



Margaret's Story

Coronary Heart Disease

A costed integrated
patient scenario

Wilmington
Healthcare



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Contents

Who is this document for and why does it matter?	4
Foreword from Professor Zaman	5
Executive summary	6
Analysis style	7
Introduction	8
Meet Margaret	10
Avatar	10
Margaret’s suboptimal coronary heart disease journey	11
What could have happened differently? Margaret’s optimal story	16
Learning points for commissioners	21
Questions for GPs and commissioners to consider	22
The ‘bills’ and how they compare: Overall pathway	23
NHS RightCare	28
References	29
Appendix	32
Acknowledgements	36

Who is this document for and why does it matter?

This scenario tells the story of Margaret, a fictional character based on real-world experience of patients with coronary heart disease (CHD). This story is developed by an expert panel reaching consensus for average or sub-optimal care vs best practice or optimal care.

At each stage of the process, we have considered the impact on the person and her family, as well as the costs associated with care.

This document was developed in April and May 2020 to align with the latest guidance and reference costs. It is intended to help local healthcare systems understand the implications of moving from a reactive, acute setting-based approach, to a proactive, integrated, community-based model of care that encourages patient activation.

It demonstrates both the quality of life and cost benefits of using electronic, shared medical records and the capabilities of primary care networks, such as social prescribing and medicines optimisation programmes.

Through Margaret's evidence-based story, we show how healthcare systems, involving both patients and carers, can evolve together towards achieving the triple aim set out in NHS England's Long Term Plan – better health, better care and a sustainable NHS.

Foreword from Professor Zaman

Since the turn of the century there have been significant quantitative and qualitative improvements in cardiovascular outcomes for people with heart disease in the UK. In order to build on this improvement, the NHS Long Term Plan has highlighted the impact of coronary heart disease (CHD) on individuals' quality of life, its burden on families, and its impact on healthcare budgets and the wider economy.

In this document, we review some of the key issues for improvement that can be addressed by local services. It highlights inequalities in awareness, diagnosis and treatment of heart attacks in women. It explores the impact of building confidence in individuals at risk of heart disease and how managing their own health through engaging with support services, such as weight management, smoking cessation and cardiac rehabilitation (CR), can improve health outcomes while reducing healthcare costs.

We discuss the use of technology to identify at-risk groups, optimise appointment scheduling, and how to make best use of sharing data. The goal of the document is to outline the importance of integrating care across departments and organisations.

Through a fictional character, but with events based on real-world scenarios, the authors' aim is to highlight areas for improvement in cardiovascular healthcare that align with the goals set out in the NHS Long Term Plan. We hope this document, in highlighting the human and economic costs of CHD, resonates with the reader sufficiently to prove a catalyst for developing models of integrated CHD pathways and care.

Professor Azfar Zaman

Clinical Professor of Cardiology at Freeman Hospital and Newcastle University

Executive summary

NHS RightCare has developed a series of long-term condition scenarios¹ which compare and contrast the suboptimal and optimal case studies of fictitious, but realistic, patients. Using this unique analysis style, the organisation aims to highlight potential improvement opportunities and help people think strategically about the design of optimal care pathways.

The goal of this powerful, often moving, work is to employ a behavioural communication methodology that inspires more stakeholders to take note – and take action – towards positive changes that both improve care and reduce costs.

This document follows Margaret's coronary heart disease (CHD) journey, as mapped out by a leading multidisciplinary team (MDT) of healthcare professionals. While her story is fictional, it is entirely typical.

Our scenario highlights a multitude of issues, from the devastating gender bias in heart disease diagnosis and treatment, to the importance of patient activation and engagement in helping people to manage their own health. The outcomes-boosting power of reducing any delay in access to catheterisation laboratory services for people experiencing non-ST-elevation myocardial infarction (NSTEMI) is also brought into sharp focus.

One of the most striking takeaways from the comparison of Margaret's optimal and suboptimal CHD journeys is the difference technology could make to her overall health. Integrated health record systems can allow for automated risk profiling, appointment chasing and the sharing of records amongst the MDT members. Simply increasing communication prevents people 'falling through the gaps' between services and keeps them engaged in their healthcare.

We also outline the appropriate use of the latest evidence-based treatments and interventions, such as new medications and indications, and the role of echocardiography in long-term follow up. Increasing uptake of cardiac rehabilitation features prominently in the NHS Long Term Plan, and Margaret's plight demonstrates the human value of hitting that target.

Ultimately, this scenario argues for patient-centred, integrated care, both within and between organisations, and shows the detrimental impact of siloed care.

Healthcare systems that bring together difficult specialties, such as renal and cardiology teams, and different organisations across acute, primary and community settings, provide better quality care that costs less.

At the end of Margaret's almost-£30,000, suboptimal journey, her health has deteriorated massively, she has poor mobility and the whole family has suffered an inordinate amount. But as her £10,000 optimal journey shows, it doesn't have to be that way.

Analysis style

NHS RightCare has developed a series of long-term condition scenarios¹ using this style of analysis, where suboptimal and optimal case studies of a fictitious, but realistic, patient are compared and contrasted. The intention is to highlight potential improvement opportunities.

The RightCare work is powerful (and often moving) and as a result the goal is that more stakeholders will take note and take action towards positive change.

This work is independent, though like NHS RightCare, the aim is to raise awareness through supporting local health economies (including clinical, commissioning and finance colleagues) to think strategically about designing optimal care, in this scenario, for people with coronary heart disease (CHD). This scenario has been developed with experts in this specialist field and includes prompts for commissioners to consider when evaluating their local health economy requirements.

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Introduction

More than 2 million people in the UK are registered as having coronary heart disease (CHD), accounting for 3.1% of the population.² Many of them, however, receive suboptimal care – as outlined below.

CHD is responsible for more than 310,000 hospital admissions and 70,000 deaths per year in the UK – that’s one every eight minutes.³ Yet, despite 41%⁴ of these deaths occurring in women, CHD is often considered to be a ‘man’s disease’.

CHD is the biggest driver of mortality among females worldwide, killing twice as many as breast cancer in the UK every year. In 2019, the Lancet Commission on Women and Cardiovascular Disease was launched to examine and address a gender bias in the diagnosis and treatment of heart disease. It said there was a general failure to recognise the prevalence of the condition in women, despite around 50% of sufferers being female. It also indicated that there is a lack of awareness of the atypical presentation of CHD in women, which can include feeling generally unwell and unexplained weakness.⁵

More than 90% of people with CHD have a comorbidity, and 57% have three or more other health conditions.⁶ It means their care tends to be multifaceted and complex, spanning various teams of specialist healthcare professionals who often work in silos. In the absence of an integrated, multidisciplinary approach, patients are at risk of poor medicines optimisation and reduced medication compliance, as well as increased hospital admissions and complications.

The cost impact of cardiovascular disease (CVD) on the NHS is significant (Figure 1), accounting for approximately 5% of all healthcare costs, or £168 per person per year. Of this, ischaemic heart disease (IHD) is responsible for 20%, or £30 per person per year.⁷

Figure 1. Cost of IHD in UK⁷

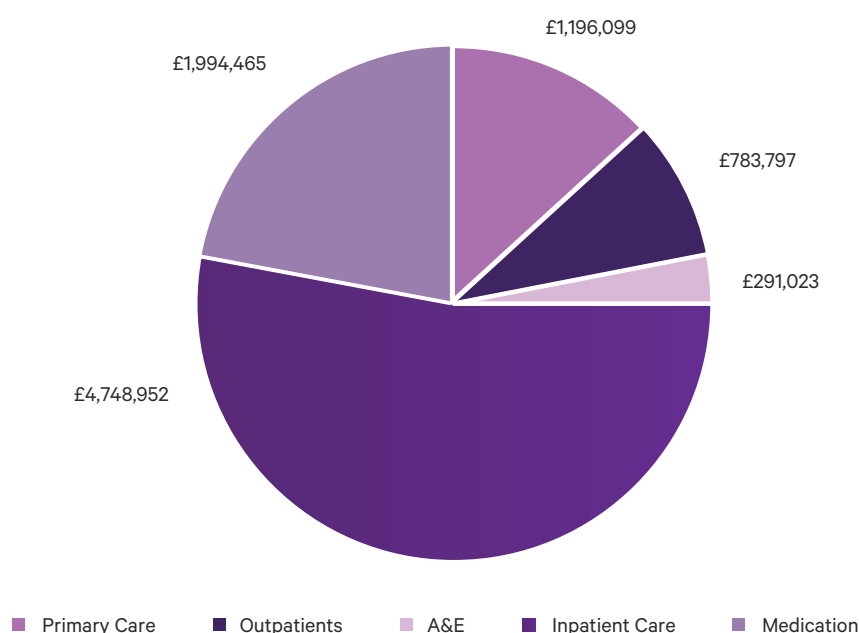





Table 13.2 Costs of CVD (€ thousands) by country, 2015, EU
European Cardiovascular Disease Statistics 2017
Exchange rate <https://www.statista.com/statistics/412806/euro-to-gbp-average-annual-exchange-rate/>

In recent years, CHD mortality and morbidity rates have decreased significantly, but improvement is slowing.⁸ While the same has also been seen in socioeconomically comparable countries across Europe, the UK already has a lower life expectancy than many of them – particularly among women – making the trend especially worrying. It was not surprising, then, to see CVD feature highly in the NHS Long Term Plan.

Much of the focus involves greater collaborative working to improve the effectiveness of initiatives such as the NHS Health Check (fig. 2), and ensure people in high-risk categories are offered appropriate preventative treatments and interventions in a timely manner.⁹ The integration of services, allowing for coordinated care across the whole pathway, is fundamental to this approach.

Figure 2. The size of the prize in cardiovascular disease (CVD) prevention¹⁰

England

1. The diagnosis and treatment gap		2. The burden: first ever CVD events		
 <p>Hypertension</p>	Estimated adult population with hypertension	13,550,700	Coronary Heart disease	128,750
	Estimated adult population with undiagnosed hypertension	5,601,600	Stroke	66,450
	GP registered hypertensives not treated to 150/90 mmHg target	1,618,900	Heart Failure	48,350
 <p>Atrial Fibrillation (AF)</p>	GP registered population with Atrial Fibrillation (AF)	983,300	3. The opportunity: potential events averted and savings over 3 years by optimising treatment in AF and hypertension	
	Estimated GP registered population with undiagnosed AF	422,600	Optimal anti-hypertensive treatment of diagnosed hypertensives averts within 3 years:	<p>9,710 heart attacks</p> <p>Up to £72.5 million saved</p>
	GP registered high risk AF patients (CHA ₂ DS ₂ -VASc) not anticoagulated	177,800	14,500 strokes	Up to £201.7 million saved
 <p>CVD risk</p>	Estimated adult population 30 to 85 years with 10 year CVD risk >20%	3,960,200	Optimally treating high risk AF patients averts within 3 years:	<p>14,220 strokes</p> <p>Up to £241.6 million saved</p>
	Estimated percentage of people with CVD risk ≥ 20% treated with statins	49		

The creation of Primary Care Networks (PCNs) and Directed Enhanced Services (DES), with a focus on CVD diagnosis and prevention in 2021, provides healthcare systems with the opportunity to move from a reactive to a proactive model of care. The use of integrated, electronic patient records and community-based services, such as social prescribing, community monitoring and practice-based medicines optimisation, can increase communication between teams, help people to avoid acute admissions and encourage patients to engage in their own healthcare journey.

Such an approach will not only significantly boost quality of life, but, as Margaret's story demonstrates, it can reduce costs to the healthcare system by as much as 66%.

NICE provides significant guidance for CHD services, including:

- Quality Standard for the management of acute coronary syndromes in adults: QS68 – currently being updated and due for publication in July 2020;¹¹
- Quality Standard for secondary prevention after a myocardial infarction: QS99;¹²
- Chronic kidney disease in adults: assessment and management (CG182) currently being updated and due for publication in March 2021.¹³

Margaret's story highlights some of the common issues and best practice in managing CVD.

Meet Margaret

Family, friends and fun are the most important things to Margaret, a credit controller from Middlesbrough who has just become a grandmother for the first time.

The 60-year-old thrives on the pressure of meeting strict targets at the furniture manufacturing company where she works, and enjoys the office culture of caffeine, cigarettes and drinks after work on a Friday.

She and husband of 30 years, Steve, spend her work bonuses on holidays and travel, and at the weekend they take her classic two-seater sports car out to the countryside. The pair have two grown-up daughters, and Margaret is excited about the prospect of spending more time with her growing family.

She said: "I love my life: the challenge and buzz of my job and enjoying time with my family – and I always have a glass of wine in the evenings, of course.



"I do worry about my weight sometimes, but everyone spreads out a little as they get older, don't they? You have to seize the day and enjoy life, otherwise what's the point?"

Goals and values

Margaret wants to:

- Enjoy life – seize the day
- Spend time with her family
- Be around for her grandchildren
- Travel
- Do well at work
- Stay independent
- Stay mobile

Margaret is committed to:

- Her family
- Her job
- Her friends

Challenges and pain points

Margaret is challenged with:

- Maintaining a healthy weight
- Reducing alcohol consumption
- Being a smoker
- Feeling time-poor

Engagement difficulties / objections

Margaret is not engaging with her health because:

- She is in denial about the health implications of her weight
- She doesn't believe she drinks excessive amounts
- Smoking and drinking are part of the culture of her office
- Works full time and has an active social life, so finds it difficult to find the time to attend appointments

Margaret's suboptimal coronary heart disease journey

Margaret was rushing back to her computer to meet a deadline when she tripped and fell on the factory floor at work. She said she was fine, but her colleagues insisted she go to hospital.

A&E doctors took a medical and family history, discovering that Margaret had experienced pre-eclampsia during both pregnancies, and that her mother had died following a stroke at the age of 60. They took Margaret's blood pressure (BP), which was recorded at 162/98mmHg, and carried out a urinary dipstick test which was positive for protein indicating that kidney disease could be present.

Discharged from A&E with a slight concussion, Margaret was advised to visit her GP to have further tests regarding the urinary dipstick result and hypertension.

But Margaret soon got back to her daily life. Work was busy, then Steve lost his job in the steel industry, making securing bonuses even more important. Going to the GP fell down her list of priorities and, eventually, she forgot.

A year later, Margaret was invited to her local health centre for a health check, but, like so many others, she didn't go. Getting time off work was difficult and she didn't think it was that important.

According to Public Health England (PHE) data, just 47% of people accept the invitation from their GP to attend a routine health check.¹⁴ Evidence suggests telephone calls and text reminders may be more effective than letters in convincing people to attend. More innovative approaches may also be useful in hard-to-reach groups, such as black, Asian and minority ethnic (BAME) populations.¹⁵

One Saturday, five years after her initial trip to A&E, Margaret called NHS 111 with dizziness and epigastric pain. Following the call operator's advice, she went straight to the A&E department of her local district general hospital (DGH), where an electrocardiogram (ECG) revealed tachycardia.

However, Margaret was discharged without a troponin test. The department was under considerable winter-related pressure and, based on her symptoms, didn't think it necessary.

There is a gender bias in the presentation, diagnosis and treatment of women with CHD.¹⁶ A British Heart Foundation (BHF) briefing indicates:⁴

- There is a lack of awareness of the risk among the public;
- Women are 50% more likely to receive an incorrect initial diagnosis;
- Women receive substandard CHD treatment: Over a ten-year period, an estimated 8,200-plus heart attack deaths in women, in England and Wales, could have been prevented if they had received the same care as men. The study found women were less likely to receive standard treatments, such as bypass surgery and stents;
- The risk factors for heart disease are often more deadly for women. Smoking increases a woman's heart attack risk by up to twice as much as it does a man's, high blood pressure 80% more and type 2 diabetes 50% more;
- Following a heart attack, women often receive poorer aftercare than men. A BHF-funded study showed that women in England and Wales were 2.7% less likely to be prescribed statins and 7.4% less likely to be prescribed beta blockers when leaving hospital, despite the drugs' proven benefits of lowering the risk of a subsequent heart attack or stroke;
- A lack of awareness among healthcare professionals contributes to a gender bias in diagnosis rates.

Throughout the day, Margaret felt progressively more unwell, and by 6pm, a worried Steve drove her back to hospital. An ECG showed T-wave inversion, and an acute coronary syndrome (ACS) blood package found the troponin was abnormally raised, had a glomerular filtration rate (eGFR) of 50ml/min/1.73m² and raised serum creatinine of 130 µmols/l.

She was transferred to the cardiology department, where the team confirmed the abnormal troponin result and started her on angiotensin-converting enzyme (ACE) inhibitors, aspirin, ticagrelor, beta blocker, atorvastatin and glyceryl trinitrate (GTN) spray.¹⁷

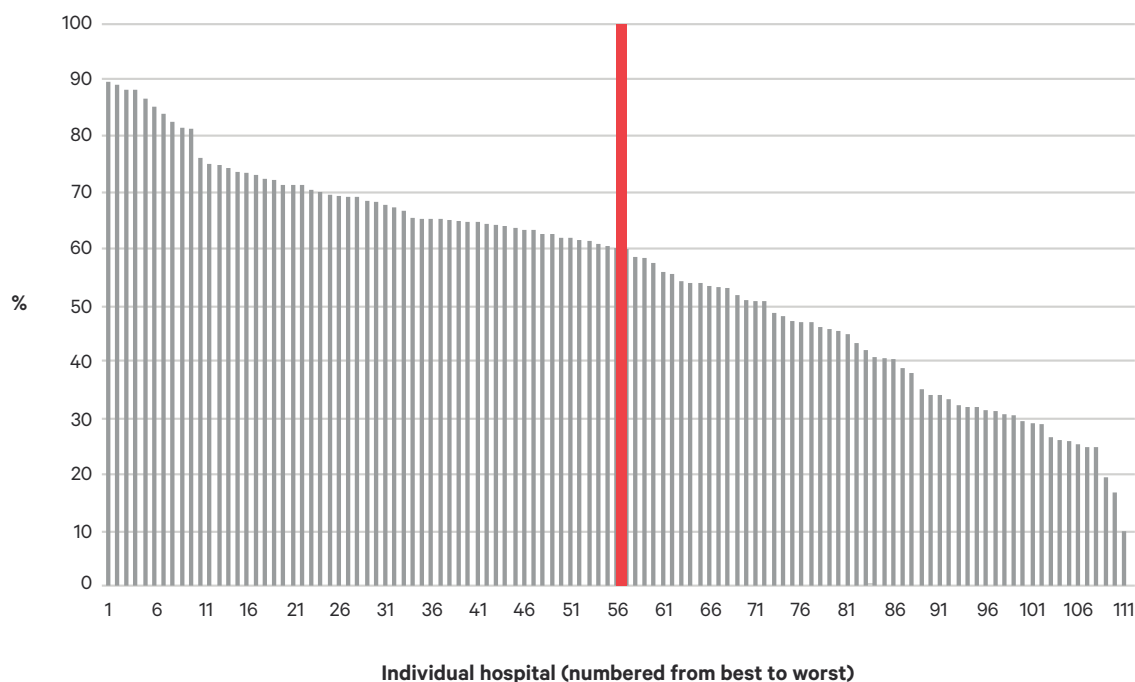
They also raised a request to transfer her to the acute coronary care unit but, as the hospital had no Saturday catheterisation (cath) lab service, Margaret was faced with a more than 72-hour wait.

For people in hospital with symptoms of non-ST-elevation myocardial infarction (NSTEMI), judged to be at moderate-to-high risk, NICE guidelines suggest a benefit for diagnostic coronary angiography, followed by percutaneous coronary intervention (PCI) if necessary, when performed up to 96 hours after admission.¹⁷ This description fits almost all those patients recorded in the Myocardial Ischaemia National Audit Project (MINAP).¹⁸ NICE also proposes that performance of angiography within 72 hours is a marker of good quality.¹⁷

In 2017/18, however, a total of 73% of admissions did not hit the 72-hour target. Figure 3 shows significant regional variation.¹⁸

It is worth noting that the best practice tariff is achieved when 60% of NSTEMI patients receive coronary angiography, with a follow-on PCI if indicated, within 72 hours of the first admission to hospital.¹⁹

Figure 3. Proportion of NSTEMI cases undergoing angiography within 72 hours¹⁹



On the Monday, Margaret was transferred to a specialist acute service by ambulance, where they confirmed diagnosis of NSTEMI. After coronary angiography, the team carried out a PCI with revascularisation on a single vessel. They noted impaired renal function prior to giving radiocontrast. She was continued on aspirin and ticagrelor, 90mg, for 12 months and transferred back to the DGH.

After three days, Margaret was discharged, asked to visit her GP for a blood test to recheck kidney function, and referred onto a Cardiac rehabilitation (CR) course. Her pre-contrast eGFR was recorded on her transfer notes.

A few days later Margaret went to her health centre where her bloods were taken, and her GP advised her to cut down on alcohol and stop smoking. When the GP received her test results, he found that the eGFR had abruptly fallen to 25ml/min/1.73m², prompting an urgent referral to the on-call renal team. On attending the renal centre it was thought likely that the results were affected by contrast nephropathy. She was followed up with weekly blood tests for four weeks, during which time her eGFR increased to 45ml/min/1.73m² which is approximately back to its former baseline.

Margaret was now attending cardiology outpatient follow-up visits, (though no echocardiogram (echo) was performed) and the renal unit, initially every three months, whilst the nephrologists tried to optimise her BP and medication.

A month later, Margaret was back at work and faced the prospect of fitting multiple, daytime health appointments into her hectic schedule.

Around the same time, her CR referral came through, but the logistics of getting to the clinic during the working day meant she was unable to attend.

NICE says CR can save lives, improve quality of life and reduce hospital readmissions. Courses tend to run between 10 and 12 weeks, with each session lasting about two hours.²⁰

Access to, and uptake of, CR varies across England, and just 62,822 of the 121,500 eligible participants (52%) accept the invitation each year. Scaling up the provision of programmes and improving the way they are marketed to a level that would place England's CR services among the best in Europe could prevent up to 23,000 premature deaths and avoid 50,000 acute admissions over 10 years.⁹

The NHS England Long Term Plan sets a target of 85% CR uptake. Currently, that figure is 50% in the UK, with highest uptake recorded among those treated with coronary artery bypass graft (CABG), PCI after myocardial infarction (MI), and as part of post-MI medical management.⁹ Without significant innovation and funding, the UK's CR programmes will not only struggle to meet existing demand, but will clearly fail to achieve the ambitious national target.

Several factors affect programme uptake and completion. There is, for example, considerable variation in the proportion of females who attend, with figures ranging from 15% to 38%. Women from BAME communities are particularly less likely to accept an invitation to a CR programme. Services that accommodate gender specificity and consider language and convenience can all help improve uptake. Recent observational studies have shown facilitated, self-managed, home-based programmes to be comparable to traditional approaches in terms of psychosocial outcomes, walking ability and CVD outcomes.

Meanwhile, she was overwhelmed by the number of medications she was being asked to take, and frequently missed doses. The stress around her appointments, her medications and missing targets through being off work was too much to cope with. She started to drink and smoke heavily again.

Around the same time, Steve got a new job in a garden centre. They now had some more income but couldn't enjoy it as Margaret's health continued to deteriorate.

Almost a year after her urgent renal referral, a terrified Steve called 999 because his wife was suffering with severe chest pains. An ECG carried out in the ambulance as she was transported to hospital on blue lights detected stent thrombosis. She was sent straight to the cardiac team, who diagnosed ST-elevation myocardial infarction (STEMI) and performed a PCI.

Margaret was started on 90mg BD of ticagrelor for 12 months and transferred to the DGH, where a follow-up echo confirmed a low ejection fraction of 40%. She was diagnosed with left ventricular systolic dysfunction indicating potential heart failure (HF). Once again, Margaret was discharged and referred for CR, but she struggled to get back to normal life.

She often felt breathless and found it difficult to keep up with her beloved grandchildren. At 66, she felt forced to retire from the job she loved, and her frustration was compounded by ill health preventing her from attending her own retirement party. At home, Steve struggled to juggle looking after his wife and providing the household's sole income, placing stress on their relationship.

Margaret attended her most of her CR and regular hospital appointments with the renal and HF teams, but a lack of multidisciplinary input led to a 'seesaw' of medications management; changes in renal function, BP and fluid retention sparked constant dosing alterations, as the two teams struggled to balance her CKD and HF treatment independently of each other. This only served to confuse Margaret more, and her compliance plummeted.

A year after her emergency admission for STEMI, Margaret was called for a 12-month review in primary care. Her eGFR was 30ml/min/1.73m², with an albumin-to-creatinine ratio (ACR) of 28mg/mmol, indicating she had stage 3b chronic kidney disease (CKD). A tendency to a high serum potassium, she was told, was preventing optimisation of her HF treatment.

She told her doctor that she felt isolated and alone without work, and with increasing immobility stopping her from getting out. In response, the GP prescribed her antidepressants and referred her to Improving Access to Psychological Therapies (IAPT).

A few weeks later, Margaret attended the renal outpatient department, where the team noted persistent congestion and prescribed furosemide to manage this.

At her HF follow-up appointment, her congestion had worsened, and Margaret was referred to the HF specialist team.

At home, fiercely independent Margaret needed a growing level of support. With limited help from social care, Steve had stopped working to become her carer, and their youngest daughter had dropped to part-time hours to support them both.

Margaret, frustrated with her dwindling independence, and anxious about the emotional and financial wellbeing of her family, was becoming increasingly despondent. She hardly recognised herself, she said.

People with CHD and depression are twice as likely to have future heart events or die than those with heart disease who are not depressed.²¹

Although more access is needed nationally, the IAPT programme is available in every area of England. The initiative provides access to cognitive behavioural therapy (CBT), which has been proven to be effective in depression, anxiety and trauma, as well as counselling and interpersonal and relationship therapy. Patients can self-refer into the IAPT service.²²

Soon, Margaret seldom left the house, and she even needed a wheelchair to get to the clinic for her renal appointment. The consultant was so concerned that she admitted her, and it was confirmed Margaret was suffering severe fluid retention in her lungs and legs which was not responding to oral diuretics. Her blood tests showed hyperkalaemia (K^+ 6.5 mmol/l) and she had an eGFR of 25ml/min/1.73m² with a serum creatinine of 200 μmol/l.

The renal ward immediately started IV diuretics, but her low BP, driven by heart failure, hampered the fluid removal efforts and Margaret was kept in for a total of 10 days.

Following fluid removal her cardiac function improved, and her blood pressure stabilised at 120/60mmHg. Upon discharge, her eGFR was 20ml/min/1.73m² and her creatinine was 240 μmol/l, although she still had some swelling and shortness of breath.

Professional and service silos can negatively impact patient care, particularly where there is uncertainty as to where the boundaries lie, or no single holistic ownership of care. This can occur as much within organisations as across them, but a focus on integrated care systems and pathways, as well as data sharing, can improve communication and, consequently, quality of care.²³

As is commonly found, the management of Margaret's HF was limited by her hyperkalaemia and CKD. However, though often locally restricted, NICE advocates the use of Patiromer²⁴ or Lokelma²⁵ in such a scenario.

The need for dialysis was averted, but by the time Margaret went home, her mobility was so poor that she needed a social care package, including home help.

Her quality of life plummeted. She was frequently short of breath and had difficulty sleeping, leaving her extremely fatigued during the day. Even mobilising around the house became a challenge, and Margaret and Steve, who balked at the idea of leaving the family home, considered installing a stair lift.

By Margaret's 70th birthday, her mobility was at an all-time low and her breathlessness was incapacitating. She attended the party her family and friends had organised for her – but found herself watching from the side lines. Margaret, once the life and soul of the party, was devastated.

What could have happened differently? Margaret's optimal story

Margaret was rushing back to her computer to meet a deadline when she tripped and fell on the factory floor at work. She told her colleagues she was fine, but they insisted she go to hospital.

A&E doctors took a medical and family history, discovering that Margaret had experienced pre-eclampsia during both pregnancies, and that her mother had died following a stroke at the age of 60. They took Margaret's blood pressure, which was recorded at 162/98mmHg, and carried out a urinary dipstick test which was positive for protein indicating that kidney disease could be present. Consequently, a urine sample was sent for analysis, finding an ACR of 35mg/mmol.

All Margaret's test results and risk scores were recorded in her Local Health and Care Record (LHCR), and, through routine risk profiling, the integrated patient record flagged Margaret's ACR to primary care.

Through the NHS Health Check Recall Tool, developed by PRIMIS on behalf of Public Health England (PHE), practices can quickly and easily discover who needs to be recalled for a health check. It can review all patients aged between 40 and 74 who have no pre-existing diagnosis, based on 10 specific diagnosis codes, or those who have not been prescribed statins in the previous 12 months. The system also incorporates an inbuilt mail merge for recall letters.²⁶

Consequently, Margaret was called for a health check at her GP practice a month later. At first, she didn't see the point, but a practice nurse called her to explain her risk profile and how proactive care was the best way to stay healthy.

The NHS Long Term Plan identifies the roll out of integrated, digitally enabled primary and outpatient care as a core priority. To drive this transformation, healthcare providers will need to:⁹

Create straightforward digital access to NHS services, and help patients and their carers manage their health;

- Ensure clinicians in all settings can access and interact with patient records and care plans;
- Use decision support and artificial intelligence (AI) to help clinicians apply best practice, eliminate unwarranted variation across the care pathway, and support patients in managing their own health and condition;
- Use predictive techniques to plan care for local populations;
- Use intuitive tools to capture data as a by-product of care in ways that empower clinicians and reduce the administrative burden.

All of these factors would support Margaret's optimal care.

The 12 Local Health Integrated Care Record Exemplars (LHCREs) are regional collaborations that bring health and care services and local authorities together to develop integrated, shared records for the people in their region. The aim is to facilitate coordinated care and ensure that, regardless of whether an individual is receiving care and support at their GP, hospital, in the community or even at home, the people looking after them can access the right information, at the right time. The LHCREs will develop best practice for implementation for other localities.²⁷

Diabetes services are also starting to integrate data at a service level, with some early adopters using systems such as Eclipse Live. It integrates Hospital Episode Statistics (HES) and patient data, making them available across the whole MDT, and allowing patient management to take place via remote virtual clinics, rather than regular outpatient appointments.²⁸

During the health check, the doctor measured and recorded Margaret's BP, weight, height and HbA1c, and performed a urea and electrolytes (U&E) blood test. Her total cholesterol was found to be 6.4mmol/l. Familial hypercholesterolaemia was excluded with the full lipid profile results, and the doctor asked about her smoking status, average alcohol intake and family medical history.

Once all the details were uploaded into the QRISK3 template, Margaret's doctor carried out an eye check and ECG, and then used the JBS3 risk score to speak to her about her CVD risk.

The QRISK3 algorithm calculates a person's risk of developing a heart attack or stroke over the next 10 years, based on their risk factors.²⁹

The JBS3 Risk Calculator is a tool that helps health professionals to communicate a patient's risk of CVD, as well as demonstrate how particular interventions can impact that risk.³⁰

Next, the GP followed up on the renal issue identified in A&E. An eGFR of 70ml/min/1.73m² with a raised ACR indicated that Margaret already had stage 2 CKD.

Talking through the CKD and CVD risks with Margaret the GP prescribed a high intensity statin and started on an antihypertensive treatment. The doctor ensured Margaret understood the rationale behind taking each drug, and that she was fully aware of the risks and benefits. She was also referred to virtual smoking cessation and app-based weight loss programmes and given the ability to monitor her own blood pressure, all of which contributed to her feeling in control of her health. The GP also referred Margaret to the practice social prescriber and practice based clinical pharmacist.

Margaret returned to the practice to see the clinical pharmacist who evaluated her risk factors considering her blood pressure and lipid profile and optimised her medication. She also went to see the primary care network's social prescriber to discuss her interests and priorities. Being a big 'Strictly' fan, Margaret welcomed the recommendation to take up a dance class as regular exercise. She really enjoyed Zumba and swing dancing, and even joined a local swing dancing club.

By her next appointment with the GP, her kidney function had improved.

Six months on from her CVD risk and CKD diagnosis being identified, Margaret had settled into her new medication schedule and lifestyle changes. Her BP had reached the target level, she had lost weight, reduced her cholesterol and her ACR had dropped to 8mg/mmol.

Her cardiovascular and renal health was monitored annually with eGFR and ACR tests, while checking HbA1c for type 2 diabetes and any key changes that increased her risk were automatically highlighted within the practice integrated health record system. This, combined with her primary healthcare team appointments, kept her engaged.

At the first annual appointment, Margaret's weight was down, and her activity levels were up. While she had reduced her smoking and drinking, she still had around five or 10 cigarettes a day, and said she enjoyed a glass of wine or two after work. The regular reviews gave the healthcare team an opportunity to re-engage Margaret in these conversations supporting her in identifying issues and adhering to medication. From these discussions and the test results, the practice pharmacist was able to optimise her medication to suit her circumstances.

When Steve was made redundant from his job, leaving Margaret as the household's sole earner, she was able to manage the stress without reverting to her old coping mechanisms.

In the average care scenario, Margaret's lack of engagement with her condition led to a significant deterioration. It is a common – but not inevitable – story.

In England, more than 15 million people have a long-term condition (LTC). Despite accounting for at least 70% of the NHS budget, they tend to spend less than 1% of their time in contact with their healthcare team. It means that for the remaining 99% of the time, they need to be able to manage their own care. To that end, supported self-management is part of the NHS Long Term Plan commitment to 'making personalised care business as usual'.⁹

Margaret wouldn't describe herself as an activated patient, but her health team probably would. She told Steve that she felt fully in control of the situation, thanks to her understanding of her risks and medicines, as well knowing that there were things she could do to keep herself healthy.

The Patient Activation Measure (PAM) is a validated, licensed tool that has been extensively tested with reviewed findings from a large number of studies. It measures a person's spectrum of knowledge, skills and confidence in managing their condition, and captures the extent to which they feel engaged in, and able to, take care of themselves – their 'activation level'. By understanding a person's PAM, NHS services can support them in the most appropriate way.³¹

Around 50% of all medications are not taken as intended³². Inappropriate medicines-related incidences cost the NHS between £1bn and 2bn a year.³³ PCN practice pharmacists, who support medicines reconciliation after discharge, involve patients in shared decision-making, and help them to understand their medicines, can support adherence.³⁴ There are a number of support resources available:

- **The Royal Pharmaceutical Society's Medicines Optimisation Briefing,³⁴**
- **NICE Medicines Optimisation Quality Standard [QS120];³⁵**
- **How you can encourage medicines optimisation in cardiovascular disease (in the Pharmaceutical Journal);³⁶**
- **Concordance, adherence and compliance in medicine taking: Report for the National Co-ordinating Centre for NHS Service Delivery and Organisation R&D.³⁷**

When Margaret turned 65, she was relatively fit and healthy and was enjoying life. She and Steve had embraced the role of doting grandparents and were overjoyed when their eldest daughter announced a second baby. They still loved to travel and marked her 65th birthday with a two-week trip to their favourite part of Turkey.

The following year, Margaret was due for retirement, but was in such good health that she stayed on part time. She enjoyed her job – and spending the extra money on holidays and spoiling the grandchildren.

Eighteen months later, she started to feel unwell. Experiencing dizziness and epigastric discomfort, and being aware of her risk factors, she asked Steve to take her to A&E. With a heart rate of 100 beats per minute, she had tachycardia, and her BP was recorded at 196/101mmHg.

The local hospital had full access to her records, so after an ECG she was rapidly transferred to the cardiology unit of the nearest specialist centre. As well as being aware of her medication and history, the staff also recognised her atypical CHD presentation.

There was no wait for a troponin test, which came back positive despite an ECG being normal. An ACS bloods package was carried out, including a full lipid profile and HbA1C (49mmol/mol) her eGFR was found to be 65ml/min/1.73m².

Once in the cardio unit, a second troponin test found levels had increased slightly. After an initial echo, Margaret was sent straight to the cath lab, which, in line with best practice recommendations, operated a Saturday service. Here they identified single vessel atherosclerosis and carried out a PCI and a single drug eluting stent was inserted into the affected artery. As Margaret had no significant renal impairment, there were no issues with renal contrast.

The following morning, with support from the hospital pharmacy team, Margaret was discharged back into primary care on ramipril, aspirin, ticagrelor beta-blocker, and her statin was increased to atorvastatin 80mg once a day (now secondary prevention) and referred to CR. Afterwards, Margaret visited her practice for a blood test and a medication review with the practice pharmacist, who optimised her medication and explained the importance of the drugs she was on. She also had a follow-up echo at the local community hospital, did not show any significant abnormalities.

Just like Margaret, people living with CHD often have complex requirements around medication optimisation, management of comorbidities, symptoms and social care support.³⁸

For those who receive suboptimal care, outcomes are consistently poor. An integrated approach to primary, community and acute services facilitates better quality of life and improved access to treatment and care. What's more, it helps avoid unnecessary hospital admissions and makes better use of NHS resources – including the workforce.³⁸

The NHS Long Term Plan recognises this, and says the health service is committed to integrating health and social care systems.⁹

One example of a successful approach can be found in the Integrated Care pilot programme, a two-year project funded by the BHF, which ran across nine UK NHS organisations.³⁸

A key part of the programme was improving the skills and capacity of primary and community care to support self-management.

Each of the organisations adapted the programme to suit their local context using a variety of approaches, and these evidence-based studies support current thinking that integrating services can maximise resources and improve population health.

Common themes were:

- early supported discharge and active hospital in-reach
- home visits with specialist services
- nurse-led, open-access community and hospital clinics
- multi-specialty clinics and networking
- practice risk register auditing and training
- healthcare professional education and professional development
- patient-led focus groups, shared decision-making and self-management tools.

At her follow-up appointment with cardiology three months later her full lipid profile indicated her Low Density Lipoproteins (LDL) was 2.2 and therefore Ezetimibe was added to bring down her LDL to <1.8.³⁹ Margaret also started the CR programme, a 10-week course that was held in the evenings, meaning she did not need to take time off work to attend.

At her next follow-up appointment in primary care, one month later, Margaret told her GP that the medical event had been a wake-up call, and that she wanted to stop smoking. In response, the GP encouraged her to use a new app-based smoking cessation support service.

Margaret had also drastically reduced her alcohol consumption. These days, she said, she was much more likely to be found in the park with her grandchildren than in the pub with her workmates.

At her first post-MI annual review in primary care and with support from the cardiologist and cardiology pharmacy-led virtual advice and guidance service, Margaret's GP checked Full Blood Count (FBC) & U&Es and assessed for risk of bleeding, and stopped the ticagrelor offering her low dose rivaroxaban to mitigate her cardiovascular risk.

Recent NICE guidelines recommend people aged 65 and over who have experienced MI in the previous 12 to 36 months are continued on 60mg twice daily of ticagrelor if:⁴⁰

- **they are at high risk of developing type 2 diabetes that requires treatment**
- **they have had more than one prior MI**
- **there is evidence of multi-vessel coronary artery disease**
- **there is evidence of chronic non-end stage renal dysfunction.**

NICE Guidelines recommend rivaroxaban ▼ plus aspirin within its marketing authorisation as an option for preventing atherothrombotic events in adults with coronary artery disease, or those with symptomatic peripheral artery disease who are at high risk of ischaemic events.⁴¹

As Margaret approached her 70th birthday, she enjoyed planning the perfect party and was raring to go when the big day arrived. After greeting their guests and enjoying a few rounds of party games with the grandchildren, Margaret joined her fellow dance club members on the dance floor to show off their moves.

Later, she and Steve took a moment to reflect on how the way she had worked with her care team to manage her health had made it all possible.

Learning points for commissioners

Comparing Margaret's optimal and suboptimal journeys of coronary heart disease raises some considerations for teams involved in commissioning or redesigning CHD services:

- Ensure professional and public awareness that coronary heart disease (CHD) kills twice as many women as breast cancer in the UK – it is not just a ‘man’s disease’;⁴²
- Encourage practices to proactively identify patients at risk of CHD. The advent of cardiovascular disease (CVD) prevention as a service requirement for the Primary Care Network Directed Enhanced Service will support patient identification, but services and drivers need to be in place to ensure their management;⁴³
- Support practices in reaching out to patients for health checks with tools such as PRIMIS NHS Health Check Recall Tool and appointment reminder services;²⁶
- Ensure out-of-hours catheterisation (cath) lab services are available to reduce outcome-impacting delays in access to PCI interventions;⁴⁴
- Currently, just 50% of eligible patients attend and complete cardiac rehabilitation (CR) programmes. To meet the NHS Long Term Plan target of 85%, many services will need to be scaled up. To further support uptake, issues around convenience and mode of delivery, cultural sensitivities and language should all be considered;²⁰
- Depression is both a CHD comorbidity and a significant exacerbator of adverse outcomes.²¹ Those at risk of, or diagnosed with, CHD should be made aware of Improving Access to Psychological Therapies (IAPT) services;²²
- Integrating services is at the forefront of most service transformation projects, and fundamental to shared care is the ability for acute and community teams to access appropriate primary care data. Commissioners should consider service development in light of:
 - the local digital roadmap
 - best practice from the local integrated healthcare record exemplars
 - the systems currently available on frameworks such as GP IT Future;²⁷
- Virtual multidisciplinary teams (MDTs) can ensure workforce capacity is focused on where it is needed, for instance on those most at risk, rather than arbitrarily repeated outpatient appointments;
- People who recognise they have a key role in managing their own condition, and have the skills and confidence to do so, experience better health outcomes. This ability varies considerably from person to person, so patient engagement and activation should be supported across all members of the MDT and measured through tools such as the Patient Activation Measure (PAM);³¹
- The Primary Care Network Direct Enhanced Service (PCN DES) has consolidated the involvement of clinical pharmacists in supporting patient care. Engaging this team in medicines optimisation initiatives can support the delivery of the cardiovascular elements of the PCN DES;⁴⁵
- There have been a number of updates in technology guidance from NICE that could be incorporated into local pathways to improve care for people like Margaret. They include:
 - Rivaroxaban for preventing atherothrombotic events in people with coronary or peripheral artery disease: TA607⁴¹
 - Sodium zirconium cyclosilicate for treating hyperkalaemia: TA599²⁵
 - Patiomer for treating hyperkalaemia TA623²⁴
 - High-sensitivity troponin tests for the early rule out of non-ST-elevation myocardial infarction (NSTEMI) – publication is expected in August 2020.⁴⁶

Questions for GPs and commissioners to consider

1. What is the local burden of disease, including:
 - a. How many people are currently at risk of coronary heart disease (CHD)?
 - b. How many CHD patients had a percutaneous coronary intervention (PCI) last year?
2. What does the current pathway for CHD look like?
3. How many patients are currently identified by the Quality and Outcomes Framework? How does this compare to local public health estimates? And what is the gender difference in these figures?
4. How many at-risk patients are reviewed annually?
5. Are CHD patients routinely offered Improving Access to Psychological Therapies services (IAPT) where appropriate? How many patients with CHD are comorbidly depressed, and how many have accessed IAPT?
6. What are the Primary Care Network (PCN)'s plans for cardiovascular case finding within the Directed Enhanced Services (DES)?
7. What are the current plans for PCN pharmacists with respect to CHD medicines optimisation?
8. What mechanisms of multidisciplinary team (MDT) working exist between the following teams:
 - a. cardiology?
 - b. renal?
 - c. community heart failure?
 - d. cardiac rehabilitation?
 - e. primary care?
9. What, if anything, does the local map tell you about current record sharing between these teams?
10. Which of these teams have recently managed virtual or telephone triage? What were their experiences?
11. When is the catheterisation (cath) lab open? Does it provide an out-of-hours service?
12. What modes of cardiac rehabilitation do you offer, and how is it tailored to gender and ethnicity differences?
13. How do you measure patient engagement in CHD services?

The 'bills' and how they compare: Overall pathway

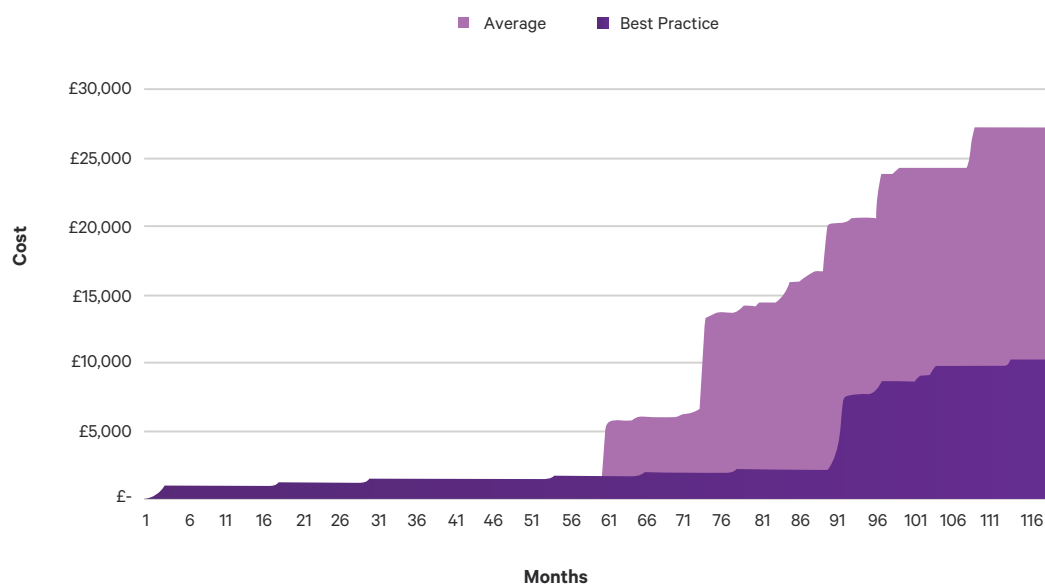
What are the financial costs to the healthcare system of Margaret's care? Figures 4 and 5 give a high-level pathway description of the optimal and suboptimal journeys and demonstrate the potential financial savings of best practice care.

Figure 4. Timechart of Margaret's story of coronary heart disease

Cost	Average Practice	Month	Best Practice	Cost
Margaret falls on the factory floor and is taken to A&E. She is diagnosed with slight concussion. A urinary dipstick test reveals a positive risk for kidney disease.				
	The potential renal issue is indicated on her discharge notes, but Margaret does not attend GP follow-up.	2	The potential renal issue is entered into an integrated patient record, and routine risk profiling triggers a health check invitation.	
		3	The GP practice follows the health check invitation with a text and Margaret attends. The GP identifies a risk of chronic kidney disease (CKD) and coronary heart disease (CHD), and rules out familial hypercholesterolaemia (FH). Ambulatory blood pressure (BP) and a practice-based electrocardiogram (ECG), with remote reading, was carried out. Margaret is prescribed statins and BP medications, and the clinical pharmacist explains all the medicines.	
£112	A health check letter sent is sent to Margaret, but she doesn't respond. The appointment is not followed up.	12	Margaret regularly attends primary care for bloods and BP monitoring, and has online medicines optimisation consultations with the GP or clinical pharmacist.	£1,086
£112	48 Steve made redundant			£1,518
£112	60 New grandson			£1,692
	Margaret goes to A&E feeling dizzy and unwell. Her tachycardia and myocardial infarction (MI) are not spotted because of her atypical presentation. A troponin test is not carried out. All indicative of the gender bias in diagnosis.	60	<p>Through social prescribing, and with the support of her primary care team, Margaret has taken part in remote smoking cessation and weight loss programmes. She has also taken up swing dancing as regular exercise .</p> <ul style="list-style-type: none"> • Activated patient • Regular blood tests and BP • Medicines optimised 	
	As the catheterisation (cath) lab was only open on weekdays, she was admitted to a general cardiac ward overnight, and then transferred to university hospital.	60		
	Non-ST-elevation myocardial infarction (NSTEMI) is diagnosed and a percutaneous coronary intervention (PCI) carried out before she is discharged to community care.	60		
	CKD was not highlighted because of the potential for the radio contrast to interfere with angiography.	60		
	A post-MI echocardiogram (echo) was not performed and the cardiac rehabilitation course was not completed.	61		
	Margaret starts to miss doses of medication.	61		
£5,837	62 Steve gets new job at garden centre			£1,692
		65	Margaret and Steve enjoy a holiday in Turkey.	
	Margaret is taken to the university hospital by ambulance. She is diagnosed with stent thrombosis, MI and STEMI. An echo shows low ejection fraction and the onset of heart failure .	74		

£13,188	Margaret retires	74	Margaret works part-time	£1,867
	She attends the HF and renal services as an outpatient every three months, during which the two renal teams attempt to optimise diuretics and blood pressure medications independently of each other.	74	Margaret carries on working part time because she enjoys it, even wins a medal in a local swing dancing competition. She enjoys days out with husband, Steve, and being a grandmother.	
	Margaret's health declines and confusion over the medication leads to poor adherence. At home, finances are stretched and Steve struggles to juggle his wife's care and working.			
	Margaret is depressed and isolated. She is no longer working and becomes less mobile. She is prescribed antidepressants and referred to Improving Access to Psychological Therapies services (IAPT).	85		
	Margaret's condition declines. With high potassium and fluid overload, she is admitted to renal ward for 10 days.	90		
	Moderate/severe HF and CKD are diagnosed.	92	Margaret goes to hospital feeling dizzy and unwell, and with tachycardia. Her atypical presentation is recognised as a potential MI, and the team, who have access to an integrated patient record transfer, carry out a troponin test and full lipid profile. She is transferred to the seven-day cath lab service at the university hospital where she is diagnosed with NSTEMI and undergoes a PCI.	
		93	The virtual multidisciplinary team (MDT) review Margaret's bloods and notes, and the consultant speaks to her on a Zoom call.	
		94	The referral to the female-only, evening cardiac rehabilitation course is followed up with text messages.	
	Upon discharge, Margaret needs a social care package that includes weekly home help.	98	Margaret attends regular bloods and BP monitoring clinics, as well as medication reviews with the practice pharmacist. Her QRISK3 is highlighted and managed by the GP, who intercedes, where appropriate, with the MDT.	
		104	At review, ticagrelor is stopped and rivaroxaban is started, as per TA607. ⁴¹	
£27,201	120 Margaret's 70 th birthday party			£9,989
	Margaret needs mobility support and is considering installing a stair lift.	120	Margaret celebrates her birthday with a swing dancing party surrounded by family and friends.	

Figure 5. Cumulative expenditure on care



During the early years of the suboptimal care pathway, Margaret was not engaged in her symptomless, deteriorating health. She received no support and no costs were incurred.

Strategically, however, these years were the most important to Margaret's long-term health. The effective use of preventative care early on in her healthcare journey might have delayed the later complications, and made them more manageable, as indicated in her optimal care pathway.

Not only are Margaret and Steve's health and quality of life significantly better in the optimal pathway, but the costs to the healthcare system are an estimated 66% lower.

The impact of best practice care is significant in terms of outcomes, quality and finances.

The breakdown tables below indicate the costs incurred by each organisation during the suboptimal and optimal pathways, Figures 6 and 7.

Figure 6. Service costs

Service	Average Practice	Best Practice
Ambulance Service	£351	£47
Community Care	£1,290	£59
Prescribing & Meds Optimisation	£3,554	£2,615
Prevention & Public Health		£350
Primary Care Management	£504	£1,443
Secondary Care Management	£17,683	£5,363
Urgent & Emergency Care	£224	£112
Social Services	£3,595	
Total	£27,201	£9,989

Figure 7. Breakdown of costs

Service	Average Practice	Best Practice
A&E visit	£224	£112
Actual or Suspected Myocardial Infarction, with CC Score 0-3	£1,521	£1,521
Actual or Suspected Myocardial Infarction, with CC Score 4-6	£1,820	
Ambulance called out	£257	
Ambulance Transfer	£94	£47
App-based weight management course		£350
Heart Failure Nurse	£840	
Heart failure opd - follow up	£858	
Heart failure opd/clinic - first appt	£155	
Heart Failure or Shock, with CC Score 8-10	£3,102	
High sensitivity Troponin test		£6
IAPT	£450	
Medical Review - GP Practice	£272	£170
Multidisciplinary assessment Cardiology (MDT)		£462
Outpatient renal single professional - follow up	£2,356	
Outpatients cardiology consultant review - 1st appointment	£310	£155
Outpatients cardiology consultant review - follow up	£546	£78
Outpatients renal consultant review - 1st appointment	£498	
Phlebotomist - community		£3
Practice Nurse	£60	£192
Practice pharmacist		£141
Prescribing - Spironolactone	£273	
Prescribing - Rivaroxaban		£893
Prescribing - Citalopram	£27	
Prescribing - Ezetimibe		£91
Prescription - Aspirin	£666	£311
Prescription - Atorvastatin	£152	£258
Prescription - Bisoprolol	£132	
Prescription - Ramipril	£186	£348
Prescription - Ticagrelor	£2,114	£725
Rehabilitation post discharge - Cardiac	£468	£468

Simple Echocardiogram, 19 years and over	£59	£59
Smoking cessation course		£109
Social Care Equipment (Specialised bed / handrails etc)	£1,000	
Social care help	£2,340	
Social prescribing -Dance		£120
Social worker	£255	
Standard Percutaneous Transluminal Coronary Angioplasty with CC Score 0-3	£2,673	£2,673
Standard Percutaneous Transluminal Coronary Angioplasty with CC Score 4-7	£3,317	
Test - ECG		£97
Test - HbA1c	£16	£65
Test - Liver Function	£32	£130
Test - Renal Function	£52	£130
Test - U & E	£32	£136
Test - Ambulatory Blood Pressure Monitoring		
Test - Blood Lipids	£39	£136
Grand Total	£ 27,201	£ 9,989

NHS RightCare

The NHS RightCare teams work locally with systems to present a diagnosis of data and evidence across that population. NHS RightCare Delivery Partners and their teams work collaboratively with systems to look at the evidence to identify opportunities and potential threats. The Delivery Partners are senior roles: effective change leaders to influence systems to deliver effective and efficient returns for their population.

Using nationally collected robust data, this collaborative working arrangement helps systems to make improvements in both spend and patient outcomes. Together they complete delivery plans on a continuous basis, to evaluate the system and establish a base plan to maximise opportunities and turnaround issues. Throughout this process, they ensure patient care is at the top of the agenda by promoting the strong clinical interventions developed with the Senior Clinical Advisors and key stakeholders. Delivery Partners and their teams will highlight good practice, in particular at sustainability and transformation partnership population, to accelerate delivery, standardise reporting and embed practices to ensure systems use optimal care pathways.

The NHS RightCare delivery methodology is based around three simple principles of working with local systems:

- Diagnose the issues and identify the opportunities with data, evidence and intelligence;
- Develop solutions, guidance and innovation;
- Deliver improvements for patients, populations and systems.

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Appendix

Below are details of the major classifications used for the health resource group (HRG) codes and costs for the complex admissions used within the scenarios. These are based on the 2019/20 national tariff.

Scenario 1

A patient with no identified complications lives in the catchment area of a district general hospital (DGH) with no catheterisation (cath) lab. They have patient with a suspected myocardial infarction (MI) who is admitted, via A&E, to the DGH for assessment. They are then transferred to tertiary centre for percutaneous coronary intervention (PCI) and then discharged. The DGH manages all post-operative care through the outpatient department (OPD).

DGH initial admission with chest pain, found to have raised troponin level and abnormal electrocardiogram (ECG), diagnosed as probable non-ST-elevation myocardial infarction (NSTEMI).		
ICD10 code	Condition	
I214	Acute subendocardial myocardial infarction	
F171	Harmful use of tobacco	
HRG	Description	Tariff £
EB10E	Actual or suspected myocardial infarction, with Complexity and comorbidity (CC) score 0–3	1,521

Transfer to tertiary hospital with cath lab for diagnostic angiogram +/- PCI. Diagnosis of NSTEMI confirmed and patient found to have coronary artery disease. One drug-eluting stent inserted.		
ICD10 code	Condition	
I251	Atherosclerotic heart disease	
I214	Acute subendocardial myocardial infarction	
F171	Harmful use of tobacco	
OPCS4.9 code	Intervention	
K751	Percutaneous transluminal balloon angioplasty and insertion of 1–2 drug-eluting stents into coronary artery	
Y534	Approach to organ under fluoroscopic control	
HRG	Description	Tariff £
EY41D	Standard percutaneous transluminal coronary angioplasty with CC Score 0–3	2,673

Scenario 2

A patient with a previous myocardial infarction (MI) and stent in situ is subsequently diagnosed with chronic kidney disease (CKD) stage 3. Following an acute MI, she is blue-lighted directly to the catheterisation (cath) lab, where she has percutaneous coronary intervention (PCI) for stent thrombosis. She is admitted overnight and then transferred back to the local district general hospital (DGH) for ongoing post-operative care and outpatient department (OPD) management.

Direct admission to hospital with cath lab. Diagnosis of anterolateral non-ST-elevation myocardial infarction (STEMI). Coronary arteriography showed extensive coronary artery disease with left anterior descending (LAD) occlusion. PCI with multi-vessel stenting.		
ICD10 code	Condition	
I210	Acute transmural myocardial infarction of anterior wall	
I251	Atherosclerotic heart disease	
I252	Old myocardial infarction	
N183	Chronic kidney disease, stage 3	
F171	Harmful use of tobacco	
Z955	Presence of coronary angioplasty implant and graft	
Z911	Personal history of non-compliance with medical treatment and regimen	
OPCS4.9 code	Intervention	
K751	Percutaneous transluminal balloon angioplasty and insertion of 1-2 drug-eluting stents into coronary artery	
Y534	Approach to organ under fluoroscopic control	
HRG	Description	Tariff £
EY41C	Standard percutaneous transluminal coronary angioplasty with CC score 4-7	3,317

The patient is transferred back to DGH with coronary stent in situ. No cardiac rehabilitation is carried out, but an echocardiogram (echo) is performed and left ventricular failure (LVF) is diagnosed.

ICD10 code	Condition	
I210	Acute transmural myocardial infarction of anterior wall	
I251	Atherosclerotic heart disease	
I252	Old myocardial infarction	
I501	Left ventricular failure	
N183	Chronic kidney disease, stage 3	
F171	Harmful use of tobacco	
Z955	Presence of coronary angioplasty implant and graft	
Z911	Personal history of non-compliance with medical treatment and regimen	
OPCS4.9 code	Intervention	
U201	Transthoracic echocardiography	
Y981	Radiology of one body area	
HRG	Description	Tariff £
EB10D	Actual or suspected myocardial infarction, with CC score 4-6	1,820
Unbundled HRG	Description	Tariff £
RD51A	Simple echocardiogram, 19 years and over	59

Scenario 3

The patient, with a past medical history of myocardial infarction (MI), a stent in situ, stage 3 chronic kidney disease (CKD), left ventricular failure (LVF) and depression, is admitted to hospital as an emergency admission with fluid overload, hyperkalaemia and hypotension. Worsening heart failure is diagnosed.

Direct emergency admission to hospital for management of fluid overload.		
ICD10 code	Condition	
I500	Congestive cardiac failure	
E877	Fluid overload	
E875	Hyperkalaemia	
I959	Hypotension	
I251	Atherosclerotic heart disease	
I252	Old myocardial infarction	
N183	Chronic kidney disease, stage 3	
F171	Harmful use of tobacco	
F329	Depression	
Z955	Presence of coronary angioplasty implant and graft	
HRG	Description	Tariff £
EB03C	Heart failure or shock, with CC score 8–10	3,102

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