunities for your local Trust's CR service?	
69. What are the threats to your local Trust's CR service	

Appendix 2: ANOVA between regions

Descriptives

		N	Mean	Std. Deviation
budget	CPG	15	161533.33	105479.09
	Northwest	5	128000.00	88309.12
	Anglia	3	135666.67	30171.73
	Total	23	150869.57	93854.48
throughput	CPG	15	622.67	274.34
	Northwest	5	644.60	363.63
	Anglia	3	409.33	102.89
	Total	23	599.61	280.46
cost_patient	CPG	15	282.60	221.58
	Northwest	5	212.14	128.27
	Anglia	3	340.26	96.92
	Total	23	274.80	191.33

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
budget	.919	2	20	.415
throughput	.969	2	20	.396
cost_patient	.762	2	20	.480

p>0.05 signifies that all data distributions had comparable variances which is a prerequisite to ANOVA

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
budget	Between Groups	5.0E+009	2	2507104348	.266	.769
	Within Groups	1.9E+011	20	9438820000		
	Total	1.9E+011	22			
throughput	Between Groups	126710.3	2	63355.139	.790	.467
	Within Groups	1603755	20	80187.760		
	Total	1730465	22			
cost_patient	Between Groups	33397.057	2	16698.529	.433	.655
	Within Groups	771938.0	20	38596.901		
	Total	805335.1	22			

The 'F' values were all non-significant and concluded that budget, throughput and cost per patient did not differ significantly between services or between regions.

Appendix 3. ANOVA CR professions between regions

Descriptives

Percent

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
England	13	48.85	34.56	9.59	27.96	69.73	4.00	100.00
Manchester	13	38.46	37.81	10.49	15.61	61.31	.00	100.00
Anglia	13	39.46	35.69	9.90	17.89	61.03	.00	100.00
Total	39	42.26	35.40	5.67	30.78	53.73	.00	100.00

Test of Homogeneity of Variances

Percent

Levene Statistic	df1	df2	Sig.
.050	2	36	.951

Equal variances confirmed

ANOVA

Percent

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	853.282	2	426.641	.328	.722
Within Groups	46776.154	36	1299.338		
Total	47629.436	38			

No significant differences found

Appendix 4. Professional short fall in respect of SIGN.

Descriptives

prof_group

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
England	6	57.50	34.71	14.17	21.07	93.93	10.00	97.00
Mancheste	6	64.33	21.65	8.84	41.61	87.05	37.00	94.00
Anglia	6	69.83	18.69	7.63	50.22	89.45	42.00	89.00
Total	18	63.89	24.94	5.88	51.49	76.29	10.00	97.00

Test of Homogeneity of Variances

prof_group

Levene Statistic	df1	df2	Sig.
2.202	2	15	.145

Equal variances confirmed

ANOVA

prof_group

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	458.111	2	229.056	.340	.717
Within Groups	10115.667	15	674.378		
Total	10573.778	17			

No significant differences found

Appendix 5. Proportion of programmes offering services to each cardiac condition

Descriptives

per_pts

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
mi	3	97.33	4.62	2.67	85.86	108.81	92.00	100.00
ohs	3	86.00	24.25	14.00	25.76	146.24	58.00	100.00
pci	3	68.33	30.60	17.67	-7.68	144.35	33.00	86.00
trans	3	43.67	23.09	13.33	-13.70	101.04	17.00	57.00
icd	3	32.33	6.35	3.67	16.56	48.11	25.00	36.00
hf	3	18.00	8.89	5.13	-4.08	40.08	8.00	25.00
acs	3	14.33	6.51	3.76	-1.83	30.50	8.00	21.00
Total	21	51.43	34.64	7.56	35.66	67.20	8.00	100.00

Test of Homogeneity of Variances

per_pts

Levene Statistic	df1	df2	Sig.
5.588	6	14	.004

Significant differences between variances were found. ANOVA was still carried out as there is no non-parametric alternative for multiple conditions. The Bonferroni comparison is a further reassurance to ensure that any differences are tested thoroughly.

ANOVA

per_pts

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19519.810	6	3253.302	10.164	.000
Within Groups	4481.333	14	320.095		
Total	24001.143	20			

Significant differences found

Post Hoc Tests

Multiple Comparisons

Dependent Variable: per_pts

Bonferroni

(I) cond	(J) cond	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
mi	ohs	11.33333	14.60811	1.000	-42.7054	65.3721
	pci	29.00000	14.60811	1.000	-25.0387	83.0387
	trans	53.66667	14.60811	.053	-.3721	107.7054
	icd	65.00000*	14.60811	.012	10.9613	119.0387
	hf	79.33333*	14.60811	.002	25.2946	133.3721
	acs	83.00000*	14.60811	.001	28.9613	137.0387
ohs	mi	-11.33333	14.60811	1.000	-65.3721	42.7054
	pci	17.66667	14.60811	1.000	-36.3721	71.7054
	trans	42.33333	14.60811	.245	-11.7054	96.3721
	icd	53.66667	14.60811	.053	-.3721	107.7054
	hf	68.00000*	14.60811	.008	13.9613	122.0387
	acs	71.66667*	14.60811	.005	17.6279	125.7054
pci	mi	-29.00000	14.60811	1.000	-83.0387	25.0387
	ohs	-17.66667	14.60811	1.000	-71.7054	36.3721
	trans	24.66667	14.60811	1.000	-29.3721	78.7054
	icd	36.00000	14.60811	.573	-18.0387	90.0387
	hf	50.33333	14.60811	.083	-3.7054	104.3721
	acs	54.00000	14.60811	.050	-.0387	108.0387
trans	mi	-53.66667	14.60811	.053	-107.7054	.3721
	ohs	-42.33333	14.60811	.245	-96.3721	11.7054
	pci	-24.66667	14.60811	1.000	-78.7054	29.3721
	icd	11.33333	14.60811	1.000	-42.7054	65.3721
	hf	25.66667	14.60811	1.000	-28.3721	79.7054
	acs	29.33333	14.60811	1.000	-24.7054	83.3721
icd	mi	-65.00000*	14.60811	.012	-119.0387	-10.9613
	ohs	-53.66667	14.60811	.053	-107.7054	.3721
	pci	-36.00000	14.60811	.573	-90.0387	18.0387
	trans	-11.33333	14.60811	1.000	-65.3721	42.7054
	hf	14.33333	14.60811	1.000	-39.7054	68.3721
	acs	18.00000	14.60811	1.000	-36.0387	72.0387
hf	mi	-79.33333*	14.60811	.002	-133.3721	-25.2946
	ohs	-68.00000*	14.60811	.008	-122.0387	-13.9613
	pci	-50.33333	14.60811	.083	-104.3721	3.7054
	trans	-25.66667	14.60811	1.000	-79.7054	28.3721
	icd	-14.33333	14.60811	1.000	-68.3721	39.7054
	acs	3.66667	14.60811	1.000	-50.3721	57.7054
acs	mi	-83.00000*	14.60811	.001	-137.0387	-28.9613
	ohs	-71.66667*	14.60811	.005	-125.7054	-17.6279
	pci	-54.00000	14.60811	.050	-108.0387	.0387
	trans	-29.33333	14.60811	1.000	-83.3721	24.7054
	icd	-18.00000	14.60811	1.000	-72.0387	36.0387
	hf	-3.66667	14.60811	1.000	-57.7054	50.3721

*. The mean difference is significant at the .05 level.

Appendix 6. Regional analysis of cardiac rehabilitation offered for CHD condition

Descriptives

per_pts

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
cpg	7	60.71	34.65	13.10	28.67	92.76	21.00	100.00
anglia	7	34.43	30.72	11.61	6.02	62.84	8.00	92.00
nw	7	59.14	36.73	13.88	25.18	93.11	14.00	100.00
Total	21	51.43	34.64	7.56	35.66	67.20	8.00	100.00

Test of Homogeneity of Variances

per_pts

Levene Statistic	df1	df2	Sig.
.515	2	18	.606

Equal variances found

ANOVA

per_pts

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3043.143	2	1521.571	1.307	.295
Within Groups	20958.000	18	1164.333		
Total	24001.143	20			

No significant differences

Appendix 7. The National service framework recommendations

Phase 1 protocol to identify patients likely to benefit
Phase 1 assessment of physical needs
Phase 1 assessment of psychological needs
Phase 1 lifestyle advice
Phase 1 assessment of social needs
Phase 1 written individual plan to patient and GP
Phase1 involvement of carer
Phase 1 support group information given
Phase 1 written information on CR given
Phase 2 yes
Phase 3 structured exercise x2 per week for 6-12 weeks
Phase 3 education
Phase 3 inclusion of other CHD patients other than MI and revasc
Phase 3 ratio 3:15
Phase 3 defibrillator and ALS present
Referral to specialist services
Discharge information passed on to Primary Care
Evidence of integration primary and secondary care
Electronic resources and ability to audit
Achieved milestone 1
Achieved milestone 2
Achieved Milestone 3
Achieved goal (a)
Achieved goal (b)
District-wide CR service

Appendix 8. SIGN Guideline recommendations

Screening for anxiety and depression at discharge and 6-12 weeks
Address cardiac misconceptions
Patient education
Individual psychological and behavioural intervention
Heart manual
Referral to trained psychological personnel for moderate to severe psychological disturbance
Exercise training
Risk stratification
Exercise testing / ECHO for high risk patients
Functional capacity assessment
Ratio 1:10
BLS and defibrillator present
Access to ALS for high risk patients
Low to moderate risk to community
Exercise 2x week for 8 weeks
Monitoring exercise intensity with Borg or pulse
Include MI patients
Include all revascularisation patients
Include angina and chronic heart failure patients
Staffing recommendations for 500 patients
Produce audit data

Appendix 9. Achievement of NSF and SIGN recommendations between regions

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
NSF	England	28	17.46	2.47	.47	16.51	18.42	13.00	23.00
	Manchester	14	13.21	2.22	.59	11.93	14.50	9.00	17.00
	Anglia	12	11.67	1.50	.43	10.72	12.62	9.00	14.00
	Total	54	15.07	3.37	.46	14.15	15.99	9.00	23.00
SIGN	England	28	14.32	1.54	.29	13.72	14.92	10.00	17.00
	Manchester	14	12.71	1.94	.52	11.59	13.83	10.00	16.00
	Anglia	12	11.42	1.51	.43	10.46	12.37	9.00	14.00
	Total	54	13.26	2.01	.27	12.71	13.81	9.00	17.00

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
NSF	2.119	2	51	.131
SIGN	1.149	2	51	.325

Equal variances

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
NSF	Between Groups	347.716	2	173.858	34.910	.00000000028
	Within Groups	253.988	51	4.980		
	Total	601.704	53			
SIGN	Between Groups	76.489	2	38.245	14.146	.00001296157
	Within Groups	137.881	51	2.704		
	Total	214.370	53			

Significant differences

Post Hoc Tests

Multiple Comparisons

Bonferroni

Dependent Variable	(I) region	(J) region	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
NSF	England	Manchester	4.25000*	.73047	.000	2.4417	6.0583
		Anglia	5.79762*	.76998	.000	3.8915	7.7037
	Manchester	England	-4.25000*	.73047	.000	-6.0583	-2.4417
		Anglia	1.54762	.87792	.252	-.6257	3.7209
	Anglia	England	-5.79762*	.76998	.000	-7.7037	-3.8915
		Manchester	-1.54762	.87792	.252	-3.7209	.6257
SIGN	England	Manchester	1.60714*	.53821	.013	.2748	2.9395
		Anglia	2.90476*	.56732	.000	1.5004	4.3092
	Manchester	England	-1.60714*	.53821	.013	-2.9395	-.2748
		Anglia	1.29762	.64684	.150	-.3037	2.8989
	Anglia	England	-2.90476*	.56732	.000	-4.3092	-1.5004
		Manchester	-1.29762	.64684	.150	-2.8989	.3037

*. The mean difference is significant at the .05 level.

Appendix 10. Programme strengths reported by co-ordinators

STRENGTH	NUMBER	PERCENT
Multi-disciplinary team	34	63%
Good communication primary and secondary care	22	41%
Menu-driven programme	10	19%
District-wide programme	9	17%
Good Phase 4	8	15%
Budget	8	15%
Good facilities	6	11%
Doctor support	6	11%
Includes all CHD patients	5	9%
MDT shared office	4	7%
IT support	3	6%
Nurse led MI clinic	2	4%
Co-ordinator member of LIT	2	4%
Arrangements for fast-track discharge Phase 3	2	4%
Interpreter service	2	4%
Good links with support group	2	4%
Robust referral system	2	4%
Annual review for NSF data	2	4%
Offer variety of class times	2	4%
Offer prehabilitation	2	4%
No waiting list	1	2%
Primary care support	1	2%
Access to Psychologist	1	2%
Turkish programme	1	2%
Cardiac rehabilitation ICP	1	2%
Database	1	2%
Back to work programme	1	2%
Ladies only class	1	2%

Appendix 11. Programme weaknesses reported by the co-ordinator

WEAKNESS	NUMBER	PERCENT
Poor funding	30	56%
Poor facilities	23	43%
Lack of staff	14	26%
Does not include all CHD	13	24%
Inadequate Phase 2	7	13%
Inability to collect 12 month NSF data	7	13%
Waiting list	6	11%
No cardiology support	5	9%
Poor psychological input	5	9%
Poor Phase 4	4	7%
Poor tertiary referral	4	7%
No holiday / sickness cover	3	6%
Lack of functional capacity assessment	3	6%
No CR lead	3	6%
Lack of recognition	2	4%
No district-wide database	2	4%
No evening sessions	2	4%
Separate services for MI and revascularisation	1	2%
No secretary support	1	2%
No dedicated posts	1	2%
No transport	1	2%
Not menu-based	1	2%
No primary care CR	1	2%
No Quality of Life tool	1	2%
Not meeting set standards	1	2%
Co-oordinator not a member of LIT	1	2%
No GP referral	1	2%

Appendix 12. Programme opportunities reported by co-ordinators

OPPORTTUNITIES	NUMBER	PERCENT
Include all CHD patients	33	61%
Database	9	17%
Development of community CR	7	13%
Develop menu driven approach	5	9%
Increased staffing resources	4	7%
Introduce prehabilitation	3	6%
Evening service	3	6%
Develop Phase 4	2	4%
Increase exercise knowledge	2	4%
Nurse-led clinics	2	4%
Improve communication with Primary care	2	4%
Work with leisure services	2	4%
Work with CHD collaborative	1	2%
Book Exercise Tolerance Tests	1	2%
MDT shared office	1	2%
12 month follow-up clinic	1	2%
Develop CR research	1	2%
Expand outreach	1	2%
Medical support	1	2%
Raise profile in LIT	1	2%
Psychology input	1	2%
Provide 6-12 month follow up	1	2%

Appendix 13. Programme threats reported by co-ordinators

THREAT	NUMBER	PERCENT
Financial	21	39%
Staffing	11	20%
Facilities	7	13%
Lack of consultant support	6	11%
No sickness / holiday cover	4	7%
Waiting list	4	7%
Low morale	3	6%
Access / parking	2	4%
Poor profile	2	4%
Hospital closure	2	4%
Primary /secondary care ownership problems	1	2%
Lack of training	1	2%
Lack of managerial responsibility	1	2%

Appendix 14. Abstract BACR conference Stratford 2004

TITLE OF ABSTRACT:
The content of Phase 3 cardiac rehabilitation programmes in England

FULL ADDRESS OF PRESENTING AUTHOR:
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Category of Submission: Scientific Paper Clinical Communication

Objective: To audit a random selection of cardiac rehabilitation (CR) programmes in England to establish whether they were meeting NSF and SIGN guidelines.

Method: Twenty eight CR units were selected - one from each Strategic Health Authority in England. Questionnaires were sent to the CR Coordinator, the Coronary Care Unit Nurse Manager, the Primary Care Trust CHD Lead and the Director of Public Health for each Unit. The questionnaires were followed by visits to the CR coordinators and telephone interviews with the other personnel.

Results: Most physical conditioning programmes used a group aerobic circuit (96%). All services calculated heart rate training thresholds. However, functional assessment was not offered by eight (29%) of the programmes prior to exercise. Risk stratification was undertaken by twenty three (82%) of the services. All staff to patient ratios at exercise sessions were within NSF or SIGN guidelines. Defibrillators were available during every session. Half the programmes had staff trained in advanced life support, and the remainder had staff trained in intermediate life support. Most education was offered through group talks (93%). The topics of how the heart works, risk factors, benefits and effects of exercise, medication, diet, relaxation and lifestyle were common to all. The HAD scale was used by twenty four (86%) of the programmes at entry to Phase 3 and 22 centres repeated it if appropriate at exit. Stress management was offered by twenty two (79%) of the centres. Individual counselling sessions were available in nineteen (68%) of the services. Most were by referral, often with long waiting lists. Relaxation techniques were only offered beyond the educational classes by eight (29%) of the programmes.

Conclusion: Phase 3 programmes vary widely in content. Detailed discussion with CR coordinators indicates that identified weaknesses included: lack of funding (57%); lack of dedicated facilities (43%); poor staffing (32%); and the inability to include all patients with CHD (28%). CR practitioners are recommended to: work closely with leisure services to optimise long-term provision of cardiac rehabilitation; audit the CR programme against national guidelines and standards to identify any failings and gaps in provision; develop flexible approaches to enhance access, participation and adherence; examine ways to tailor service to individual needs, offering a flexible, menu-driven approach.

Appendix 15. Abstract BACR conference Glasgow 2005

Introduction: The context of the known benefits of cardiac rehabilitation, coupled with the requirements of the National Service Framework (NSF) for Coronary Heart Disease (Department of Health, 2000) and the adoption of the SIGN guideline (SIGN, 2002) should give clear direction to all cardiac rehabilitation services. Despite the publication of these guidelines, little evidence of implementation has been reported and variation in service models and delivery are shown to exist (Bethell et al, 2001, 2004; Child, 2004). **Objective:** To examine cardiac rehabilitation programmes in England in detail to investigate trends in current provision. Where deficiencies from the national requirements and guidelines are established, recommendations for improvements in delivery will be made. **Methods:** Three groups of services were targeted: a random selection from each of England's 28 strategic health authorities, and all cardiac rehabilitation services within two Cardiac Networks, one rural and one urban. Factual information sought through postal questionnaires included: structure and organisation, funding and budget, staffing, patients included, and implementation of the guidelines. **Results:** Provision of Cardiac rehabilitation in England remains variable. Only 26% of services meet national standards for staffing levels with less than half holding their own budget. The NSF priority patients: post myocardial infarction (97%) and revascularisation (78%) are most likely to be included, whereas other patient groups are not routinely gaining access: transplant (44%), implantable defibrillator (32%), heart failure (18%) and angina (14%). Services remain largely hospital-based (49%) with some evidence of integration between primary and secondary care (37%). Overall achievement of the recommended guidelines is poor. **Conclusion:** Limited staffing and resources has contributed to only 60% of the NSF recommendations and 62% of the national adopted guidelines being achieved, resulting in the inability to make management planning decisions locally and lack of quality of care. Recommendations for improvement have been made.

Appendix 16. Abstract Cardiac Rehabilitation World Congress 2004

Cardiac rehabilitation (CR) services in England: a project proposal for 2003-4

Brodie DA, Bell J, Bethel H, Breen SK.
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Introduction: The context of the known benefits of CR, coupled with the requirements of the NSF and the adoption of the SIGN guidelines should give clear direction to all CR services. The known variability in CR programmes in England is based on factual information from specific sources, mainly that of the co-ordinator of the programme. **Objective:**The above has prompted the Coronary Prevention Group to examine CR programmes in England in detail. This information will be used to establish two strategic views of cardiac rehabilitation nationally, its cost, effectiveness and especially the attitudes of health professionals working within the service. **Methods:** One randomly selected CR service from each of England's 28 strategic health authorities will be examined. The investigation will collect quantitative and qualitative data from the relevant Director of Public Health, CHD lead, CCU nurse manager and Co-ordinator of the CR programme. Factual information will include protocols, funding, staffing, methods of recording patient details, content of programmes and arrangements for follow-up. Semi-structured interviews will be used to establish, amongst other things, perceived barriers to provide the level of care detailed in the NSF. **Results:**The project started in November 2003, so by May 2004 information will be available on all the above data and will be presented as the most comprehensive report to date on CR services in England. **Conclusion:** It is anticipated that in addition to establishing detailed CR provision, the information gained in this study will show how well the NSF requirements are being met and whether the SIGN guidelines are being implemented.