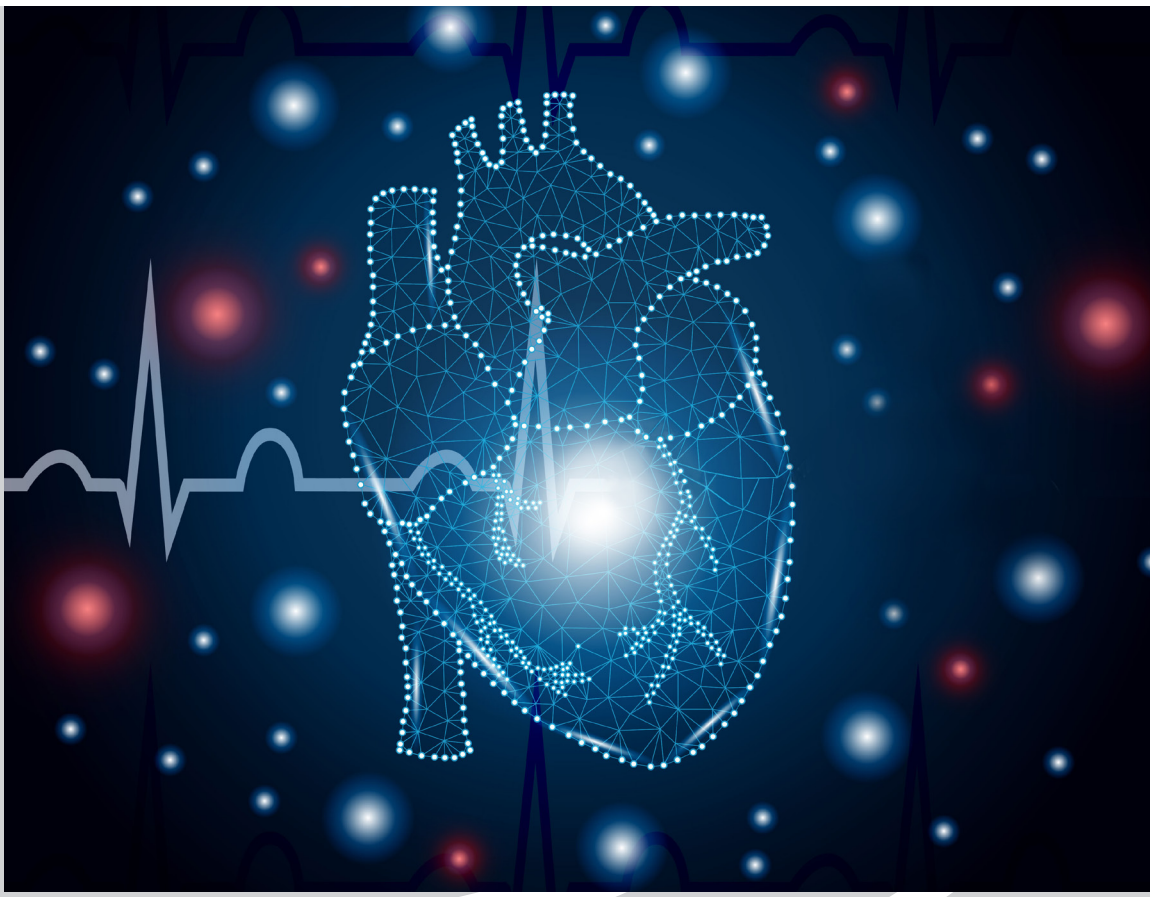
Failure to Function

A review of the care received by patients who died in hospital following an admission with acute heart failure



NCEPOD

Improving the quality of healthcare

Failure to Function

A review of the care received by patients who died in hospital following an admission with acute heart failure

A report published by the National Confidential Enquiry into Patient Outcome and Death (2018)

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Contents

Acknowledgements

Back to contents

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Foreword

Back to contents

This report provides a focused review of the quality of care provided to patients who were admitted to hospital with acute heart failure. For NCEPOD it has been another welcome opportunity to demonstrate the benefits of using the confidential enquiry method to supplement and complement a national audit. The National Heart Failure Audit has run for more than a decade and includes patients with a confirmed diagnosis of heart failure on discharge from hospital. The latest audit revealed a mortality rate of 8.9% and called for urgent attention to reduce this figure by all hospitals that admit these acute heart failure patients. In the sickest patients who have cardiogenic shock, the severity of their illness dictates a rapid assessment and investigations to confirm the diagnosis. In many patients, however, the diagnosis of heart failure is not clear. Their symptoms frequently overlap with other conditions and this can lead to inappropriate treatments being given. This diagnostic difficulty was apparent when assessing the patient records for inclusion in this study: cases were frequently excluded as the patient did not in fact have heart failure. This study aimed to concentrate on whether patients in acute heart failure received a timely diagnosis and access to specialists in order that they were offered the correct treatment.

Although the study was proposed to review acute heart failure, it must be recognised that hospital based heart failure services are designed to meet the needs of both long-standing heart failure and acute heart failure patients. Not only is the overlap frequently difficult to clinically distinguish, but in addition hospital coders cannot differentiate between acute or chronic forms of 'heart failure' since no separate codes exist.

The patients in this study had several co-morbidities, were primarily elderly and had arrived acutely unwell in the emergency department. In addition, and to test the issues of concern around the care received by this group of patients, we deliberately sampled patients who had died in the seven days following admission. This did not mean that we were only looking for cases of poor care. In many cases the death was not unexpected and the more important question was why some patients had been brought to the emergency department at all. Those with a worsening of their long-standing heart failure would/should have been known to the service and therefore had all treatment options considered. One might have expected that suitable end of life care planning discussions had also taken place.

For those patients with a new diagnosis of heart failure, the diagnosis could have been made sooner if pertinent tests had been completed sooner. Two key steps to aid a prompt diagnosis are the measurement of serum brain naturietic peptide (BNP) followed by an echocardiogram if the BNP is positive. This is an important way to tell the difference between heart failure and, for example, pneumonia, and to ensure that the right treatment pathway is followed. Whilst current clinical guidelines state that an echocardiogram should be undertaken within 48 hours of admission to hospital, this interval may be too long for the acute admitting medical team. This is a patient group that are often amenable to ambulatory/emergency day care, so a more effective one stop assessment and daily hot clinic access would provide better immediate care and an early determination of whether specialist follow-up will prove to be necessary.

Access to a specialist heart failure team has been shown to be critical in improving patient outcomes. However, this study demonstrated from both the clinical data and the organisational data, that these services are not always available and even when they are, that not all patients are offered access to them.

Furthermore, many patients did not receive a timely BNP or echocardiogram, despite current guidelines promoting their use. More rapid review by the heart failure team might improve this.

Overall, the care of patients in this study was rated as good in 44% of the cases reviewed. Clinical care showed room for improvement in 31% of the cases and a combination of clinical and organisation of care needed improvement in 21%. In 4% of patients the care was below a standard that would have been accepted by the clinicians reviewing the cases. Room for improvement in care was linked to an absence of specialist reviews and for those patients with a new diagnosis.

As with all NCEPOD publications I would like to thank everyone who has made a contribution to the production of this report. To the NCEPOD Steering Group who represent the Royal Colleges, their Faculties and Specialist Associations for identifying the clinical concern and short listing the topic. To the multidisciplinary study advisory group and patient representatives who contributed their expertise and pointed us to what we should be looking at and the questions we needed to ask. To the Reviewers who generously gave up so much of their time to painstakingly review each set of case notes and to those clinicians, who took the time to complete their questionnaires. To the NCEPOD Local Reporters for identifying the patient samples to us, for copying the case notes and being so understanding when we had to select further cases due to the poor coding. Thanks also to our NCEPOD Ambassadors who have championed the topic locally. I would also like to thank the authors for writing such a detailed report, the researchers for their analysis and guidance on interpreting the data, the NCEPOD team for running the study and our panel of lay representatives for their invaluable insight and non-clinical interpretation of the findings. Finally thanks to my fellow Trustees, and our clinical co-ordinators for all their support.

Professor Lesley Regan
NCEPOD Chair

Principal recommendations

Back to contents

A guideline for the clinical management of acute heart failure should be available in all hospitals.
These guidelines should include standards for:

- The location of care - which should be on a specialist unit
- Arrangements for heart failure service review within 24 hours
- Initial investigations required to diagnose acute heart failure, including a standard protocol for the use of:
  - BNP/NTproBNP testing
  - Echocardiography
- Immediate treatments (medications guidance for treatment prior to specialist review)

Hospitals should audit against these standards annually. *(Medical Directors, Directors of Nursing, Clinical Directors)*
This recommendation supports NICE guideline CG187
This recommendation refers to the specialist heart failure/ cardiology team review - see also RECOMMENDATION 2 p.82 regarding all acute admissions and consultant review within 14 hours of admission.

All heart failure patients should have access to a heart failure multidisciplinary team. Core membership of this team should include:

- A clinician with a sub-speciality interest in heart failure
- A specialist heart failure nurse
- A healthcare professional with expertise in specialist prescribing for heart failure
- The primary care team
- A specialist in palliative care

Other services such as cardiac rehabilitation, physiotherapy, occupational therapy, clinical psychology, elderly care, dietetics and clerical support should be involved as needed. *(Commissioners, Medical Directors, Directors of Nursing and Clinical Directors)*
This recommendation supports the draft NICE guidelines for chronic heart failure management outlining the core membership with the addition of palliative care to the core group

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Serum natriuretic peptide measurement should be included in the first set of blood tests in all patients with acute breathlessness and who may have new acute heart failure. It is central to the assessment of these patients to guide further investigation. *(All Clinicians)*
This recommendation supports NICE guideline CG187 rec 1.2.2

An echocardiogram should be performed for all patients with suspected acute heart failure as early as possible after presentation to hospital, and within a maximum of 48 hours as it is the key to diagnosis, risk stratification and specialist management of acute heart failure. *(All Clinicians, Lead Physiologists and Medical Directors)*
This recommendation supports NICE guideline CG187 rec 1.2.4

For all patients with heart failure, best practice in escalation decision making includes:

- Assessment of the goals and benefits of treatment escalation
- Inclusion of the patient (and their family where possible)
- Involvement of the cardiology or heart failure consultant
- Agreement among members of the multidisciplinary team
- Communication of the decision with healthcare professionals across the whole care pathway

For patients with advanced heart failure, pre-emptive discussion in the outpatient setting of treatments that would not be beneficial, along with consideration of palliative care needs, can prevent unnecessary admissions and should be encouraged. Escalation decisions should be reviewed at the time of all admissions with acute heart failure. *(Heart Failure Teams/Consultant Cardiologists)*
See also: Treatment and care towards the end of life: good practice in decision making (GMC 2010)

Please see the full list of recommendations on page 81

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Introduction

Back to contents

Heart failure is a clinical syndrome that occurs when the heart is unable to pump sufficient blood to provide for the needs of the body. It can be caused by poor function of the heart due to muscle damage, dysfunction of heart valves, disturbances of heart rhythm or other rare causes. Muscle damage can impair contraction (systolic function) and/or relaxation (diastolic function) of the heart which can be identified by echocardiography. There are two types of heart failure, acute and chronic and the care pathways for both overlap considerably. (see glossary on page 87).

Acute heart failure can present as a new diagnosis in patients with no previous heart disease or as an episode of worsening of chronic heart failure, triggered by other co-existing conditions. These conditions are commonly reversible or treatable events such as infections, arrhythmias or acute coronary syndromes. Acute heart failure is the commonest emergency admission in >65 year olds causing 5% of all emergency admissions and 70% of heart failure associated healthcare costs. It carries an inpatient mortality of 11%.[1]

Chronic heart failure is a long-term condition and the disease path is one of acute worsening rather than progressive deterioration. Chronic heart failure is one of the commonest long-term conditions and accounts for 2% of the NHS budget.[1]

Common symptoms of heart failure are breathlessness (due to congestion of the lungs with fluid), fatigue, and swelling of the ankles, legs or abdomen (also due to fluid retention).

There have been major advances in the treatment of chronic heart failure in the last ten years.[2] Drug treatments are increasingly tailored for individual patients, different combinations being used in systolic and diastolic dysfunction. Device therapy (complex pacing devices and implantable cardioverter/defibrillators) is also used for selected patient groups. These, combined with improved models of care, have resulted in a greater than 50% improvement in survival.

Alongside these improvements, acute heart failure management has remained largely unchanged for over 25 years. The improvements in long-term treatment combined with the often reversible nature of episodes of acute worsening means that investigation to establish an accurate diagnosis, and specialist review to ensure appropriate treatments are given, have become increasingly important. Published guidance for the management of both acute and chronic heart failure makes recommendations about pathways of care, specialist review and follow-up as well as investigations and treatments.[3,4]

In England and Wales there is an almost five-fold variation in inpatient mortality due to heart failure between acute hospitals (lowest 6%, highest 26%). The National Heart Failure Audit which includes 80% of patients admitted to hospital with acute heart failure has shown that care delivered in a specialist cardiology ward is associated with a 40% reduction in mortality, but that the proportion of patients transferred to cardiology varies.[2]

The National Heart Failure Audit has also shown that when patients are treated by a cardiologist, heart failure medications are prescribed more frequently and survival rates are better. Access to cardiology, however, is age and sex dependent; only 43% of patients >75 years vs 65% of <75 years and 44% of women vs 55% of men are cared for in cardiology wards.[2]

The study presented in this report was proposed to explore the variation in the organisation of heart failures services and clinical care for patients with acute heart failure on arrival at, and admission to, hospitals in the United Kingdom. We looked at a sample of patients who died in hospital during their admission due to a new diagnosis of heart failure, or an acute episode of their chronic heart failure. Case note review helps to answer the questions raised by the national audit by providing a more in-depth analysis of clinical care including a qualitative assessment of clinical practice in individual cases.

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1

Method and Data Returns

Back to contents

Study Advisory Group

The Study Advisory Group (SAG) comprised a multidisciplinary group of clinicians in: cardiology, acute medicine, critical care, palliative care, emergency medicine, specialist heart failure nursing, specialist outreach nursing, specialist cardiology pharmacist, ambulance service and lay persons.

Study aim

To identify and explore avoidable and remediable factors in the process of care for patients with acute heart failure admitted to hospital as an emergency, and who died during the admission.

Objectives

The Study Advisory Group identified a number of objectives that would address the primary aim of the study:

- Prompt recognition and diagnosis of heart failure and rapid initiation of a heart failure pathway
- Appropriate documentation and management of heart failure
- Prompt senior review and follow-up throughout admission
- Escalation of care decisions and planning including admission to critical care
- Assessing multidisciplinary team approach
- Assessing adequate communications with patient, families and carers
- Examining the management of the 'acute' end of life pathway and ceilings of treatment including appropriateness of interventions
- Equity of access for mechanical support / transplant centre and escalation decisions
- Organisational aspects of care delivery for heart failure patients on acute, general or cardiology wards to include aspects of staff training.

Hospital participation

National Health Service hospitals in England, Scotland, Wales and Northern Ireland were expected to participate as well as public hospitals in the Isle of Man, Guernsey and Jersey.

Within each hospital, a named contact, referred to as the NCEPOD Local Reporter, acted as a link between NCEPOD and the hospital staff, facilitating case identification, dissemination of questionnaires and data collation.

Study population and case ascertainment

All adult patients (aged 16 and older) who were admitted as an emergency between 1st January 2016 and 31st December 2016 inclusive with a primary diagnosis of heart failure (ICD10 codes: I11.0, I25.5, I42.0, I42.9 and I50.0, I50.1, I50.9) and died in hospital were included. A subpopulation of patients who died in hospital within seven days of admission were selected for detailed review of their care.

Questionnaires and case notes

Two questionnaires were used to collect data for this study; a clinician questionnaire for each patient and an organisational questionnaire for each hospital participating in the study.

Clinician questionnaire

This questionnaire was sent to the consultant responsible for the patient at the time of their death. If the consultant was not the most suitable person to complete the questionnaire they were asked to identify a more appropriate consultant. Information was requested on the patient's presenting features/comorbid conditions, previous hospital attendances/ interventions for heart failure, initial management, investigations, complications, escalation in care and palliation.

Organisational questionnaire

The data requested in this questionnaire included information on the staff that manage patients with heart failure, guidelines and standard operating procedures relevant to the management of patients with acute heart failure, availability of specific investigations and interventions.

Case notes

Copies of case note extracts were requested for each case that was to be peer reviewed:
Final inpatient admission

- All inpatient medical notes
- Ambulance service Patient Report Form/notes
- General practitioner referral letter
- Emergency department clerking proforma/records
- Nursing notes
- Critical care notes/charts
- Microbiology reports
- Blood gas reports
- Operation/procedure notes
- CT and other radiology investigation reports/ echocardiography/ECGs
- Anaesthetic charts
- Observation charts
- Haematology/biochemistry results
- Fluid balance charts
- Blood transfusion records
- Drug charts
- Heart failure pathway
- Nutrition/dietitian notes
- Physiotherapy notes
- Consent forms
- Do not attempt cardiopulmonary resuscitation (DNACPR)/treatment escalation forms
- Datix or other incident reports
- Discharge letter/summary
- Autopsy report if applicable.

In addition, for the twelve-months prior to this admission: any discharge summaries, outpatient letters, brain natriuretic peptide (BNP) results, and cardiac imaging (i.e. echocardiography and cardiac MRI results).

Peer review of the case notes and data

A multidisciplinary group of case reviewers was recruited from hospitals across the UK to peer review the case notes and associated clinician questionnaires. The group of case reviewers comprised consultants, trainees and clinical nurse specialists, from the following specialties: cardiology, anaesthesia, intensive care medicine, high dependency medicine, acute medicine, emergency medicine, pharmacy, physiotherapy and cardiac nursing.

Questionnaires and case notes were anonymised by the non-clinical staff at NCEPOD. All patient identifiers were removed and the case reviewers had no access to patient identifiable information.

After being anonymised, each case was reviewed by at least one reviewer within a multidisciplinary group. At regular intervals throughout the meeting the Chair allowed a period of discussion for each reviewer to summarise their cases and ask for opinions from other specialties or raise aspects of the case for discussion.

Case reviewers answered a number of specific questions using a semi structured electronic questionnaire and were encouraged to enter free text commentary at various points.

The grading system below was used by the case reviewers to grade the overall care each patient received:
Good practice: A standard that you would accept from yourself, your trainees and your institution.
Room for improvement: Aspects of **clinical** care that could have been better.
Room for improvement: Aspects of **organisational** care that could have been better.
Room for improvement: Aspects of both **clinical and organisational** care that could have been better.
Less than satisfactory: Several aspects of clinical and/or organisational care that were well below that you would accept from yourself, your trainees and your institution.
Insufficient data: Insufficient information submitted to NCEPOD to assess the quality of care.

Information governance

All data received and handled by NCEPOD complies with all relevant national requirements, including the Data Protection Act (DPA) 1998 and now GDPR 2016 (Z5442652), the NHS Act 2006 (PIAG 4-08(b)/2003, App No 007) and the NHS Code of Practice.

Quality and confidentiality

Each case was given a unique NCEPOD number. The data from all questionnaires received were electronically scanned into a database. Prior to any analysis taking place, the data were cleaned to ensure that there were no duplicate records and that erroneous data had not been entered during scanning. Any fields that contained data that could not be validated were removed.

Data analysis

Following cleaning of the quantitative data, descriptive data summaries were produced.

The qualitative data collected from the case reviewers' opinions and free text answers in the clinician questionnaires were coded, where applicable, according to content to allow quantitative analysis. The data were reviewed by NCEPOD Clinical Co-ordinators, a Clinical Researcher and two Researchers to identify the nature and frequency of recurring themes.

Case studies have been used throughout this report to illustrate particular themes.

All data were analysed using Microsoft Access™ and Excel™.

The findings of the report were reviewed by the Study Advisory Group, Reviewers, NCEPOD Steering Group including Clinical Co-ordinators, Trustees and Lay Representatives prior to publication.

Data returns

In total 4,768 patients were identified as meeting the study inclusion criteria (Figure 1.1). A sample of up to six cases per hospital was selected. This resulted in a total of 979 cases included in the main data collection. A large number of cases (369) were subsequently excluded (both originally sampled cases and reselections). In the majority of cases this was because on review of the case notes the patient was deemed not to have had an episode of acute heart failure. A total of 603/980 completed clinician questionnaires and 464 sets of case notes were returned to NCEPOD.

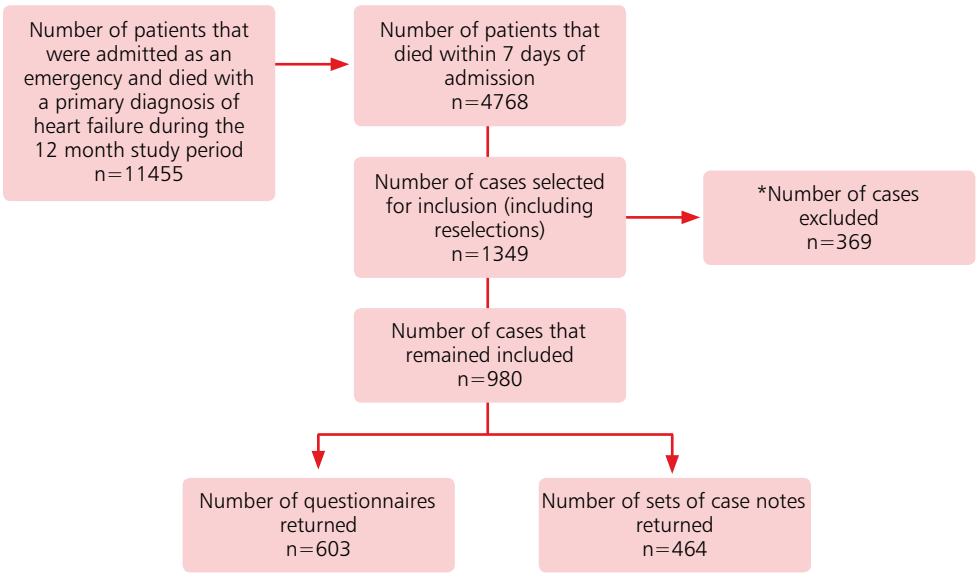

Figure 1.1 Data returns

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2

Organisation of heart failure services

Back to contents

Over several decades, new approaches to treatment have made the long term care of heart failure patients more complex. Increasingly effective drug management has improved outcomes.

Ventricular arrhythmias account for up to 50% of deaths in people with heart failure and reduced ejection fraction. The use of implantable cardioverter defibrillators has reduced mortality and in addition biventricular pacing (cardiac re-synchronisation therapy) has been shown to improve symptoms, reduce hospitalisation and prolong life in selected patients.These improvements in treatment, targeted at particular patients with heart failure, mean that investigation to make an accurate diagnosis of heart failure and of its cause is of great importance.

Good organisation of heart failure services has increased the use of drugs for chronic disease management in the outpatient clinic and the community. It has also improved access to devices. This has been shown to be associated with reduced mortality rates and a reduction in admission to hospital both due to heart failure and to other causes.[5]

For patients admitted to hospital with acute heart failure, guidelines recommend that hospitals provide an acute heart failure team and that patients have early and continuing input from this team.[4] Access to investigation to confirm the diagnosis and to guide treatment is also recommended in patients with suspected acute heart failure.[4] Audit data has shown both an increasing frequency of appropriate investigation (with echocardiography) and use of disease modifying drugs.[2] Appropriate heart failure management is more common when patients are seen by the heart failure team and/or looked after on cardiology wards and this is associated with improved outcomes.[2]

It is recommended that there should be one heart failure specialist per 100,000 population, and in departments with three cardiologists, one should have a heart failure interest.[2] Similarly, the European Society of Cardiology has set a target of one heart failure nurse per 100,000 population and that in tertiary cardiology units, at least a quarter of consultants are specialists in heart failure.[5]

It was reported that the majority (157/178; 88.2%) of hospitals stated that they had a specialist heart failure service (Table 2.1). Similarly 168/175 (96.0%) provided an outpatient service for heart failure (Table 2.2), and 156/178 (87.6%) a heart failure specialist nursing service (Table 2.3).

Table 2.1 Heart failure specialist service was available

	Number of hospitals	%
Yes	157	88.2
No	21	11.8
Total	**178**	

Table 2.2 Heart failure out-patient provisions was available

	Number of hospitals	%
Yes	168	96.0
No	7	4.0
Subtotal	**175**	
Not answered	3	
Total	**178**	

There were 147/174 (84.5%) hospitals with an identified lead clinician for heart failure and 131/177 (74.0%) with a specialist nurse lead for heart failure (Figure 2.3). Of the 157 hospitals that stated they had a specialist heart failure service there were 21/154 that did not have a medical lead and 37/156 with no nursing lead.

Figure 2.1 shows the number of whole time equivalent cardiologists reported. Of the 158 hospitals, from which a response was received, with three or more cardiologists, 146 (92.4%) stated that they met the recommendation and had at least one with a special interest in heart failure (Figure 2.2). In 61/165 (37.0%) hospitals, there was a single heart failure specialist.

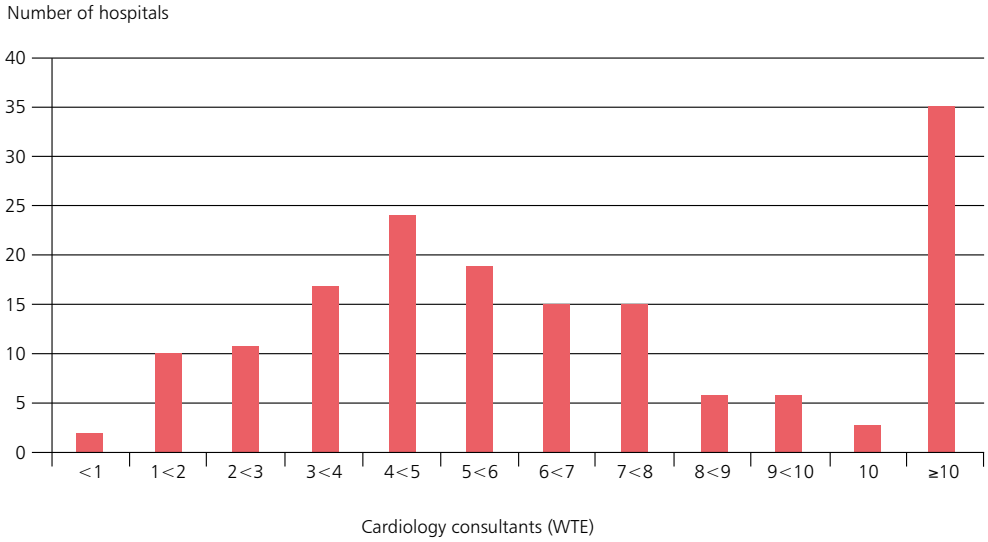

Figure 2.1 Number of whole time equivalent cardiologists for 147/157 hospitals

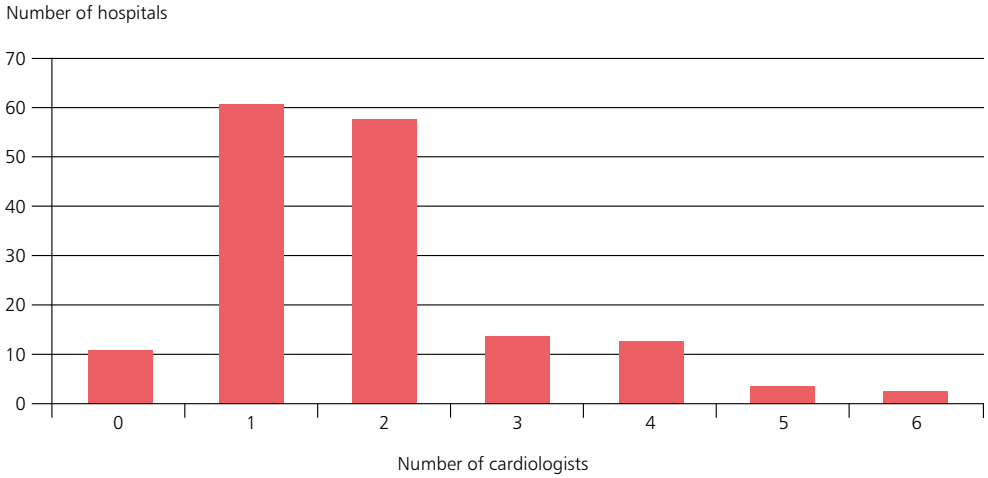

Figure 2.2 Number of whole time equivalent cardiologists with a special interest in heart failure

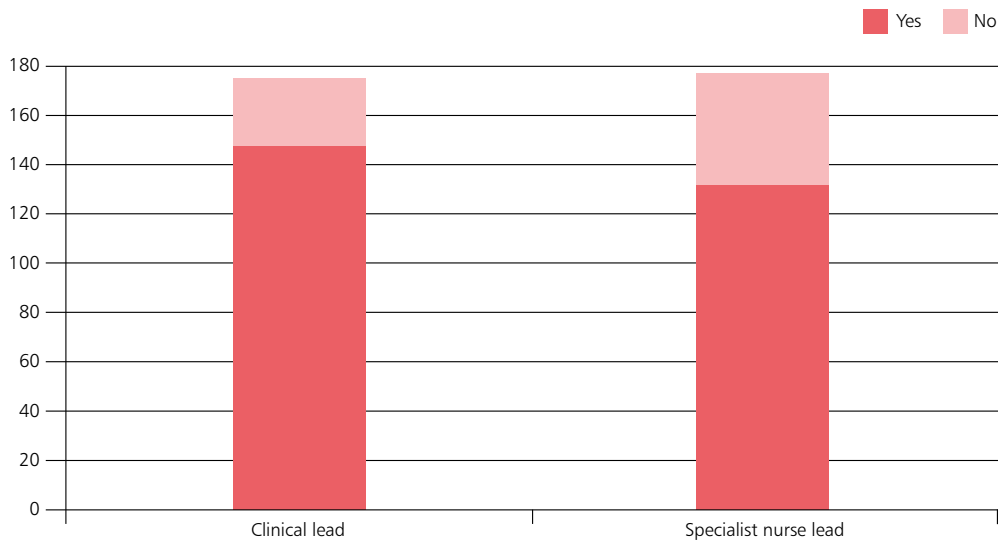

Figure 2.3 Identified heart failure leads

Table 2.3 Heart failure specialist nursing service was available

	Number of hospitals	%
Yes	156	87.6
No	22	12.4
Total	**178**	

Of the 168 hospitals that provided heart failure outpatient services, the most common model of service included nurse-led clinics (131 hospitals). For medically-led clinics, there was a split between specific heart failure clinics (102 hospitals) and seeing heart failure patients as part of a general cardiology clinic (82 hospitals) (Table 2.4).

Table 2.4 Types of heart failure clinics

	Number of hospitals
Heart failure clinics (nurse-led)	131
Heart failure clinics (doctor-led)	102
General cardiology clinics	82
Heart failure clinics (pharmacy-led)	13

Waiting time targets for outpatient assessment are two weeks for patients with brain natriuretic peptide (BNP) levels >2000 and six weeks if the BNP level is <2000.[17] Just over half of all hospitals had a rapid access heart failure clinic (91/174; 52.3%) (Table 2.5). The target waiting time to access this clinic was two weeks or less for the majority of hospitals (72/86; 83.7%). This two-week target was achieved in 51/79 (64.6%) (Figure 2.4).

Table 2.5 Rapid access heart failure clinic was available

	Number of hospitals	%
Yes	91	52.3
No	83	47.7
Subtotal	**174**	
Not answered	4	
Total	**178**	

Figure 2.4 Rapid access heart failure clinic

Guidelines emphasise the importance of echocardiography in defining cardiac dysfunction.[5] The ideal service model provides direct access to this investigation in the outpatient clinic. Almost all hospitals (175/178) had an echocardiography service on-site (data not shown). Of the 168 hospitals that provided heart failure outpatient services, 95 (57.2%) provided an 'on demand' service for echocardiography, where echocardiography was immediately available within the heart failure clinic (Table 2.6). Many services therefore have the potential to improve access to this important investigation within the heart failure clinic.

Table 2.6 Echocardiography is available on demand in the heart failure clinic

	Number of hospitals	%
Yes	95	57.2
No	71	42.8
Subtotal	**166**	
Not answered	2	
Total	**168**	

Inpatient assessment with echocardiography is also important to help guide treatment in acute heart failure. Guidelines recommend that an echocardiogram is performed within 48 hours of admission in new suspected heart failure.[4]

The waiting time for inpatient echocardiography is shown in Figure 2.5 for 175 hospitals. There were 59 (33.7%) hospitals that had a service to provide echocardiogram within the first 24 hours of admission, and a further 56 (32.0%) within 48 hours. Twenty-two hospitals did not meet the recommended standard of echocardiography within 48 hours. There were also 48 hospitals where the waiting time for echocardiography was not known. For all hospitals, monitoring performance to ensure the 48 hour standard is achieved has the potential to improve early access to specialist heart failure treatment.

For patients with chronic heart failure, regular clinical review, at least every six months, and more frequently in unstable patients, has been previously recommended.[3] This review involves a combination of clinical assessment, review and titration of medication doses, and monitoring of kidney function. Long term disease management generally involves a combination of community and outpatient assessment and monitoring. There were 148/178 (83.1%) hospitals that provided access to a community heart failure team as part of the heart failure service (Table 2.7). The service model for most (120) of these teams provided cover on weekdays during normal working hours (Table 2.8).

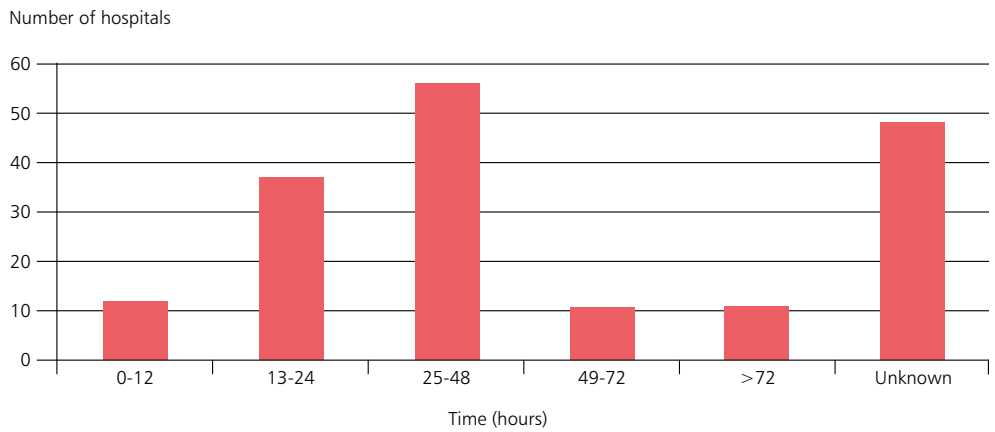

Figure 2.5 Waiting time for inpatient echocardiography

European guidelines have recommended that even stable patients with established heart failure receive annual specialist review.[5] Specialist review at least annually was offered for all heart failure patients (excluding palliative care patients) in 61/169 (36.1%) hospitals who gave an answer (data not shown).

Table 2.7 Patients had access to a community heart failure team

	Number of hospitals	%
Yes	148	83.1
No	30	16.9
Total	**178**	

Table 2.8 Hours covered by the community heart failure team

	Number of hospitals
Weekday 9-5	120
Weekday extended hours	9
Alternative hours	5
7 days 9-5	1
7 days extended hours	2
Unknown	11
Total	**148**

National audit data shows that inpatient mortality is lower when patients are reviewed by a cardiologist.[2] For inpatients, service organisation for out of hours cover varied between hospitals. Supervision of care out of hours was provided either by a cardiology consultant on-call rota or by the general medical consultant on-call rota in approximately equal numbers of hospitals (Table 2.9). This reflects the variation in organisation of out of hours services between hospitals.

Table 2.9 Provision of out of hours medical supervision of heart failure

	Number of hospitals	%
General medical consultant on-call rota	63	35.4
Cardiology/general medical consultant on-call rota	53	29.8
Cardiology consultant on-call rota	59	33.1
Other	3	1.7
Total	**178**	

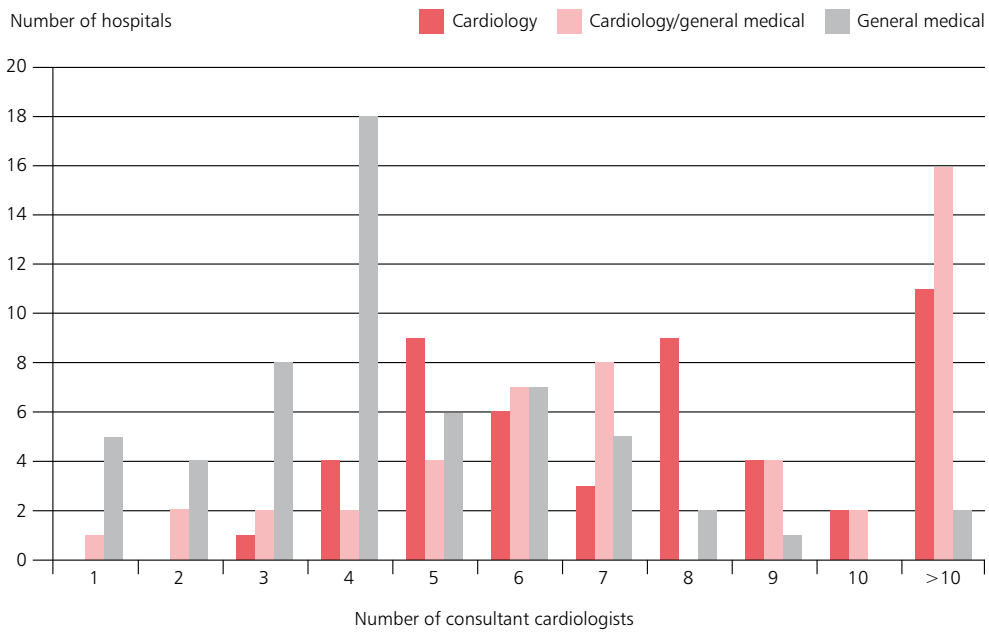

Figure 2.6 Medical supervision of heart failure by number of consultant cardiologists

Figure 2.6 shows the out of hours arrangements for cardiology cover plotted against the number of consultant cardiologists available in each hospital to provide that cover. Hospitals with a greater number of cardiologists are better placed to run a separate on-call rota. Of the 63 hospitals where cover was provided by the general medical on-call rota, nine had one or two cardiologists and 17 (27.0%) had six or more. Of the hospitals that ran a separate cardiology on-call rota was run, 39/59 (66.1%) had six or more cardiologists.

Rehabilitation services

Rehabilitation is an important part of the care provided to patients with heart failure. Guidance now suggests that a rehabilitation programme including exercise, psychological and educational components is offered for patients with chronic heart failure.[3] Despite the guidance suggesting this intervention it has previously been found that only a minority of patients with heart failure are involved in cardiac rehabilitation and that a significant minority of hospitals across both the United Kingdom and Europe have not introduced rehabilitation for heart failure patients.[6]

Just over four out of five hospitals (148/178; 83.1%) offered a cardiac rehabilitation service (Table 2.10). These services will have been established to provide rehabilitation for patients with coronary disease who constitute the largest proportion of patients who start rehabilitation.

Table 2.10 Cardiac rehabilitation service was provided at the hospital

	Number of hospitals	%
Yes	148	83.1
No	30	16.9
Total	**178**	

There were 60 of 148 hospitals from which data on waiting times for this service was not available. The waiting time for rehabilitation is shown in Figure 2.7 for the 88 hospitals from which data were provided.

Access to these rehabilitation services is important for heart failure patients. The most up-to-date audit data (2015-16) showed that only 5.3% of patients starting rehabilitation had underlying heart failure.[7]

Of 148 hospitals, the majority (83) were not able to provide data on the number of heart failure patients who had attended cardiac rehabilitation. For the hospitals from which data were provided, the numbers that attended rehabilitation in 2016 are listed in Figure 2.8. It was reported from 29 hospitals that thirty or fewer patients had attended rehabilitation.

Despite guidelines that suggest that rehabilitation should be available for heart failure patients, there is clearly room for improvement in service organisation. Action is needed to ensure that heart failure patients have access to these services.

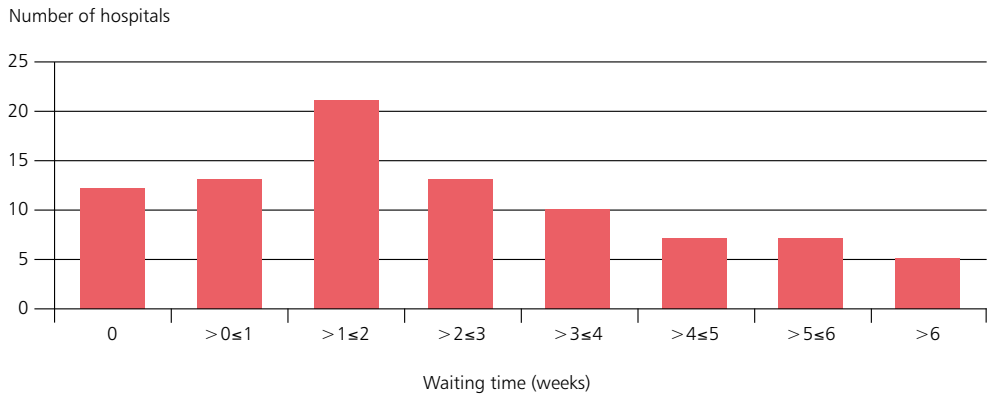

Figure 2.7 Waiting time for rehabilitation

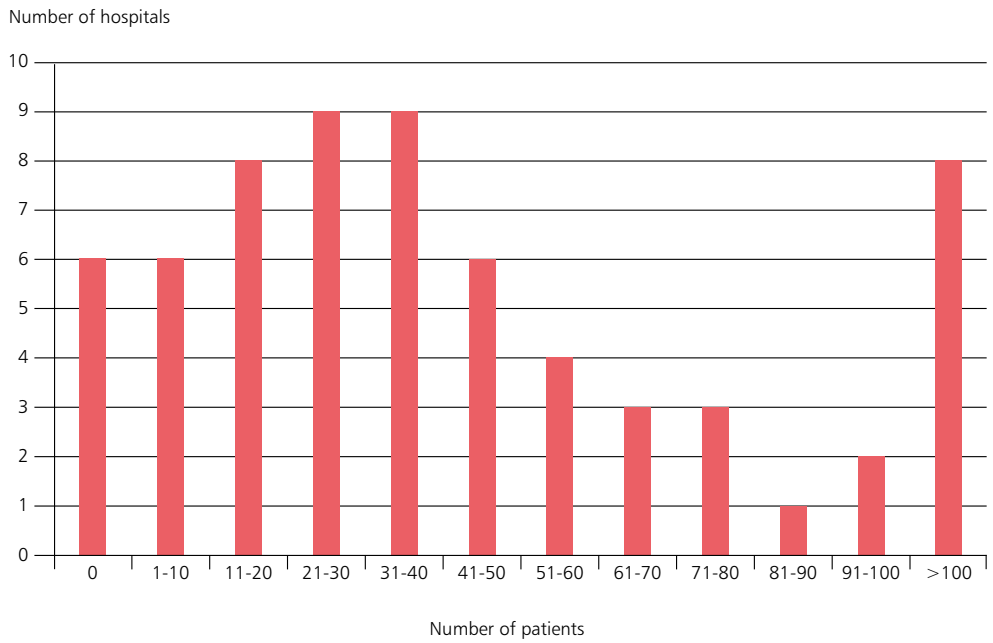

Figure 2.8 Number of heart failure patients attending rehabilitation

Investigations and specialist heart failure management

Specific investigations contribute both to making an accurate diagnosis (including the type of heart failure, its cause, and severity) and to providing optimal management of heart failure. Of 171 hospitals, 144 (84.2%) used measurement of natriuretic peptides and 165 (96.5%) had access to echocardiography. Almost half of the hospitals provided resynchronisation therapy (85 hospitals) or an implantable cardioverter/defibrillator service (87 hospitals) (Table 2.11).

Table 2.11 Investigations available

Service	Number of hospitals	(%)
2D echocardiography	165	96.5
Transthoracic Doppler echocardiography	152	88.9
BNP/NT pro BNP	144	84.2
Implantable cardioverter defibrillator (ICD)	87	50.9
Cardiac resyncronisation therapy device (CRTD)	85	49.7
Other (specified)	29	17.0
Surgical aortic valve replacement	27	15.8
Transcatheter aortic valve implantation	25	14.6
Ventricular assist device	5	2.9

Answers may be multiple; n=171

Guidelines and policies

Guidelines help to standardise the care that patients receive. This is particularly important for hospitals where care is not always provided by the specialist team (such as those where out of hours cover is provided by general physicians). There were 119/178 (66.9%) hospitals that had a guideline or protocol for acute heart failure (Table 2.12). Of these hospitals, 78/118 (66.1%) hospitals stated that their protocol was the same as the national guideline (Table 2.13).

Table 2.12 Hospital guideline/protocol for acute heart failure was available

	Number of hospitals	%
Yes	119	66.9
No	59	33.1
Total	**178**	

Table 2.13 Local guideline/protocol was the same as the national guidelines

	Number of hospitals	%
Yes	78	66.1
No	40	33.9
Subtotal	**118**	
Not answered	1	
Total	**119**	

Table 2.14 shows that the hospitals that did not have a guideline were not necessarily those without a lead clinician for their service. There were 44 hospitals with a lead clinician but with no guideline or protocol for acute heart failure.

Table 2.14 Comparison of whether the hospital has a guideline/protocol for acute heart failure and whether they have an identified heart failure lead clinician

	Identified heart failure lead clinician			
Guideline/protocol for acute heart failure	Yes	No	Not answered	**Total**
Yes	102	15	2	**119**
No	44	12	3	**59**
Total	**146**	**27**	**5**	**178**

Table 2.15 summarises the areas covered by guidelines from 119 hospitals and illustrates that areas such as medical therapy and standardised investigation (including ECG and BNP measurement) were the most uniformly included areas of practice. 87/119 hospitals reported including referral criteria for resynchronisation therapy or cardioverter/ defibrillator insertion. Fewer guidelines (but still a majority of hospitals) included aspects of primary care, rehabilitation and palliative care referral. There was therefore some variability between organisations in the guidance provided and there is room for more standardisation to ensure equal access to investigation and treatment for patients.

Table 2.15 What the guideline/protocol included

	Number of hospitals	%
Medical therapy guidance	115	96.6
Treatment / medication in hospital	113	95.0
Standardised investigation protocol	105	88.2
Standard initial investigation including BNP and ECG	104	87.4
Referral guidance for primary care	89	74.8
Standards / referral pathway for ICD / CRT referral	87	73.1
Treatment / medication in primary care	87	73.1
Guidance on cardiac rehabilitation	80	67.2
Guidance on referral to palliative care services	76	63.9
Guidance on the frequency of follow up required	65	54.6
Guidance on referral for transplantation	40	33.6
Guidance on use of LV assist devices	32	26.9

Answers may be multiple; n=119

It is recommended by NICE that following an admission with acute heart failure, patients should have a follow-up clinical assessment by a member of the community or hospital specialist heart failure team.[1] Table 2.16 lists the services offered to patients following an acute admission with heart failure in 173 hospitals. As already noted, not all hospitals had specialist heart failure teams. Follow-up by a specialist team in either the hospital or the community was available in 168/173 hospitals.

Table 2.16 Service provided after an acute admission with heart failure

	Number of hospitals	(%)
Enhanced self care	97	56.1
Telephone follow-up	113	65.3
Primary care follow-up	102	59.0
Community heart failure team follow-up (in GP surgery)	98	56.6
Community heart failure team follow-up (home visits)	139	80.3
Access to tele-monitoring	43	24.9
Multiprofessional (community) heart failure clinic	63	36.4
Multiprofessional (hospital) heart failure clinic	124	71.7
Community palliative care team follow-up (when relevant)	137	79.2

Answers may be multiple; n=173

For patients with chronic heart failure in an out-patient setting, a self-management plan can be used to improve symptom control for patients with heart failure and has been shown to reduce both readmissions for heart failure and readmissions due to other causes.[8] The British Heart Foundation provides useful patient-centred advice to help individuals deal with symptoms and medications.[9] In three quarters of hospitals (129/171; 75.4%), a written self-management plan was provided to patients (Table 2.17).

Table 2.17 Patients under the heart failure service received a written self-management plan

	Number of hospitals	%
Yes	129	75.4
No	42	24.6
Subtotal	**171**	
Not answered	7	
Total	**178**	

In hospitals where a self-management plan was provided, this included advice on daily weight measurement (127/129 hospitals) and frequently included the regular recording of heart failure symptoms (111/129 hospitals) (Table 2.18).

In the out-patient setting, self-management can include regular weight measurements at home. These can help identify fluid retention which would eventually result in acute worsening. Weight gain over consecutive days can be used to identify the need to increase the dose of diuretics. This can pre-empt deterioration and subsequent admission. Whether this type of advice is appropriate depends on whether individual patients (and carers) are willing and/or able to take responsibility for self-management. Specific advice on diuretic dose adjustment or self-administration was included in 85/129 and 88/129 respectively.

Table 2.18 Criteria included in self management plan

	Yes	No
Includes a daily weight measurement	127	2
Includes criteria for dose adjustment of diuretics	85	44
Includes self administration of diuretics	88	41
Includes regular recording of heart failure symptoms	111	18

Provision of more consistent self-management plans would ensure that patients across the whole system receive the same standard of care.

Inpatient care

The organisation of care for acutely ill medical patients has changed in the last two decades with the establishment of acute medical units and more recently the development of ambulatory care services. For some patients such as patients with heart attacks or stroke, where time-critical intervention is needed, pathways have been developed to ensure direct access to specialist units for immediate treatment and ongoing care. The advantage of these arrangements is that patients receive both early disease specific treatment and early input from an appropriate specialist. Outcomes have improved as a result.

For acute heart failure patients, it is recommended that they are reviewed by a specialist heart failure team within 24 hours of admission to hospital.[1] No specific recommendation has been made about the location of care. It has however been shown that patients with heart failure treated on a cardiology ward more frequently receive appropriate investigations and heart failure specific treatment and this is associated with lower mortality rates.[2] It was reported that the majority of hospitals (154/178; 86.5%) had specific cardiology ward beds (Table 2.19).

Table 2.19 Cardiology ward beds available

	Number of hospitals	%
Yes	154	86.5
No	24	13.5
Total	**178**	

Weakening of the heart muscle due to a heart attack or coronary artery disease (ischaemic cardiomyopathy) is one of the most common causes of heart failure. Rapid access to percutaneous coronary intervention (known as PCI or angioplasty and stenting) is important to restore the coronary circulation and prevent further heart muscle damage in patients with acute coronary syndromes.

Just over two-thirds of hospitals (127/178; 71.3%) had a cardiac catheter laboratory (Table 2.20). There were 126/178 (70.8%) hospitals able to provide a coronary angiography service (Table 2.21). Of the 127 hospitals with a catheter laboratory, 80 (63.0%) were able to provide an on-site PCI service (Table 2.22). Treatment of acute coronary syndromes with PCI is time critical. Rapid access to coronary intervention is therefore important. No data were collected on the hours that PCI services were available.

Table 2.20 Cardiac catheter labs available

	Number of hospitals	%
Yes	127	71.3
No	51	28.7
Total	**178**	

Table 2.21 Coronary angiography available

	Number of hospitals	%
On-site	126	70.8
Off-site	39	21.9
Unavailable	13	7.3
Total	**178**	

Table 2.22 On-site percutaneous coronary intervention service available

	Number of hospitals	%
Yes	80	63.0
No	47	37.0
Total	**127**	

Palliative care services

Heart failure is a progressive disease which eventually becomes less responsive to treatment. In advanced heart failure, physical symptoms become more prevalent. The goal of treatment changes from managing the underlying disease to symptom management. At this stage, involvement of palliative care specialists can help with active control of physical symptoms as well as providing psychological support for patients and families.

The majority of hospitals (171/175; 97.7%) provided a palliative care service for heart failure patients (Table 2.23).

Table 2.23 Palliative care services available for heart failure patients

	Number of hospitals	%
Yes	171	97.7
No	4	2.3
Subtotal	**175**	
Not answered	3	
Total	**178**	

The type of service provided is summarised in Table 2.24. Most palliative care was in the form of a general involvement of these teams in the acute hospital and access to hospice services. Half of hospitals (85/169; 50.3%) had specific palliative care consultant ward rounds (Table 2.25). Less than a third of hospitals had a palliative care clinician included in the heart failure multidisciplinary team. There were 22/163 (13.5%) hospitals where heart failure patients were not able to access hospice services.

Table 2.24 Type of palliative care service available

	Number of hospitals	%
Review by palliative care team in the hospital	146	89.5
Access to hospice services (in patients, day care, community services) for people with heart failure	141	86.5
Referral criteria for palliative care	112	68.7
Palliative care clinician on the heart failure MDT	48	29.4
A dedicated palliative care heart failure MDT	17	10.4
Joint ward rounds	14	8.6
Other (specified)	6	3.7

Answers may be multiple; n=163

Table 2.25 Consultant sessions with ward rounds dedicated to palliative or end of life care available

	Number of hospitals	%
Yes	85	50.3
No	84	49.7
Subtotal	**169**	
Unknown	9	
Total	**178**	

Key Findings

- A specialist inpatient heart failure service was available at 157/178 (88.2%) hospitals
- Outpatient provisions for heart failure patients were provided in 168/175 (96.0%) hospitals
- 146/158 (92.4%) of hospitals in which there were three or more cardiologists had at least one with a specialist interest in heart failure
- An on-site echocardiography service was available at 165/171 (96.5%) hospitals
- An 'on demand' service for echocardiography within the outpatient heart failure clinic, was available at 95/166 (57.2%) of hospitals
- A rapid access heart failure clinic was available at 91/174 (52.3%) hospitals. The target waiting time to access this clinic was two weeks or less for the majority of hospitals (72/86; 83.7%). This two-week target was achieved in 51/79 (64.6%)
- The waiting time for echocardiogram was less than 48 hours from admission in 115/175 (65.7%) hospitals. The recommended waiting time of less than 48 hours was not met at 22 hospitals and for a further 48 the waiting time for echocardiography was not known
- Supervision of care out of hours was provided either by a cardiology consultant on call rota (59/178; 33.1%) or by the general medical consultant on call rota (63/178; 35.4%) in approximately equal numbers of hospitals
- A cardiac rehabilitation service was available at 148/178 (83.1%) hospitals. The waiting time for this service was unknown for 60/148 hospitals (40.5%)
- A guideline or protocol for acute heart failure was available at 119/178 (66.9%) hospitals. 78/118 (66.1%) used the national guideline
- Follow up by a specialist team in either the hospital or the community was provided by 168/173 hospitals
- In three quarters of hospitals (129/171; 75.4%), a written self-management plan was provided to patients
- A palliative care service for heart failure patients was provided at the majority of hospitals (171/175; 97.7%).

SEE RECOMMENDATIONS
1•3•6•10•11•13•14

**Please refer to the chapter tables for the changes in denominator*

3

Study population

Back to contents

The study sample population was taken from a total of 9,570 patients who died in hospital during the study period within 30 days of admission following an acute admission with heart failure in 2016 (Figure 3.1). Of these patients, 4,371 (45.7%) died before the end of the seventh day of admission. Figure 3.2 shows the time to death for the study population.

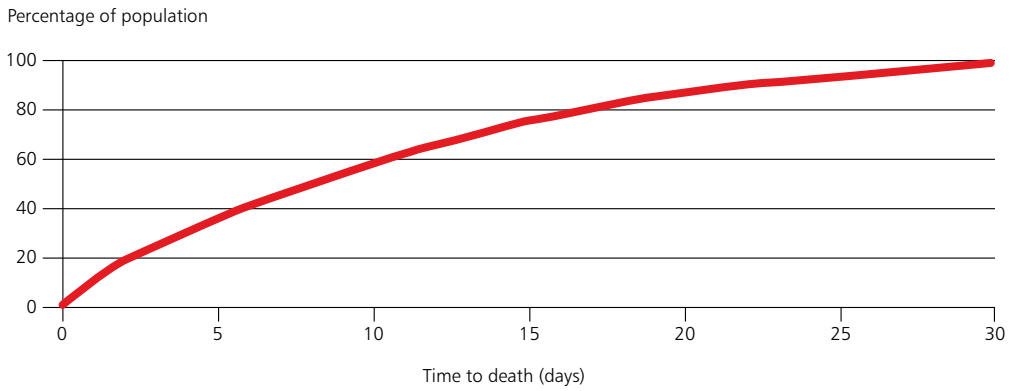

Figure 3.1 Time to death *(whole study population; n=9,570)*

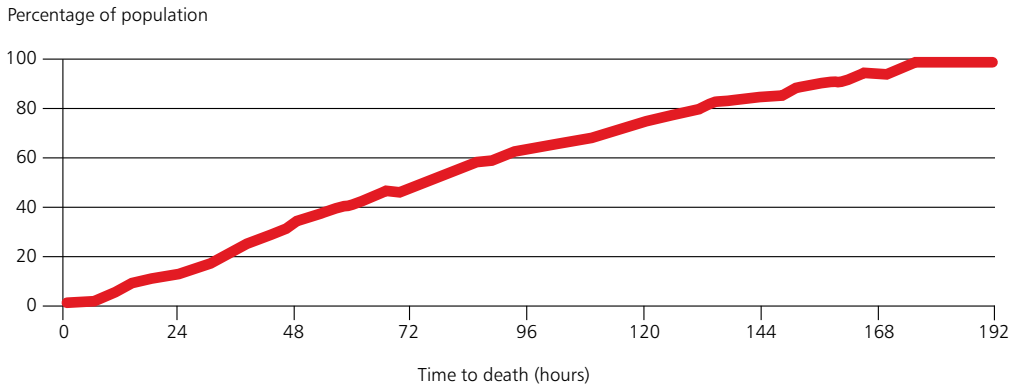

Figure 3.2 Time from admission to death *(sample study population; n=402)*

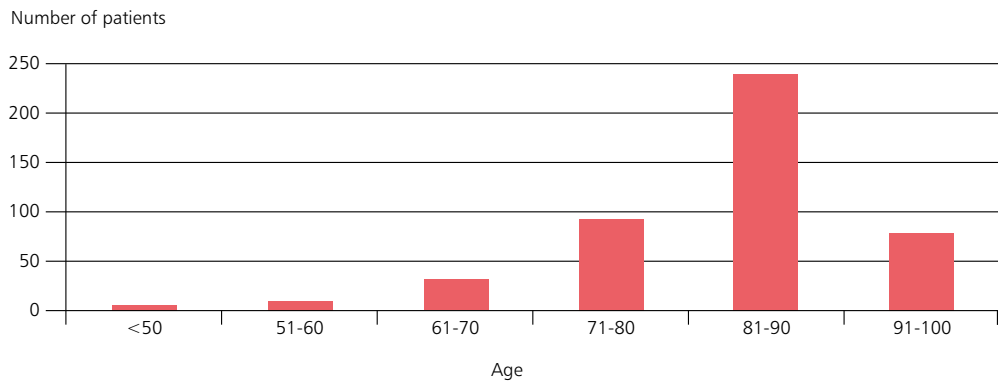

Figure 3.3 Age distribution of the study population

The average age of patients included in the national heart failure audit was 78 years and just over a third (35%) of these patients had symptoms at rest or on minimal exertion (New York Heart Association (NYHA) category IV) [10,2] (Appendix 1).

Noting that the current study selected the sub-group of the general population of patients with heart failure, who died before the end of the seventh day of an admission with acute heart failure, there were slightly more male (246/464; 53%) than female (218/464; 47%) patients (Table 3.1 and Figure 3.3). The average age of the peer reviewed patients included was 82.5 years, (male 80.1 / female 85.2) and 195/576 (33.9%) of the patients included were in the NYHA class IV category (Figure 3.4).

Table 3.1 Age and sex

	Female	Male	All
Mean	85.2	80.1	82.5
Median	87	82.5	85
Total	**218**	**246**	**464**

The Karnofsky performance status scale is commonly used to record the level of physical functioning in cancer patients.[11] This scale has better discriminatory value than the NYHA classification of heart failure when identifying patients who are reaching the end of their life. This can therefore be helpful in identifying patients for whom palliative care input would be valuable.

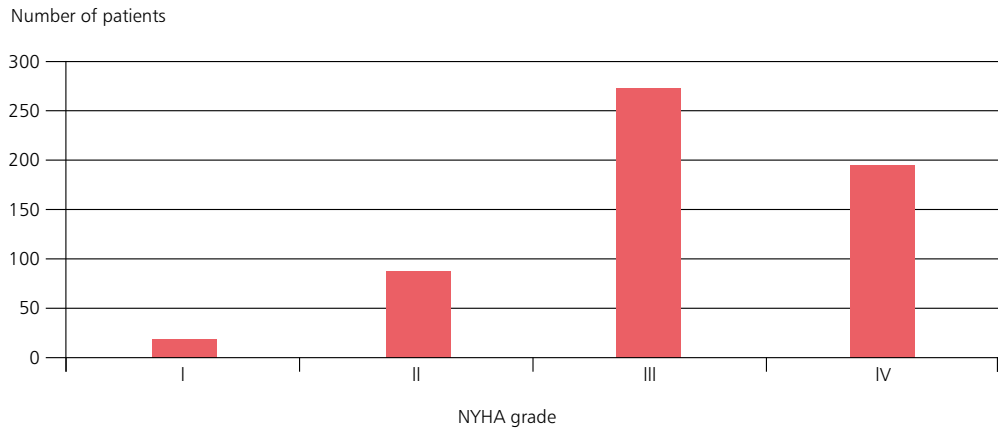

Figure 3.4 NYHA classification *(n=576)*

Clinical frailty is recognised as a syndrome associated with poor clinical outcome and has been shown to be an independent predictor of inpatient mortality. The Rockwood clinical frailty scale is a widely used tool used for the assessment of frailty in older patients.[12] Frailty is known to be common in heart failure patients. It has been suggested that patients with a high degree of frailty should have closer contact with the heart failure team, and more frequent follow up and monitoring.[13]

The functional status during the period before hospital admission of the patients included in this study was recorded with both the Karnofsky (10 point) and Rockwood (9 point) scales.

For patients admitted to acute medical units in the UK, 18% have a Rockwood score between six and nine (moderately frail or worse).[14] Of the patients included in this study, 328/458 (71.6%) were at least moderately frail (Figure 3.5). This was therefore a group of patients with major impairment of functional status and at high risk of death.

The disease trajectory for patients with heart failure is not one of progressive deterioration but of acute exacerbations. Most acute admissions are triggered by potentially reversible conditions such as coronary ischaemia, arrhythmia or infection. Prompt treatment of the underlying cause can help return the patient to their previous baseline.[15]

However, some patients with advanced heart failure are already on maximal treatment under the care of the specialist heart failure team and deteriorate despite this. There may be limited benefit from additional intervention and palliation of symptoms may be more appropriate.

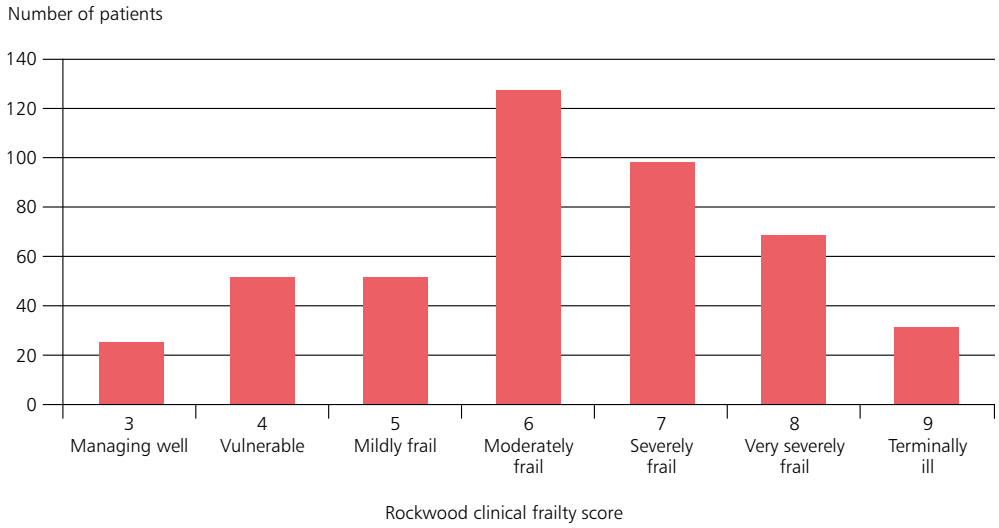

Figure 3.5 Rockwood clinical frailty score *(n=458 (72% score 6-9))*

The Karnofsky score in the period prior to admission for 463 patients is shown in Figure 3.6. Of these patients, 155/463 (33.5%) were rated as Karnofsky 10% (moribund; fatal processes progressing rapidly) or 20% (very sick; hospital admission necessary; active supportive treatment necessary) suggesting imminent death. Of these patients, 127 had an established diagnosis of heart failure.

There was considerable overlap between these two scales in the population studied; patients with a high Rockwood score (increased frailty) most commonly being scored as a low percentage on the Karnofsky scale (poor functional status) (See Figure 3.7).

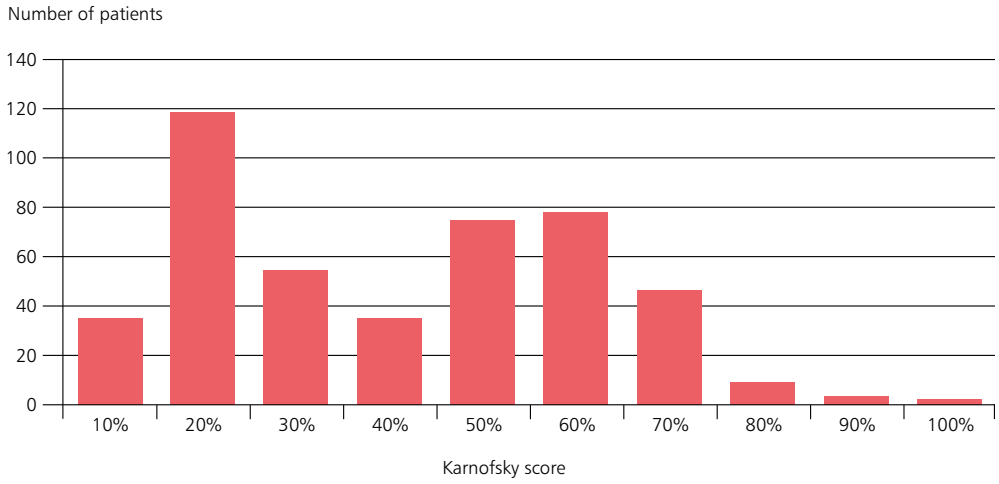

Figure 3.6 Karnofsky score *(n=463 patients)*

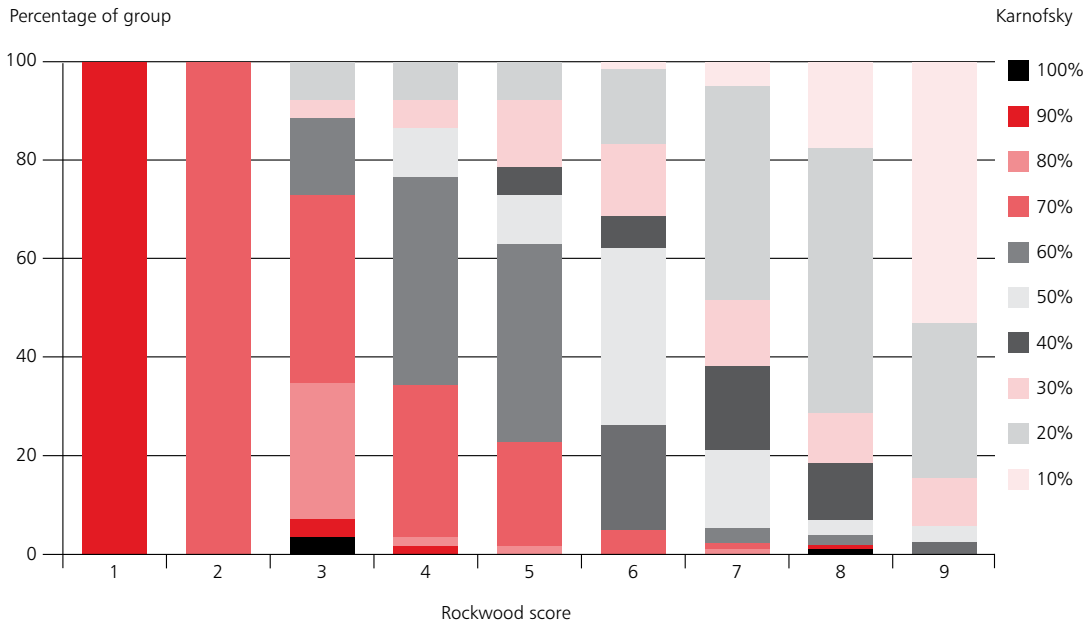

Figure 3.7 Rockwood groups cross referenced with Karnofsky categories *(n=460)*

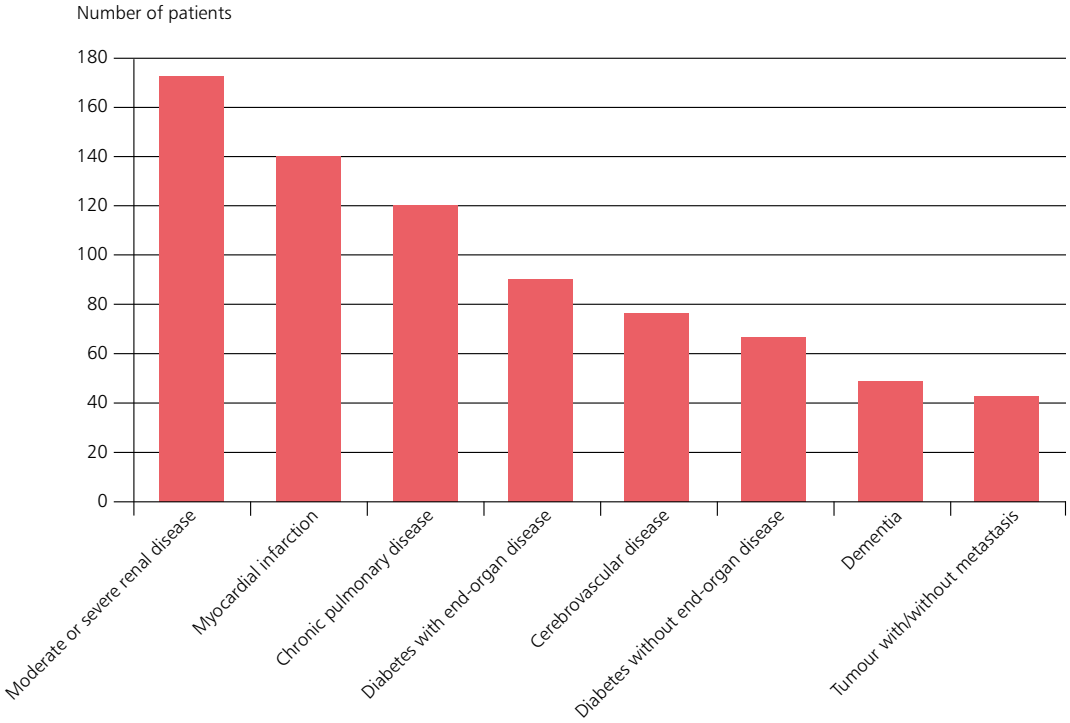

Figure 3.8 Common co-morbidities (number of patients)

For a patients with a Rockwood score of six (moderately frail), 94/128 (73.4%) had a Karnofsky score of 50% (requires considerable assistance and frequent medical care) or less. The percentage of cases with this degree of impaired performance rose in the higher Rockwood categories to seven (93/99; 93.9%), eight (66/69; 95.7%) and nine (31/32; 96.9%).

Of the patients with a Rockwood score of 1-5, 34/132 (25.8%) had a Karnofsky score of 50% or less. If the Rockwood score was 6-9, 284/328 (86.6%) patients had a Karnofsky score in this range.

The high prevalence of coexisting medical problems adds to the complexity of managing patients with heart failure. Lung diseases, in particular, can lead to signs and symptoms that can be difficult to distinguish from those of heart failure. The presence of renal disease can also result in difficulty in making decisions about fluid management and diuretic treatment which are key elements of the management of heart failure.

The co-morbid conditions used in the Charlson co-morbidity index were recorded for each patient.[16] In the study population, 449/464 (96.8%) patients had at least one of these co-morbid conditions. In both the national heart failure audit, and a survey of acute heart failure patients admitted to hospital in Europe, diabetes was present in a third of patients.[2,17] Diabetes was present in 158/464 (34.1%) of the patients in this study. The most common co-morbidities in the patients studied were moderate or severe renal disease in 173/464 (37.3%), previous myocardial infarction in 140/464 (30.2%) and chronic obstructive pulmonary disease (COPD) in 121/464 (26.1%) (Figure 3.8).

The incidence of renal disease and COPD in the study population was higher than reported in a general population of acute heart failure patients reported elsewhere.[17]

The number of co-morbid conditions in individual patients has a strong influence on outcome. There were 308/464 (66.4%) patients who had at least one of the commonest non-cardiac co-morbidities (renal disease, COPD and diabetes). Of these patients, 185 had only one of these co-morbid conditions, 102 had two and 21 had all three.

Key Findings

- The average age of the peer reviewed patients was 82.5 years
- 195/576 (33.9%) of the patients included were in the NYHA class IV category
- 328/458 (71.6%) patients were at least moderately frail
- The commonest co-morbidities were moderate or severe renal disease in 173/464 (37.3%), previous myocardial infarction in 140/464 (30.2%) and chronic obstructive pulmonary disease (COPD) in 121/464 (26.1%).

**Please refer to the chapter tables for the changes in denominator*

Previous heart failure management

Back to contents

The majority of patients (452/579; 78.1%) in the study had a prior diagnosis of heart failure (Table 4.1) and where it could be identified, more than three quarters (331/431; 76.8%) of patients had been diagnosed more than a year prior to the final admission (Table 4.2).

Table 4.1 Previous diagnosis of heart failure

	Number of patients	%
Yes	452	78.1
No	127	21.9
Subtotal	**579**	
Not answered	24	
Total	**603**	

Table 4.2 Time since diagnosis of heart failure

	Number of patients	%
< 3 months	49	11.4
3-6 months	23	5.3
>6-9 months	17	3.9
>9-12 months	11	2.6
>12 months	331	76.8
Subtotal	**431**	
Not answered	21	
Total	**452**	

In 391/452 (86.5%) patients where the underlying cause of heart failure was recorded, this was most commonly due to coronary artery disease (ischaemic) (220/391; 56.3%). Valvular disease was the cause in 107/391 (27.4%) cases reviewed.

In 61/452 (13.5%) patients the underlying cause was unknown (Table 4.3).

Table 4.3 Underlying cause of heart failure

	Number of patients	%
Ischaemic cardiomyopathy	220	56.3
Valvular	107	27.4
Hypertension	88	22.5
Tachyarrhythmia/tachycardia	44	11.3
Non Ischaemic cardiomyopathy	26	6.6
Right heart failure	9	2.3
Other	8	2.0

Answers may be multiple; n=391

For patients with established (chronic) heart failure, regular monitoring is required at least six-monthly and more frequently after treatment changes are made.[3] For patients with advanced heart failure (NYHA grade IV), management by a specialist multidisciplinary heart failure team is recommended.[3]

Of the patients with a prior diagnosis of heart failure, 166/369 (45.0%) were under the care of a hospital heart failure team (Table 4.4) and 105/301 (34.9%) were under the care of a community heart failure team (Table 4.5).

There were 151/452 (33.4%) cases where the clinician responsible for the patient did not answer or did not know whether the patient was under the care of the community heart failure team. The fact that this information was not readily available suggests that it would be possible to improve care with the use of shared documentation to aid communication between hospital and community heart failure services.

There were 76 patients who were under the care of both the community and hospital heart failure teams.

In 23 cases (6.2%), it was reported that there was no heart failure team in place to provide care. For these hospitals where there was no heart failure team, there was clear room for improvement in the organisation of services for heart failure patients (Table 4.4) (see also organisational data chapter 2).

Table 4.4 Patient was under the care of the heart failure team

	Number of patients	%
Yes	166	45.0
No	180	48.8
No heart failure team	23	6.2
Subtotal	**369**	
Not answered	83	
Total	**452**	

Figure 4.1 shows the underlying NYHA category prior to hospital admission, comparing newly diagnosed patients with patients with established heart failure. A greater percentage of the patients with an established diagnosis had a more severe category of heart failure (37.8% vs 19.2% for NYHA IV).

Table 4.5 Patient was under the care of the community heart failure team

	Number of patients	%
Yes	105	34.9
No	196	65.1
Subtotal	**301**	
Not answered	151	
Total	**452**	

As already noted, it is recommended that patients with NYHA grade IV heart failure are managed by a specialist multidisciplinary heart failure team.[3] Figure 4.2 shows that only a slightly greater percentage of the patients with NYHA IV heart failure were under the care of the hospital heart failure team when compared with patients in all other categories (46.6% vs 41.7%).

If care under the hospital or community team was combined, the percentage of patients under the heart failure team was higher with increasing severity of heart failure. There was still however room for improvement in the number of patients under the care of heart failure teams as still only 74/126 (58.7%) patients with NYHA grade IV heart failure were under the heart failure team (Figure 4.2).

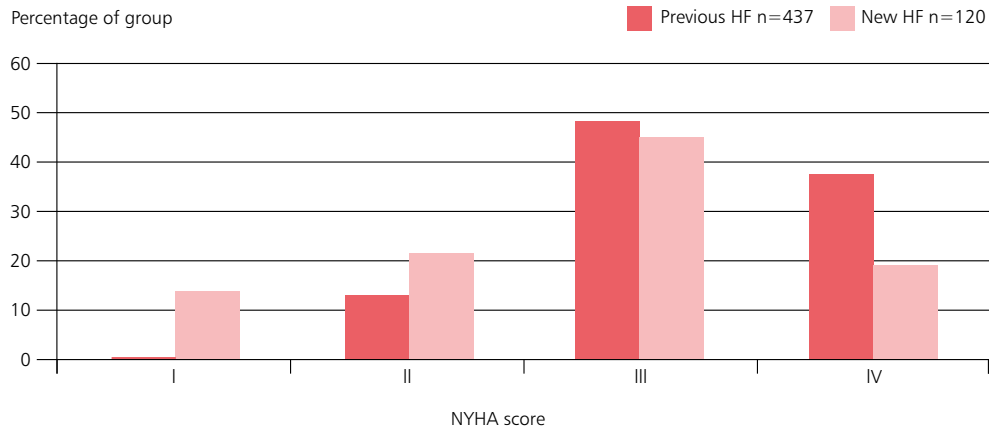

Figure 4.1 NYHA category prior to hospital admission for patients with previous heart failure and a new diagnosis

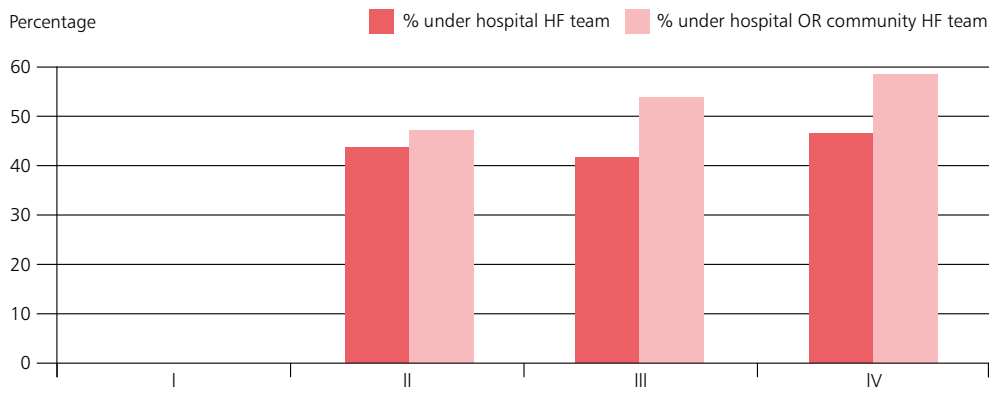

Figure 4.2 Proportion (%) under a heart failure team vs NYHA grade

Procedures / interventions

For patients with heart failure, heart function, symptoms and quality of life can be improved by a variety of procedures or interventions which depend on the underlying cause. These include coronary revascularisation for patients with angina or reversible ischaemia, valve replacement/ implantation for valvular disease and resynchronisation therapy for heart failure with reduced ejection fraction.

In the peer reviewed cases where there was a previous diagnosis of heart failure, 102/268 (38.1%) patients had been referred for intervention (Table 4.6). In 20/136 (14.7%) of the patients who had not been referred, the reviewers considered that a referral should have been made (Table 4.7).

CASE STUDY 1

A previously fit elderly patient was admitted in extremis with pulmonary oedema and died on the day of admission. They had been discharged three months previously after a five day admission with pulmonary oedema. Echocardiogram had shown severe aortic stenosis with preserved left ventricular function. The GP had requested cardiology assessment for breathlessness a month later. An appointment had not yet been booked.

The reviewers considered that there was a missed opportunity to refer urgently for assessment during the first admission. Aortic valve replacement or trans-catheter aortic valve implantation would have had a good chance of success.

Table 4.6 Patient had previously been referred for a procedure/therapy/intervention for heart failure

	Number of patients	%
Yes	102	38.1
No	166	61.9
Subtotal	**268**	
Not answered	76	
Total	**344**	

Table 4.7 The patient should have been referred – reviewers' opinion

	Number of patients	%
Yes	20	14.7
No	116	85.3
Subtotal	**136**	
Not answered	30	
Total	**166**	

Data from the clinician questionnaire showed that 124/528 (23.5%) patients had been referred for a heart failure specific intervention (Table 4.8). This figure rose to 29.7% (116/390) if only patients previously diagnosed for heart failure were considered (Table 4.9). The specific interventions are listed in Table 4.10. As would be expected, these were mainly revascularisation, valvular intervention and resynchronisation therapy.

Table 4.8 Patient was previously referred and/or had undergone a procedure/therapy for heart failure (all patients)

	Number of patients	%
Yes	124	23.5
No	404	76.5
Subtotal	**528**	
Not answered	75	
Total	**603**	

Table 4.9 Patient was previously referred and/or had undergone a procedure/therapy for heart failure (previously diagnosed patients)

	Number of patients	%
Yes	116	29.7
No	274	70.3
Subtotal	**390**	
Not answered	62	
Total	**452**	

Table 4.10 Procedure/therapy

	Referred	Underwent procedure
Coronary revascularisation	46	36
CRT/CRT-D	44	26
Other	24	15
ICD	18	12
Other cardiac surgery (valvular)	16	13
Transcatheter aortic valve implantation	9	1
Assessment for transplantation	6	2
Mechanical support device	5	4

Answers may be multiple; n=124

Previous attendances and admissions

Heart failure is a frequent cause of hospital attendance. In addition, co-existing conditions often lead to review in the outpatient, inpatient or emergency setting. Attendance at the hospital can result in treatment changes, in particular, changes to diuretic doses. These treatment changes can have either a positive or negative impact on fluid balance. As a result they have the potential either to prevent or to precipitate a subsequent admission with heart failure. The study advisory group considered that inappropriate changes to treatment were a frequent precipitant of subsequent admissions.

Attendance at the hospital had frequently occurred during the six months prior to the final admission (Table 4.11). At the time of the last attendance, changes to the patients' treatment were made in the majority of cases (134/194; 69.1%) (Table 4.12). These changes to treatment were considered to be appropriate in 100/115 (87%) cases reviewed (Table 4.13).

Table 4.11 Previous hospital attendances (last 6 months)

	Number of patients	%
Inpatient	224	77.2
Outpatients	112	38.6
Emergency department attendance	48	16.6

Answers may be multiple; n=290

Table 4.12 Treatment changes at last attendance/ admission

	Number of patients	%
Yes	134	69.1
No	60	30.9
Subtotal	**194**	
Not answered	96	
Total	**290**	

Table 4.13 Treatment changes at last attendance/ admission appropriate – reviewers' opinion

	Number of patients	%
Yes	100	87.0
No	15	13.0
Subtotal	**115**	
Not answered	18	
Total	**133**	

Of the cases where treatment was not changed at the prior attendance, there were nine cases where the reviewer considered that treatment should have been changed (data not shown).

Avoidable admissions

The reviewers were asked to comment on whether the final admission was potentially avoidable. In 104/353 (29.5%) cases, they considered that the final admission was avoidable (Table 4.14).

Table 4.14 Opportunity to prevent final admission

	Number of patients	%
Yes	104	29.5
No	249	70.5
Subtotal	**353**	
Not answered	111	
Total	**464**	

The most common reason given for an avoidable admission was that the patient should have received end of life care (48 cases) (see also chapter 9). Of these patients, only one had a Rockwood score of less than six, 29 had a Rockwood score of eight or nine.

There was also room for improvement in specific heart failure related care. In 15 cases reviewed, involvement of the heart failure team might have prevented the admission. In 19 cases, specific heart failure related treatment (mainly diuretic use) could have been improved (Table 4.15).

Table 4.15 Reasons admission was avoidable

	Number of patients
Palliative care	48
Improved clinical care	19
Heart failure referral	15

CASE STUDY 2

An elderly patient with chronic kidney disease, known to the heart failure team was coping independently at home. The GP increased diuretics due to increasing oedema. Clinical review three weeks later revealed a very low blood pressure. The patient was admitted as an emergency and found to have deteriorating kidney function with hyperkalaemia.

The reviewers considered that with a well-designed community heart failure service that included rapid access to outpatients, more frequent clinical review, medication adjustment and monitoring of blood tests would have been possible. An emergency admission could have been avoided.

CASE STUDY 3

A very elderly patient with recently diagnosed heart failure was bed-bound at home with an extensive care package. They had expressed a wish to die at home. On developing breathlessness, an ambulance was called and with the agreement of the family, the patient was admitted acutely. On discussion with the patient and family at the hospital, palliative medications were administered and the patient died shortly after admission.

The reviewers acknowledged that managing acute breathlessness at home could be challenging but considered that with better advance planning and discussion with the patient and relatives the admission might have been avoided and the patient's wish to die at home might have been achieved.

Key Findings

- The majority of patients (452/579; 78.1%) had a prior diagnosis of heart failure and more than three quarters (331/431; 76.8%) of these patients were diagnosed more than a year prior to the final admission
- 166/369 (45.0%) of the patients with a prior diagnosis of heart failure were under the care of a hospital heart failure team and 105/301 (34.9%) were under the care of a community heart failure team
- Only 74/126 (58.7%) patients with NYHA grade IV heart failure were under the heart failure team
- In the peer reviewed cases with a previous diagnosis of heart failure, 102/268 (38.1%) patients had been referred for intervention
- At the time of the last attendance, changes to the patients' treatment were made in 134/194 (69.1%)
- In 104/353 (29.5%) cases, the case reviewers considered that the final admission was avoidable. The commonest reason given for avoidable admission was that the patient should have received end of life care (48 cases).

SEE RECOMMENDATION 8

**Please refer to the chapter tables for the changes in denominator*

5

Pre-hospital and emergency department management

Back to contents

The signs and symptoms of acute or decompensated heart failure are non-specific and can include breathlessness, tachycardia, low oxygen saturations and high or low blood pressure. An accurate diagnosis of acute heart failure in the pre-hospital setting has been shown to be more likely in the absence of co-existing non-cardiac causes of breathlessness.[18] However almost a third of patients treated in hospital for heart failure, are also treated for pneumonia and/or COPD which cause similar signs and symptoms.[19] This can make accurate diagnosis and treatment challenging at any stage of the clinical pathway but in particular in the pre-hospital setting.

Pre-hospital management

The reviewers found that pre-hospital management was appropriate in 179/212 (84.4%) cases reviewed (Table 5.1).

Of the cases assessed, 142/204 (70%) patients had a pre-hospital ECG (data not shown). This is lower than would be expected in patients with a clear diagnosis of a primary cardiac problem and suggests either that the diagnosis of acute heart failure was clear on initial presentation or that there was overlap with other conditions for which an ECG would not be an essential investigation.

For patients requiring immediate assessment by a doctor on arrival at the hospital, ambulance services can use a pre-alert system to warn the department that immediate medical input is needed. The pre-alert system normally includes patients who have required cardiopulmonary resuscitation prior to hospital arrival. In 72/162 (44%) cases a pre-alert was used prior to arrival at the hospital (data not shown). Only four patients had received cardiopulmonary resuscitation prior to arrival at the hospital. This shows that it was possible to identify that many of these patients required immediate assessment in hospital at the time of assessment in the community. This represents an opportunity to explore a more proactive approach to acute heart failure management.

Table 5.1 Pre-hospital management was appropriate

	Number of patients	%
Yes	179	84.4
No	33	15.6
Subtotal	**212**	
Not answered	100	
Total	**312**	

The vital signs measured pre-hospital have been combined with those measured in the emergency department and are discussed in chapter 6.

For the 192 patients who received treatment prior to arrival at the hospital, the specific treatments are listed in Table 5.2. The majority (173/192; 90.1%) had oxygen administered. The most common other treatment given in 52/192 (27.1%) patients was the bronchodilator salbutamol. It is worth noting that the use of salbutamol is included in general ambulance service guidelines and that not all ambulance services use diuretics.[20] Salbutamol and intravenous fluids are not recognised treatments for acute heart failure, however, they were administered almost as frequently as diuretics. This illustrates how frequently there is diagnostic uncertainty when making the initial clinical assessment of patients who present with breathlessness.

Table 5.2 Pre-hospital treatments

	Number of patients
Oxygen	173
Salbutamol	52
GTN/Nitrates	35
Frusemide/diuretics	19
Intravenous fluids	17
Aspirin	13
Opioids	7

Answers may be multiple; n=192

Management in the emergency department

Triage and initial clinical assessment in the emergency department involves a rapid assessment to ensure patient safety, more detailed clinical assessment in some circumstances, and measurement of vital signs including heart and respiratory rate.

The heart and respiratory rate data both at the pre-hospital stage and on arrival in the emergency department are shown in Figures 5.1 and 5.2. These show that there were 106/233 (45.5%) patients pre-hospital and 132/294 (44.9%) in the emergency department with a heart rate above 90 beats per minute. It is worth noting that beta blockers, whilst not used specifically for acute heart failure management, are one of the standard treatments for patients with established heart failure. This should be considered when interpreting the heart rate data below.

A greater proportion of patients had a raised respiratory rate (above 20 breaths per minute). There were 174/232 (75%) patients pre-hospital and 186/290 (64.1%) in the emergency department with a respiratory rate in this range.

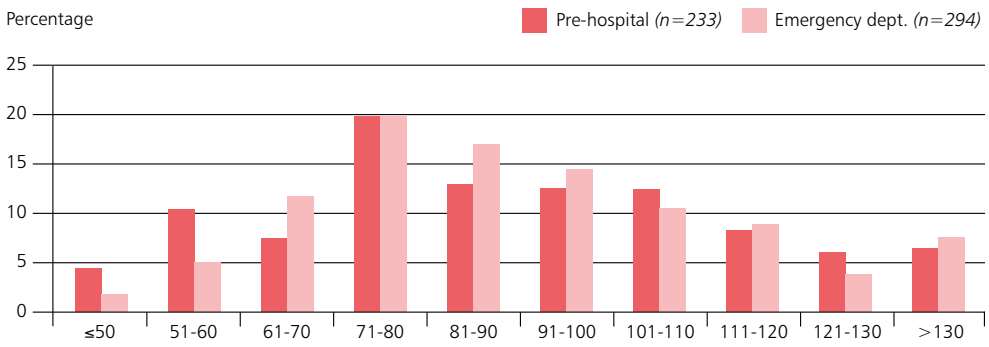

Figure 5.1 Heart rate

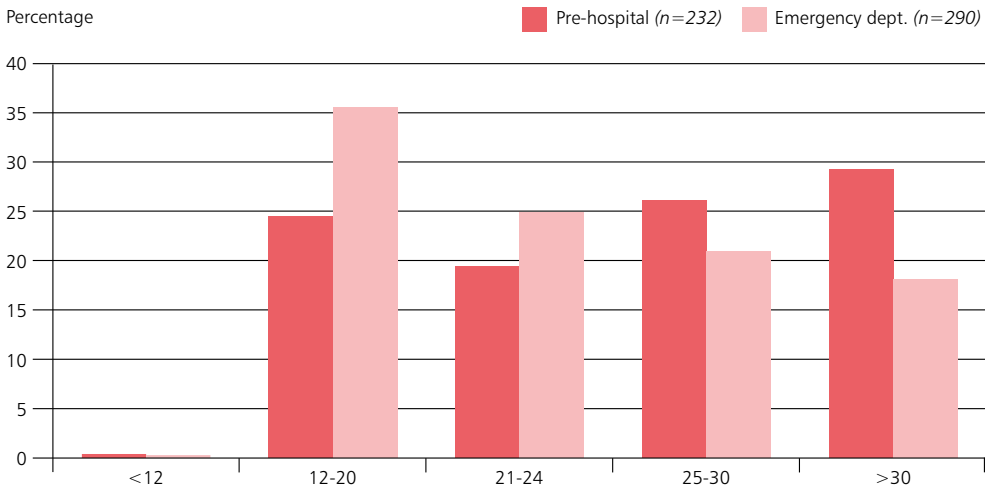

Figure 5.2 Respiratory rate

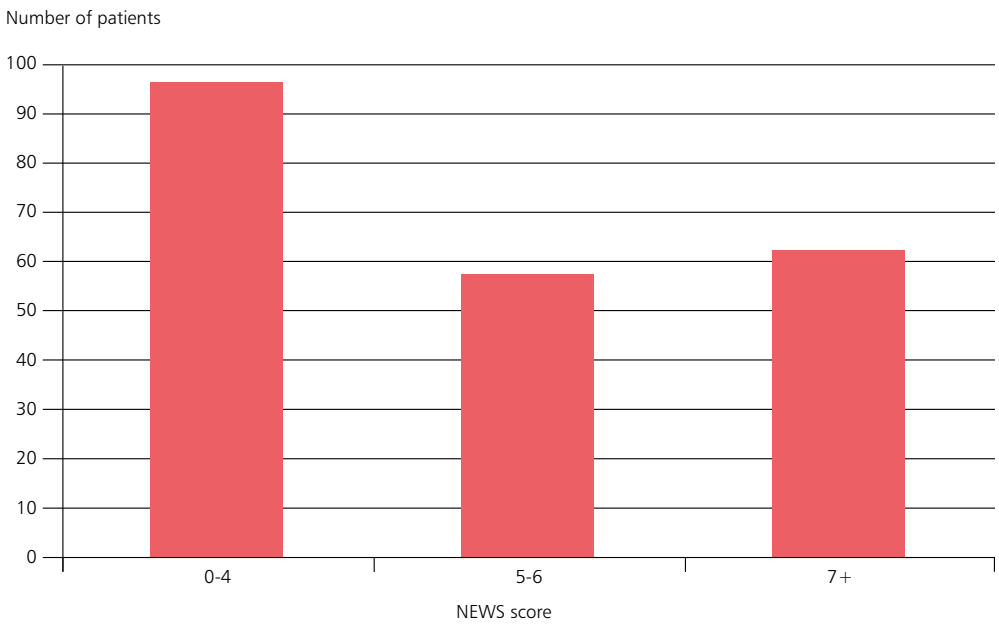

Figure 5.3 NEWS score

Physiological 'track and trigger' systems take a combination of vital signs and give a score for each individual parameter, which increases the more each measure varies from the normal range. They are recommended for use in hospital patients to help identify illness severity and to guide the frequency of clinical monitoring in the hospital.[21,22] The National Early Warning Score (NEWS) has been recommended since 2012.[22] This score was used for 214/351 (61.0%) patients in the emergency department. A score of five or more reflects a degree of acute illness severity where monitoring, at least hourly, of vital signs is recommended. A score of seven or more identifies a group of patients where emergency assessment by a team with critical care competencies is recommended.

In the 214 patients where NEWS was used, the score was five or more in 119/214 (55.6%) patients. The score was seven or more in 62/214 (29.0%) patients (Figure 5.3). This reflects a group of patients with severely deranged physiology on admission to hospital. It also demonstrates the value of NEWS in identifying illness severity in patients prior to admission to hospital.

The lack of sensitivity (and specificity) of derangement of individual physiological parameters to identify patients who are at risk of death from heart failure helps to make the case for the use of a composite measure such as NEWS.

The finding that a significant minority of patients had normal physiology at presentation also makes the case that additional investigation was needed to assess these patients effectively.

Arrival at the hospital represents the next opportunity to make an accurate diagnosis of heart failure. This is important as an accurate diagnosis will both ensure the patient receives appropriate treatment and also that they have early and continuing input from a dedicated specialist heart failure team as recommended by NICE.[4]

Natriuretic peptide measurement is a first line investigation that is valuable in excluding the diagnosis of heart failure.[23] The measurement of natriuretic peptides is recommended for people presenting with new suspected acute heart failure.[4] Natriuretic peptide measurements should be included at the earliest point possible in the acute clinical pathway to guide management. A raised level supports a diagnosis of heart failure and should prompt assessment with an echocardiogram.

Echocardiography is the gold standard for non-invasive assessment of heart function and has useful positive predictive value for heart failure diagnosis. It is recommended immediately on arrival at hospital in patients with acute heart failure and hypotension (systolic blood pressure <90mmHg).[13] It is also recommended for all other patients within 48 hours of admission, to ascertain the presence or absence or cardiac abnormalities and to guide early specialist management.[4]

Point of care ultrasound (of heart and lung) can be more effective than clinical evaluation in making a diagnosis of acute heart failure and can speed up the diagnostic process when used in unselected patients presenting with breathlessness.[24] This is not however a substitute for echocardiography and should only be used in skilled hands.

Table 5.3 lists the investigations that were undertaken for the patients treated in the emergency department. The majority (>85%) of patients were investigated with blood tests (blood count, urea, electrolytes) and chest x-ray, standard investigations for most emergency medical admissions.

The measurement of C-reactive protein (CRP), a marker of inflammation is often used to help diagnose infections. There were 240/330 (72.7%) patients who had a CRP measurement. It is worth noting how frequently this test was done in comparison with measurement of natriuretic peptides, a test recommended in the assessment of acute heart failure.

An ECG was performed in 267/330 (80.9%) patients. A minority had other cardiac specific investigations. The most common of these was troponin level (135/330; 40.9%). Only 28/330 (8.5%) patients had a measurement of natriuretic peptides. Of these patients, 77 had a new diagnosis of heart failure, and only seven of these had this measured.

There were 13/330 (3.9%) patients who had an echocardiogram. An additional four patients had a point of care ultrasound.

The reviewers considered that important investigations or treatments were omitted in the emergency department in 86/307 (28%) patients (Table 5.4). The investigations omitted were echocardiogram (10 patients), natriuretic peptide measurement (5 patients) and ECG (6 patients).

The treatments that were omitted at this stage were diuretics (11 patients), nitrates (7 patients) and advanced respiratory support (continuous positive airway pressure (CPAP)/ventilation) (7 patients).

Table 5.3 Investigations in the emergency department

	Number of patients	%
Urea and electrolytes	323	97.9
Full blood count	306	92.7
Chest x-ray	296	89.7
ECG	267	80.9
Blood gas	245	74.2
C-reactive protein	240	72.7
Lung function tests	224	67.9
Lactate	172	52.1
INR	139	42.1
Troponin	135	40.9
Cardiac enzymes	31	9.4
Brain natriuretic peptide	28	8.5
Echocardiography	13	3.9
Ultrasound chest/heart	4	1.2

Answers may be multiple; n=330

Table 5.4 Important investigations, treatments or interventions omitted in ED – reviewers' opinion

	Number of patients	%
Yes	86	28.0
No	221	72.0
Subtotal	**307**	
Not answered	32	
Total	**339**	

Key Findings

- The reviewers found that pre-hospital management was appropriate in 179/212 (84.4%) cases
- In 72/162 (44%) cases reviewed a pre-alert was used prior to arrival at the hospital
- There were 106/233 (45.5%) pre-hospital and 132/294 (44.9%) patients in the emergency department with a heart rate above 90 beats per minute
- In the 214 patients where NEWS was used, the score was five or more in 119/214 (55.6%). The score was seven or more in 62/214 (29.0%) patients
- 267/330 (80.9%) patients had an ECG in the emergency department. Only 28/330 (8.5%) had measurement of natriuretic peptides
- The reviewers considered that important investigations or treatments were omitted in the emergency department in 86/307 (28%) patients.

SEE RECOMMENDATIONS 5•7

**Please refer to the chapter tables for the changes in denominator*

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Admission to hospital

Back to contents

There was no variation seen in the day of the week patients were admitted (Figure 6.1). Approximately half of the patients were admitted between the hours of 08:01 and 18:00 (Table 6.1) This illustrates the importance of designing services to support patients admitted to hospital with heart failure that cover the night time and weekends (see organisational data in chapter 2).

Table 6.1 Time of admission

	Number of patients	%
00:01 - 08:00	119	22.6
08:01 - 18:00	267	50.7
18:01 - 00:00	141	26.7
Total	**527**	

Almost three quarters (339/456; 74.3%) of the patients studied were admitted to hospital through the emergency department (Table 6.2).

Table 6.2 Mode of admission

	Number of patients	%
Emergency department (ambulance)	312	68.4
GP referral to assessment unit	79	17.3
Emergency department (self)	27	5.9
Referral from outpatient clinic	7	1.5
Referral via community heart failure team	6	1.3
Other	25	5.5
Subtotal	**456**	
Not answered	8	
Total	**464**	

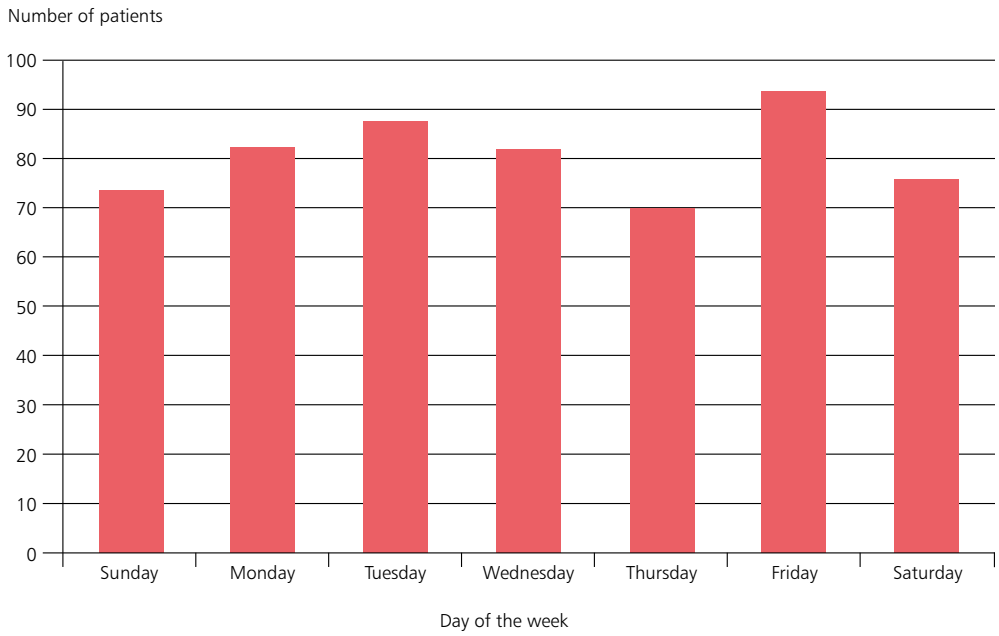

Figure 6.1 Day of admission

It is recommended that all hospitals admitting people with suspected acute heart failure provide a specialist heart failure team based on a cardiology ward and providing an outreach service.[4] Although there are is no recommendation that specifically states that patients with acute heart failure should be treated on a cardiology ward, results from the national heart failure audit show that patients treated on a cardiology ward have a higher rate of treatment with disease modifying drugs for heart failure and have lower mortality rates.[2]

Only 73/593 (12.3%) patients were admitted directly to a specialist cardiology ward or coronary care unit (Table 6.3). However, the case reviewers considered that the ward on admission was appropriate in 405/443 (91.4%) cases illustrating that admission of patients via a non-cardiology ward appears to be accepted practice (data not shown).

Patients admitted via acute units are commonly transferred on to specialist wards later in the admission. When data were analysed for the whole admission (Table 6.4), a total of 197/585 (33.7%) patients were transferred to a specialist (cardiology, coronary care, or critical care) ward.

There were some patients who were clearly at the end of life, and where palliative care would be most appropriate.

Table 6.3 Type of ward the patient was first admitted to

	Number of patients	%
Medical assessment unit	399	67.3
General medical ward	34	5.7
Care of the elderly	18	3.0
Coronary care unit	44	7.4
Specialty cardiology ward	29	4.9
Level 2/3	25	4.2
Other	44	7.4
Subtotal	**593**	
Not answered	10	
Total	**603**	

In these cases, if hospital admission could not be avoided, end of life care does not require admission to a specialist cardiology ward. Impaired functional status can help to identify patients who are likely to have a poor outcome. When categorised by frailty score (Table 6.4), a lower percentage of the extremely frail patients were cared for in specialist wards. In less frail patients however the care of a large number of patients might have been improved by transfer to a specialist ward.

Table 6.4 Type of ward admitted to by Rockwood score

	Ward			
Rockwood score	**Specialist**	**%**	**Non specialist**	**Total**
1	2	100	0	**2**
2	1	25.0	3	**4**
3	14	43.8	18	**32**
4	27	61.4	17	**44**
5	37	54.4	31	**68**
6	52	33.8	102	**154**
7	26	22.8	88	**114**
8	23	23.2	76	**99**
9	15	22.1	53	**68**
Total	**197**	**33.7**	**388**	**585**

Specialist ward = cardiology, coronary care unit, critical care

For patients with other cardiac conditions such as acute myocardial infarction, outcomes have been improved by reorganisation of services and care pathways to ensure rapid access to coronary intervention. Similarly reorganisation of care pathways for patients with other conditions such as stroke and hip fracture, many of whom are elderly and frail with multiple co-morbid conditions, has been a key driver in the improved outcomes from these conditions.[25,26]

The data presented here suggests that a similar model for patients with acute heart failure could facilitate early specialist review, more rapid and accurate diagnosis, and more effective treatment with the potential to improve outcomes. The term coronary care unit might usefully be changed to the cardiac care unit.

The grade of the admitting doctor was considered to be appropriate by the reviewers in 366/412 (88.8%) of cases (Table 6.5). There was room for improvement in the timing of the first consultant review in 72/421 (17.1%) cases (Table 6.6).

Table 6.5 Grade of admitting doctor – appropriate in the view of the reviewers

	Number of patients	%
Yes	366	88.8
No	46	11.2
Subtotal	**412**	
Not answered	52	
Total	**464**	

Table 6.6 Timing of first consultant review – appropriate in the view of the reviewers

	Number of patients	%
Yes	349	82.9
No	72	17.1
Subtotal	**421**	
Not answered	43	
Total	**464**	

Specialist / heart failure team review

To ensure that investigations are undertaken and all appropriate treatment options are considered, guidelines suggest that all people admitted to hospital with suspected acute heart failure should have early and continuing input from a dedicated heart failure team.[4] It is specifically recommended that input from such a team is provided within the first 24 hours of admission.[1]

The last four cycles of the national heart failure audit, have shown that how care is delivered to patients affects outcome. Care delivered by a cardiologist is associated with better survival.

Data provided by clinicians reviewing the records in their own hospital showed that review by a specialist heart failure team only occurred in 199/603 (33.0%) cases (Table 6.7). Almost half of the patients (273/561; 48.7%) were reviewed by a cardiologist during the final admission (Table 6.8). The timing of this review is shown in Figure 6.2 overleaf.

Table 6.7 Patient reviewed by specialist heart failure team during the inpatient episode

	Number of patients	%
Yes	199	33.0
No	404	67.0
Total	**603**	

Table 6.8 Patient assessed by cardiologist during the inpatient episode

	Number of patients	%
Yes	273	48.7
No	288	51.3
Subtotal	**561**	
Not answered	42	
Total	**603**	

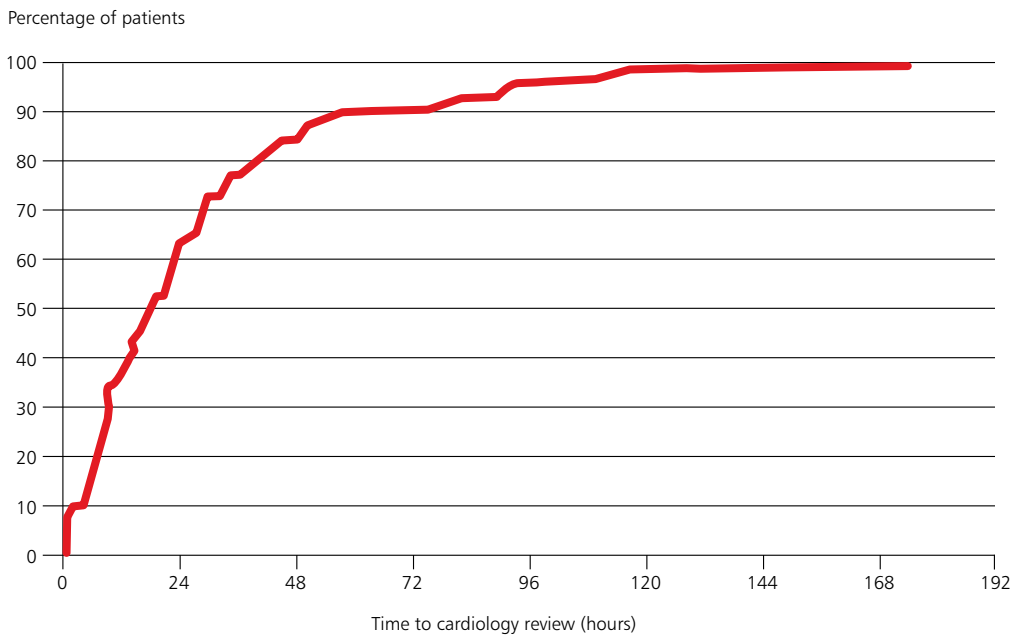

Figure 6.2 Time to cardiology review (source: clinician questionnaire)
(n=162/273 where the time was known)

Figure 6.2 shows the time between admission to hospital and review by a cardiologist where this was available from the clinician questionnaire. Of 162 patients, 61 (37.7%) were reviewed within 12 hours, 102 (63%) within 24 hours, and 136 (84%) within 48 hours. This shows that it is possible to organise care such that review takes place in an appropriate time frame. If the 251 patients (Table 6.10) who were not reviewed at all by a cardiologist are included, a maximum of only 102/438 (23.2%) patients were reviewed within 24 hours and 136/438 (31.1%) within 48 hours.

Of the 218 patients who were not seen by a cardiologist or member of the heart failure team and where the time of death was available, 52 (23.9%) died within 24 hours of admission to hospital (Table 6.9).

Table 6.9 Time to death (hours) for patients not seen by a cardiologist

	Number of patients	% of group (n=218)
≤ 12	26	11.9
≤ 24	52	23.9
≤ 36	70	32.1

If review by a member of the heart failure team or a cardiologist was considered to be a specialist review, the number of patients who were reviewed by a specialist rose to more than half of the study population (304/555; 54.8%) (Table 6.10).

Table 6.10 Patient seen by heart failure team and/or cardiologist

	Number of patients	%
Yes	304	54.8
No	251	45.2
Subtotal	**555**	
Not answered	48	
Total	**603**	

The peer reviewers were only able to identify the timing of the first cardiology review in 141 cases. In these cases, they considered that this review did not take place within an appropriate time frame in 38/133 (28.6%) cases where

they were able to give an opinion (Table 6.11). When a cardiology review did take place, it resulted in treatment changes in more than two thirds (90/134; 67.2%) of patients (Table 6.12). This illustrates the importance of specialist review in these patients.

Table 6.11 Timing of first cardiology review – appropriate in the view of the reviewers

	Number of patients	%
Yes	95	71.4
No	38	28.6
Subtotal	**133**	
Not answered	8	
Total	**141**	

Table 6.12 Cardiology review resulted in treatment changes

	Number of patients	%
Yes	90	67.2
No	44	32.8
Subtotal	**134**	
Not answered	7	
Total	**141**	

For the sub-set of patients who were reviewed by a specialist (cardiologist or member of the heart failure team) 65 patients (36.9%) were reviewed within 12 hours, 114 (64.8%) within 24 hours, 149 (84.7%) within 48 hours. However, when patients not reviewed were included then 114/419 (27.2%) were reviewed in 24 hours and 149/419 (35.6%) within 48 hours (Figure 6.3).

Taken together this shows that in this selected group of the sickest heart failure patients, all of whom died within seven days of admission, despite guidance that recommends specialist heart failure team review within 24 hours[1] this frequently did not take place.

The data also demonstrates that it was possible to organise services to ensure early review of these patients, the recommended standard being met in 102 of these cases.

There did not appear to be any relationship between the severity of NYHA grade of heart failure and the frequency with which cardiology review took place (Table 6.13). Neither was there an apparent relationship between the Rockwood frailty score and heart failure specialist review (Table 6.14).

Table 6.14 Patient assessed by specialist in cardiology/heart failure by Rockwood score

	Assessed by specialist in cardiology/heart failure			
Rockwood score	**Yes**	**No**	**% assessed**	**Total**
2	2	2	50.0	**4**
3	22	8	73.3	**30**
4	29	13	69.0	**42**
5	42	20	67.7	**62**
6	70	64	52.2	**134**
7	49	58	45.8	**107**
8	35	47	42.7	**82**
9	34	29	54.0	**63**
Total	**283**	**241**		**524**

Table 6.13 Cardiology review by NYHA

	Cardiology review			
NYHA	**Assessed**	**Not assessed**	**% assessed**	**Total**
I	13	8	61.9	**21**
II	52	36	59.1	**88**
III	130	142	47.8	**272**
IV	109	86	55.9	**195**
Not answered	11	16	40.7	**27**
Total	**315**	**288**	**52.2**	**603**

Data were analysed to understand whether age, severity of heart failure symptoms and underlying functional status of patients influenced whether review by a cardiologist or heart failure team occurred. Patients over the age of 80 years were less likely (176/375; 46.9%) to be reviewed by a specialist than those under this age (129/182; 70.9%) (Figure 6.4).

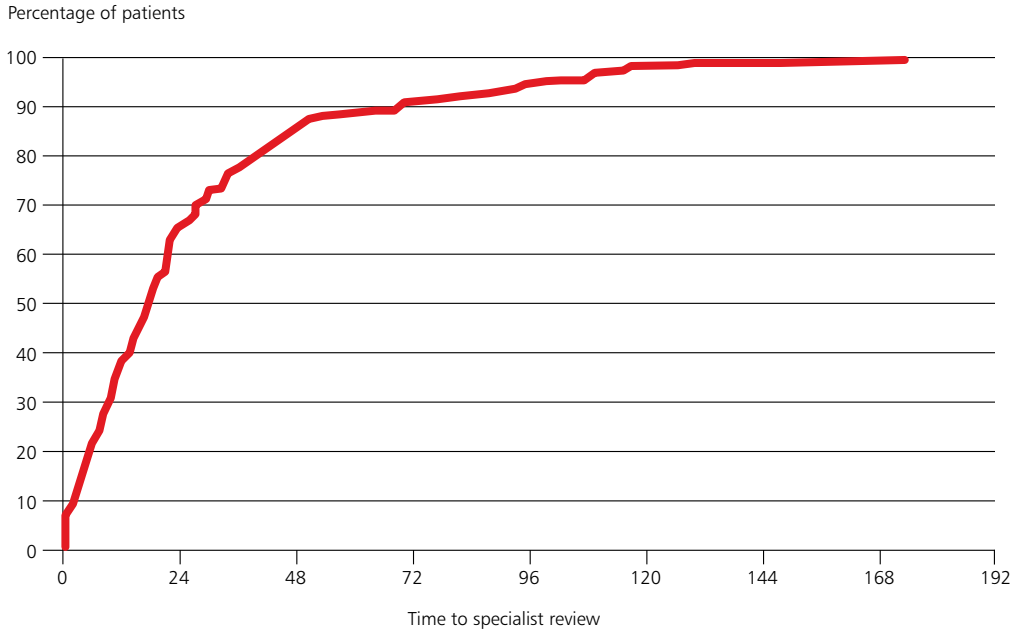

Figure 6.3 Time to specialist review represents the time to cardiologist or heart failure team review (whichever was earlier) *(n=176)*

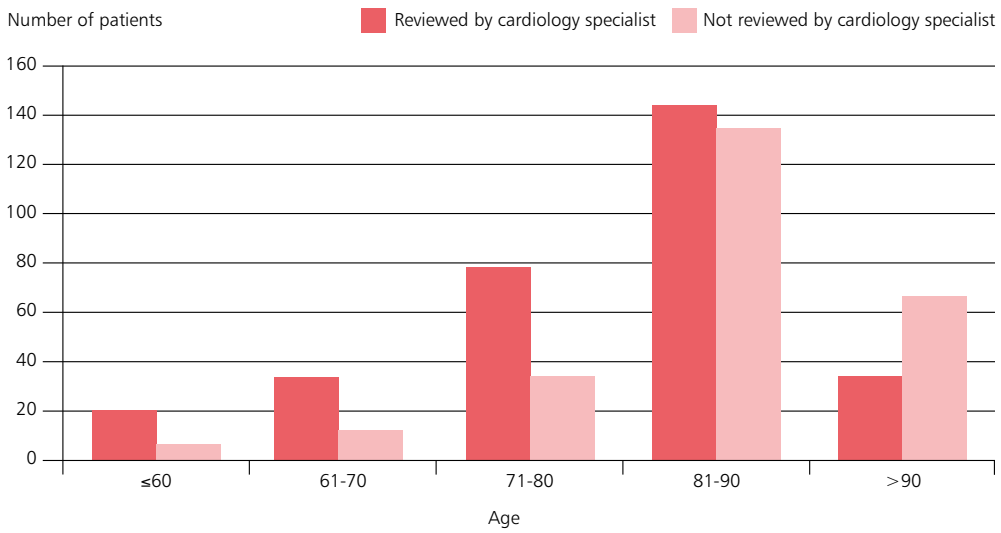

Figure 6.4 Assessed by specialist in cardiology/heart failure by age

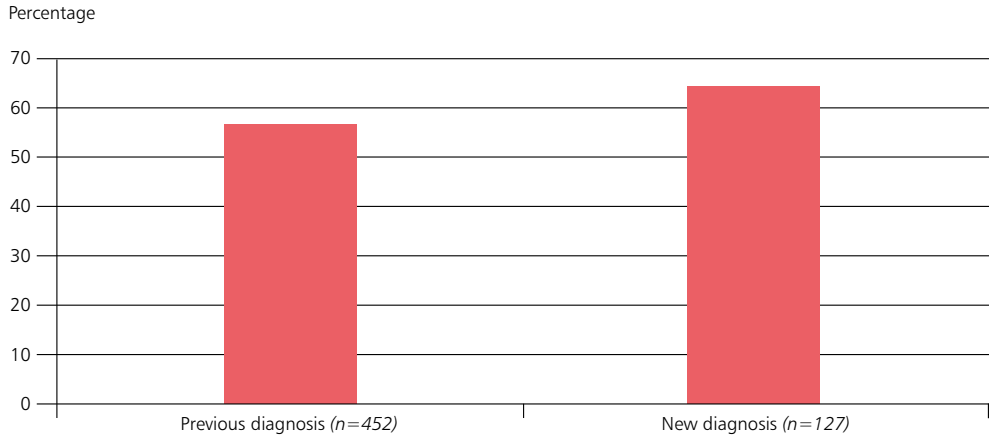

Figure 6.5 Percentage of patients assessed by cardiology or heart failure team

Patients with a new diagnosis of heart failure have the potential to benefit from specialist review both to establish an accurate diagnosis and to initiate heart failure specific therapy. Newly diagnosed patients were more likely to be assessed by a cardiologist or member of the heart failure team than those with a diagnosis of heart failure that was already established (64.6% vs 57.1%; Figure 6.5).

Overall the reviewers found that there were 106/448 (23.7%) cases where there was room for improvement in specialist input. Clinicians reviewing the case in their own hospital found 50/541 (9.2%) cases where they considered that there was room for improvement in specialist input (Table 6.15).

In 80 of the peer reviewed cases, the area for improvement related to cardiology input either being delayed, not occurring at all or being by too junior a member of the team. There was also room for improvement in review by either palliative (10 cases) or critical care (6 cases) specialists in small numbers of cases (see chapters 8 and 9 for details).

Overall the data presented show that on the admission with acute heart failure during which the patient died, there was considerable room for improvement in specialist assessment by the cardiology team. This assessment frequently resulted in treatment changes when it was done and although it was possible to organise services in a way that delivered to recommended standards, this was frequently not done.

Table 6.15 Appropriate specialist input

	Reviewer opinion Number of patients	%	Clinician opinion Number of patients	%
Yes	342	76.3	491	90.8
No	106	23.7	50	9.2
Subtotal	**448**		**541**	
Not answered	16		32	
Total	**464**		**573**	

Key Findings

- 339/456 (74.3%) patients included were admitted to hospital through the emergency department
- 197/585 (33.7%) patients were transferred to a specialist (cardiology, coronary care, or critical care) ward at some point during their admission
- There was room for improvement in the timing of the first consultant review in 72/421 (17.1%) cases
- Review by a specialist heart failure team only occurred in 199/603 (33.0%) cases
- 273/561 (48.7%) patients were reviewed by a cardiology doctor during their admission
- For the sub-set of patients who were reviewed by a specialist (cardiologist or member of the heart failure team) 65 (36.9%) were reviewed within 12 hours, 114 (64.8%) within 24 hours and 149 (84.7%) within 48 hours. However, when cases not reviewed were included (243 cases), then 114/419 (27.2%) were reviewed in 24 hours and 149/419 (35.6%) within 48 hours
- The peer reviewers were only able to identify the timing of the first cardiology review in 141 cases. In these cases, they considered that this review did not take place within an appropriate time frame in 38/133 (28.6%) cases
- When cardiology review did take place, it resulted in treatment changes in more than two thirds (90/134; 67.2%) of patients
- Overall the reviewers found that there were 106/448 (23.7%) cases where there was room for improvement in specialist input. In 80 of the peer reviewed cases, the area for improvement related to cardiology input either being delayed, not occurring at all or being by too junior a member of the team.

SEE RECOMMENDATIONS 1•2•3

**Please refer to the chapter tables for the changes in denominator*

7

Investigation, treatment and management

Back to contents

As already noted, there is often overlap between the presentation of cardiopulmonary conditions such as heart failure, pneumonia and chronic obstructive pulmonary disease.[19] Treatment for these conditions varies considerably and an accurate diagnosis is therefore key to the provision of effective treatment. Investigation to identify whether heart failure is the cause of symptoms is vital.

Table 7.1 shows the treatments received by 593 patients. Notably, nearly half of these patients (294/593; 49.6%) received antibiotics during the admission. The relatively frequent use of antibiotics might be due to diagnostic uncertainty in some patients (leading to the need to treat for infection as well as heart failure). Antibiotic treatment may also be appropriate as infection commonly contributes to worsening of heart failure.

It is recommended that in people presenting with new suspected acute heart failure, measurement of serum natriuretic peptides is used to rule out heart failure.[5,13] As already noted in chapter 2 (organisational data), BNP/NTProBNP measurement was available in 144/171 (84.2%) hospitals. It is also recommended that an echocardiogram is performed within 48 hours of admission in these patients to guide early specialist management.

Measurement of natriuretic peptides helps to establish the diagnosis of heart failure in previously undiagnosed patients as normal BNP levels make acute heart failure unlikely. Whilst a sensitive test, an elevated level is not specific for a diagnosis of heart failure, but when elevation is due to heart failure, it is strongly related to prognosis and helps in risk stratification.[4]

Table 7.1 Treatments/Interventions

	Number of patients	%
Oxygen	521	87.9
Intravenous diuretics	473	79.8
Antibiotics	294	49.6
Urinary catheter	240	40.4
Oral beta blockers	166	28.0
Intravenous fluids	133	22.4
Others	126	21.2
Oral diuretics	124	20.9
Bronchodilators	107	18.0
Intravenous nitrates	104	17.5
ACE inhibitors	88	14.8
Continuous positive airway pressure	71	12.0
Oral Digoxin	65	11.0
Inotropes	61	10.3
Non-invasive ventilation	60	10.1
Mineralocorticoid antagonist	55	9.3
Intravenous digoxin	28	4.7
Sublingual nitrates	14	2.4
Cardioversion	6	1.0
Intravenous beta blockers	6	1.0

Answers may be multiple; n=593

In those patients with a prior diagnosis of heart failure, BNP testing can be useful to guide treatment (and prevent inappropriate treatment). Measurement is recommended to rule out a diagnosis of acute decompensation of heart failure in patients with undiagnosed breathlessness.[13]

Table 7.2 Investigations undertaken

	Established heart failure		Newly diagnosed	
	Number of patients	% (n=319)	Number of patients	% (n=95)
Urea and electrolytes	301	94.4	87	91.6
Full blood count	272	85.3	77	81.1
ECG	267	83.7	82	86.3
Chest x-ray	257	80.6	77	81.1
Liver function	225	70.5	74	77.9
Estimated glomerular filtration rate (eGFR)	206	64.6	54	56.8
Troponin	114	35.7	48	50.5
Transthoracic Doppler/2D echocardiography	71	22.3	42	44.2
Thyroid function	57	17.9	22	23.2
BNP/NTproBNP	50	15.7	17	17.9
Fasting glucose	26	8.2	10	10.5
Lipids	21	6.6	5	5.3
Renal ultrasound	18	5.6	4	4.2
D-dimer	15	4.7	13	13.7
CT pulmonary angiography	7	2.2	4	4.2
Other	65	20.4	13	13.7

Echocardiography is a key investigation used for diagnosis, risk stratification and to guide specialist management in most patients admitted with acute heart failure.

Table 7.2 shows the investigations that were done in patients in this study. Notably only a minority had a measurement of their natriuretic peptides. This test was done infrequently in both newly diagnosed (17/95; 17.9%) patients and patients with an established (50/319; 15.7%) heart failure diagnosis. Thyroid function testing (a test that is discouraged in acutely ill patients) was done more frequently that natriuretic peptide measurement.

Echocardiography was done twice as frequently in newly diagnosed patients (42/95; 44.2%) as in patients already known to have heart failure (71/319; 22.3%).

Reviewers found that a number of the key investigations outlined above were omitted. Important investigations were omitted in more than a third of cases (146/430; 34%) (Table 7.3). Most commonly, in 86 cases, this was an echocardiogram.

The reviewers considered that measurement of natriuretic peptides was indicated but not done in 43 cases.

Table 7.3 Any investigations omitted that should have been undertaken – reviewers' opinion

	Number of patients	%
Yes	146	34.0
No	284	66.0
Subtotal	**430**	
Not answered	34	
Total	**464**	

When the groups were examined separately, reviewers found a higher proportion (37/91; 40.7%) of patients with a new diagnosis of heart failure had investigations omitted than of those with a previous diagnosis (99/321; 30.8%) (Table 7.4).

In the 269 patients already known to have heart failure, who did not have a natriuretic peptide measurement, the reviewers considered that 29 (10.8%) should have had this done. In the 248 who did not have an echocardiogram, in 57 (23.0%) the reviewers considered that this was required (Figure 7.1).

Of the 100 newly diagnosed cases, 78 did not have a measurement of natriuretic peptide and the reviewers considered that 14 (17.9%) would have benefited this measurement.

CASE STUDY 4

An elderly patient was admitted with acute onset breathlessness, and an acute kidney injury. Initial treatment included antibiotics and intravenous fluids. During the first four days of admission, the diagnosis remained unclear. Diuretics and intravenous fluid were administered alternately. An echocardiogram on day four confirmed severe left ventricular dysfunction and clarified the management plan. The patient was referred to the cardiologists but died prior to being reviewed.

Reviewers considered that BNP measurement on the admission blood tests would have prompted an earlier echocardiogram. This would have resulted in a more rapid diagnosis, earlier specialist referral and access to appropriate treatment.

Table 7.4 Any investigations omitted that should have been undertaken – reviewers' opinion

	Previously diagnosed: Number of patients	%	Newly diagnosed: Number of patients	%
Yes	99	30.8	37	40.7
No	222	69.2	54	59.3
Subtotal	**321**		**91**	
Not answered	23		9	
Total	**344**		**100**	

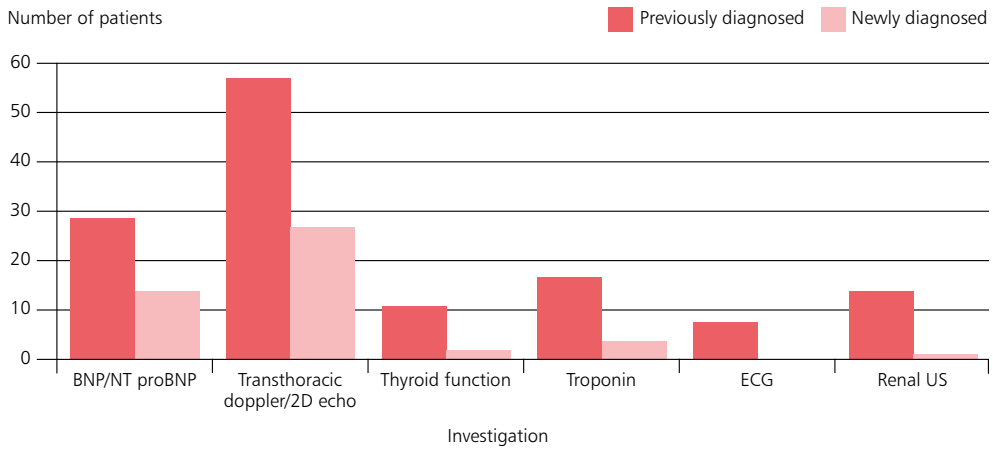

Figure 7.1 Omitted investigations

It is recommended by NICE that BNP is measured, however it was clear from the opinions of the reviewers that this has still has not been accepted into practice.

There were 53 newly diagnosed cases who did not have an echocardiogram. Of these, in 27 (50.9%), the reviewers considered that an echocardiogram was indicated.

There is therefore considerable room for improved investigation of patients admitted to hospital with acute heart failure.

Medication / treatment

Long term outcome for patients with heart failure and reduced ejection fraction is improved by the use of medication including angiotensin converting enzyme inhibitors (or angiotensin receptor blockers), beta blockers and mineralocorticoid receptor antagonists. A presentation with acute heart failure represents an opportunity to ensure patients are prescribed long term disease modifying drugs. The national heart failure audit has shown improved consistency in the prescription of these drugs with 44% of patients prescribed a drug in all three classes in the latest audit.[2] A higher proportion of patients were prescribed all three drug classes on hospital discharge if they were seen by a heart failure specialist (47% vs 22%).[2]

The reviewers considered that treatments or interventions were omitted in 96/435 (22.1%) cases (Table 7.5). The most common omissions were respiratory support (CPAP or NIV) in 27 cases, diuretic treatment in 19 cases and nitrates in 16 cases. The key disease modifying drugs were only omitted in a small number of cases: ACE inhibitors in four, beta blockers in two and mineralocorticoid antagonists in five cases.

Table 7.5 Any treatments/interventions omitted that should have been undertaken

	Number of patients	%
Yes	96	22.1
No	339	77.9
Subtotal	**435**	
Not answered	29	
Total	**464**	

The uptake of disease modifying drugs has improved over several cycles of the national heart failure audit.[2] The administration of these drugs can be inappropriate in certain circumstances including in hypotensive or dehydrated patients or in patients with kidney disease. As a global assessment, reviewers assessed appropriateness of medication changes. These are summarised in Table 7.6. In total there were 123/464 (26.5%) patients where one or more medication issue was identified by the case reviewers.

Table 7.6 Appropriateness of medication changes

	Medications stopped that should not have been		Medications continued that should not have been		Medications started that should not have been		Medications not started that should have been	
	Number of patients	%	Number of patients	%	Number of patients	%	Number of patients	%
Yes	35	8.1	32	7.5	44	10.1	57	13.6
No	398	91.9	395	92.5	393	89.9	363	86.4
Subtotal	**433**		**427**		**437**		**420**	
Not answered	31		37		27		44	
Total	**464**		**464**		**464**		**464**	

There was no difference in the frequency of medication issues between the whole cohort of patients and those with a previous diagnosis of heart failure. Of the patients with established heart failure, 88/318 (27.7%) had at least one medication issue identified.

There were 286 patients where the reviewers were able to identify whether or not the patient was reviewed by a pharmacist. Of these patients, 110 (38.5%) were reviewed by a pharmacist (Table 7.7). In 161/178 (90.5%) hospitals it was reported that pharmacists were a core member or available if needed (Table 7.8).

Table 7.7 Patient reviewed by pharmacist

	Number of patients	%
Yes	110	38.5
No	176	61.5
Subtotal	**286**	
Not answered	178	
Total	**464**	

Table 7.8 Involvement of pharmacists in the heart failure service

	Number of hospitals	%
Available if needed	139	78.1
Core member	22	12.4
Not available	13	7.3
Unknown	4	2.2
Total	**178**	

These data illustrate the complex medication decisions that are needed in this group of patients, and further justifies the need for specialist involvement in their care. In addition, ensuring that prescriptions are reviewed by a pharmacist has the potential to improve practice.

Diuretic treatment is a key part of both acute and chronic heart failure management. Reviewers identified that diuretic management could have been improved in 86/428 (20.1%) patients (Table 7.9).

Table 7.9 Appropriate changes to the patient's diuretic management

	Number of patients	%
Yes	342	79.9
No	86	20.1
Subtotal	**428**	
Not answered	36	
Total	**464**	

Salt and water retention leading to peripheral and pulmonary oedema is a cardinal feature of heart failure. Renal disease has an impact both on the handling of salt and water and on response to diuretics. The combination of heart failure and renal disease therefore has the potential to impact on an individual's response to heart failure treatments. The presence or absence of moderate or severe renal disease did not appear to affect whether diuretic management was considered appropriate. The reviewers considered diuretic management inappropriate in 30/162 (18.5%) patients with renal disease and 54/242 (21.4%) of those without renal disease (Table 7.10).

Table 7.10 Appropriate changes to the patient's diuretic management by presence of renal disease

	Appropriate changes to the patients diuretic management					
Renal disease	Yes	No	% No	**Subtotal**	Not answered	**Total**
Yes	132	30	18.5	**162**	11	**173**
No	198	54	21.4	**252**	24	**276**
Total	**330**	**84**	**20.3**	**414**	**35**	**449**

Non-pharmacological treatments

Non-pharmacological interventions are an important part of the management of heart failure patients. These have been described in chapter 4 (previous heart failure management). In the review of the case notes from the final admission, only a small minority of patients (8/457; 1.8%) underwent a procedure in the cardiac catheter laboratory (data not shown).

There were an additional 26/392 (6.6%) cases where the reviewers considered that the patient should have undergone a procedure (Table 7.11). Most commonly, in 15 of these cases, the reviewers considered that angiography with a view to revascularisation was indicated.

Table 7.11 Patent should have undergone a procedure – reviewers' opinion

	Number of patients	%
Yes	26	6.6
No	366	93.4
Subtotal	**392**	
Not answered	57	
Total	**449**	

Key Findings

- Only a minority of patients had a measurement of their natriuretic peptides. This test was done infrequently in both newly diagnosed (17/95; 17.9%) patients and patients with an established (50/319; 15.7%) heart failure diagnosis
- Echocardiography was done twice as frequently in newly diagnosed patients (42/95; 44.2%) as in patients already known to have heart failure (71/319; 22.3%)
- The reviewers considered that important investigations were omitted in 146/430 (34%) cases. Most commonly, this was an echocardiogram (86 patients) and in 43 patients that the measurement of natriuretic peptides was indicated but not done
- The reviewers considered that treatments or interventions were omitted in 96/435 (22.1%) cases. The most common omissions were respiratory support (CPAP or NIV) in 27 patients, diuretic treatment in 19 cases and nitrates in 16 patients
- In total there were 123/464 (26.5%) patients where one or more medication issue was identified by the case reviewers
- There were 286 patients where the reviewers was able to identify whether or not the patient was reviewed by a pharmacist. Of these patients 110 (38.5%) were reviewed by a pharmacist
- Reviewers identified that diuretic management could have been improved in approximately one in five cases 86/428 (20.1%) patients
- Only a small minority of patients (8/457; 1.8%) underwent a procedure in the cardiac catheter laboratory. There were an additional 26/392 (6.6%) cases where the reviewers considered that the patient should have undergone a procedure.

SEE RECOMMENDATIONS 4•5•6

**Please refer to the chapter tables for the changes in denominator*

Treatment escalation and critical care

Back to contents

In a group of patients, many of whom had poor functional status prior to admission, escalation to critical care might be expected to occur only in a minority of patients. Of the cases reviewed, 127/462 (27.5%) were referred for escalation to a higher level of care (Table 8.1). Of the 127 patients referred, 55 (43.3%) were not admitted to a higher dependency area. The destination of the patients who were transferred to a higher dependency area is shown in Figure 8.1. It is worth noting that the clinical area that the biggest group of patients was transferred to was the coronary care unit, an area where supervision of care is generally provided by cardiologists. This emphasises the importance of cardiology input for these patients, in particular when they require escalation.

Table 8.1 Referred for level 2/3 care

	Number of patients	%
Yes	127	27.5
No	335	72.5
Subtotal	**462**	
Not answered	2	
Total	**464**	

CASE STUDY 5

An elderly patient, of previously good functional status with known coronary disease and COPD was admitted in acute pulmonary oedema with severe hypoxaemia. There was limited response to oxygen diuretics, nebulisers and antibiotics and the patient was transferred to a general ward. They deteriorated further and over the next four days developed renal failure, was palliated and died.

The reviewers considered that options for treatment including CPAP or invasive ventilation and other organ support were not adequately considered. No referral was made to critical care and with more aggressive management in the first 48 hours of admission the patient might have survived.

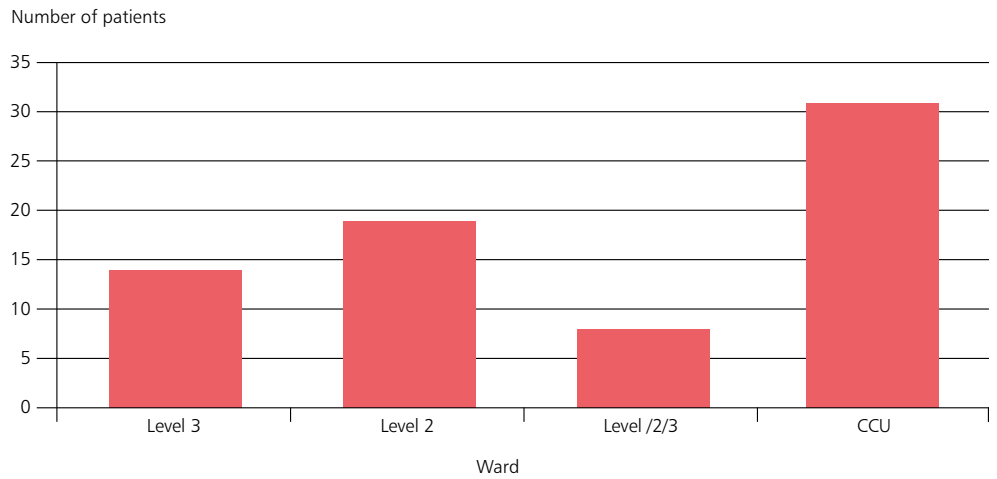

Figure 8.1 Escalation to higher level of care

The reviewers identified a further 31/212 (14.6%) cases where they considered that escalation in care did not occur but was indicated (Table 8.2).

Table 8.2 If not admitted to level 2/3 care in your opinion should they have – reviewers' opinion

	Number of patients	%
Yes	31	14.6
No	181	85.4
Subtotal	**212**	
Not answered	70	
Total	**282**	

Figure 8.2 (Rockwood vs critical care referral) and Figure 8.3 (Karnofsky vs critical care referral) show the relationship between measures of functional status and the percentage of patients either referred or where the reviewers considered they should have been referred to critical care. They show that there is a clear relationship between both Rockwood score and Karnofsky performance status and whether an escalation in care was considered to be appropriate.

Table 8.3 shows a similar relationship between age and appropriateness of critical care referral. Both increasing age and greater functional impairment were associated with a reduced frequency of referral for escalation of care.

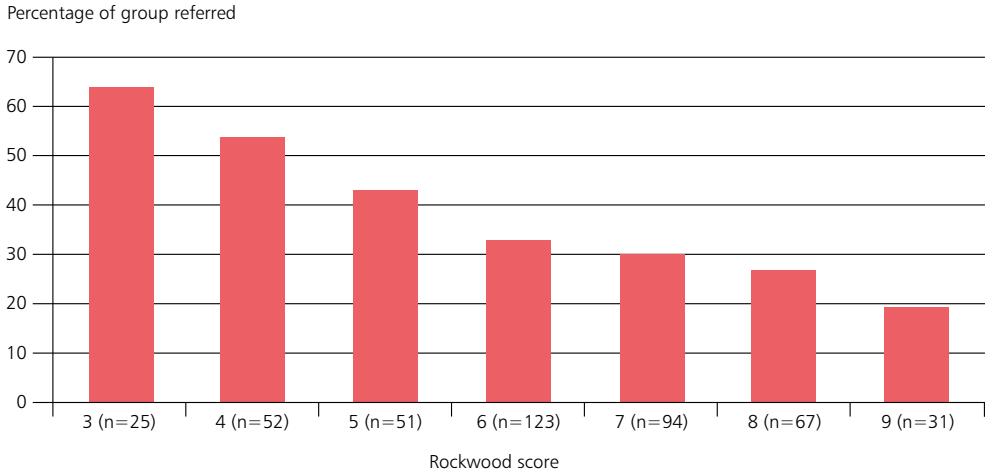

Figure 8.2 Rockwood score and critical care referral

Table 8.3 Appropriateness of critical care referral by age

Age	Not referred	Referred	Should have been referred	Referred AND should have been (%)
< 50	1	4	1	83.3
51 - 60	1	10		90.9
61 - 70	17	14	2	48.5
71 - 80	45	36	11	51.1
81 - 90	157	56	17	31.7
91 - 100	68	7	2	11.7

Note: Not referred = patients not referred when reviewer considered this appropriate. Should have been referred = not referred and reviewer considered should have been. Total not referred is sum of these.

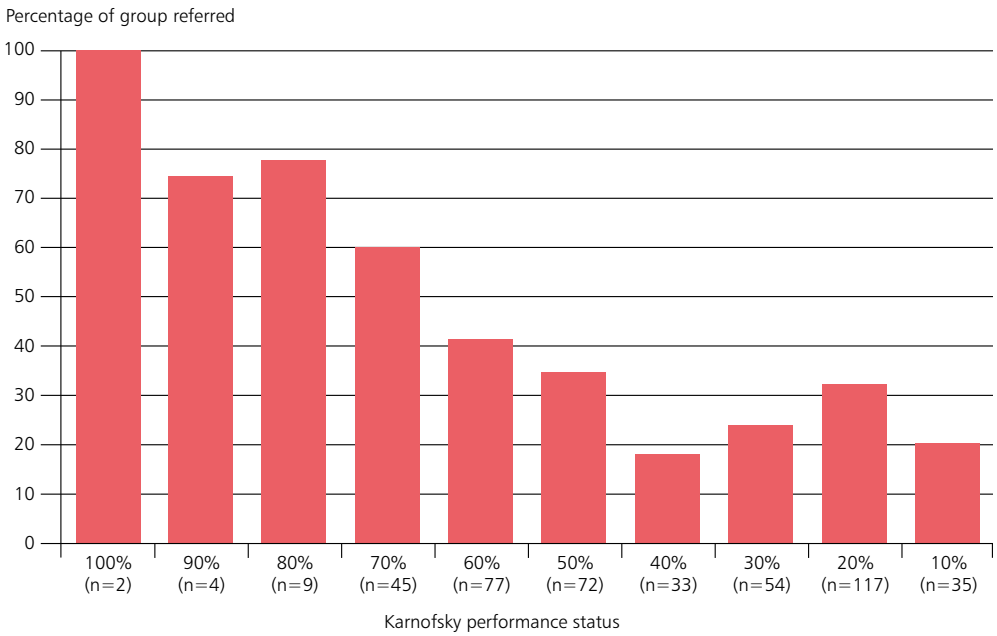

Figure 8.3 Karnofsky and referral to critical care

When patients with acute heart failure deteriorate to the point where organ failure develops, the mortality rate is much higher. Early and aggressive management of cardiogenic shock is recommended to prevent progression to multi-organ failure.[27]

Patients with a combination of major comorbidity and significant functional impairment tolerate organ support in intensive care and cardiopulmonary resuscitation poorly. The underlying disease trajectory is also important. Patients with acute deterioration following previous stability and reasonable function are more likely to have reversible causes that would benefit from treatment escalation. These are complicated but important factors in decision making. Involvement of patients and their families in decisions about their care is also a key element of good medical practice.[28]

Table 8.4 Treatment escalation decision made

	Number of patients	%
Yes	406	90.0
No	45	10.0
Subtotal	**451**	
Not answered	13	
Total	**464**	

In the majority of patients (406/451; 90%) a treatment escalation decision was made at some point during the admission (Table 8.4). Table 8.5 summarises the active decisions made. In only a small minority of patients was the decision made that escalation to include organ support or cardiopulmonary resuscitation was appropriate. This reflects the combination of advanced disease, co-morbidity and impaired functional status of the patients in the study.

Table 8.5 Escalation decisions

	Number of patients
Not for cardiopulmonary resuscitation	350
Not for invasive ventilation	225
Not for critical care referral	213
Not for renal replacement therapy	183
Not for inotropic support	172
Not for vasopressor support	170
For critical care referral	20
For inotropic support	10
For cardiopulmonary resuscitation	9
For invasive ventilation	7
For renal replacement therapy	7
For vasopressor support	5
Other	24

The time between hospital admission and the escalation decision is shown in Figure 8.4.

Escalation decisions were frequently made early in the hospital admission. In 158/272 (58.1%) cases this was within the first 24 hours. In the group of patients with a frailty score of eight or nine (Figure 8.5), escalation decisions were more frequently made at an earlier stage of the admission (48/66; 72.7% vs 110/204; 53.9% within 24 hours). This suggests that clinical frailty has in impact on decision making about escalation decisions.

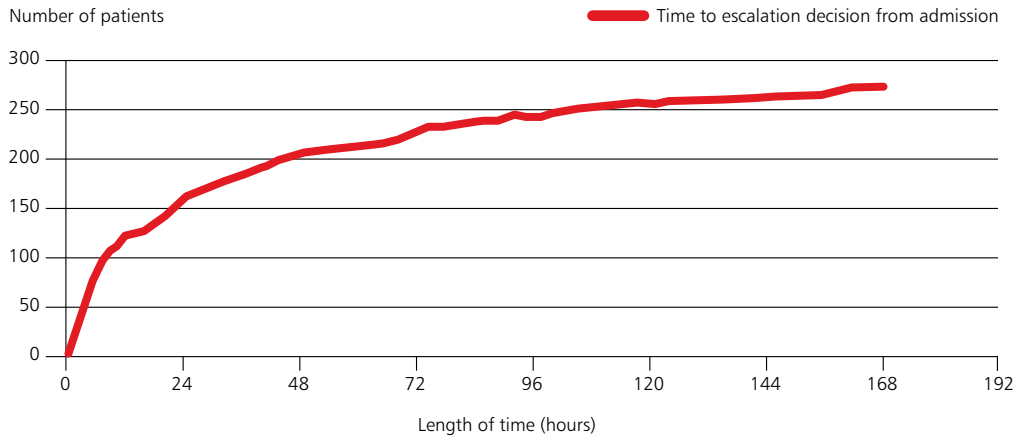

Figure 8.4 Timing of escalation decisions *(n=272)*

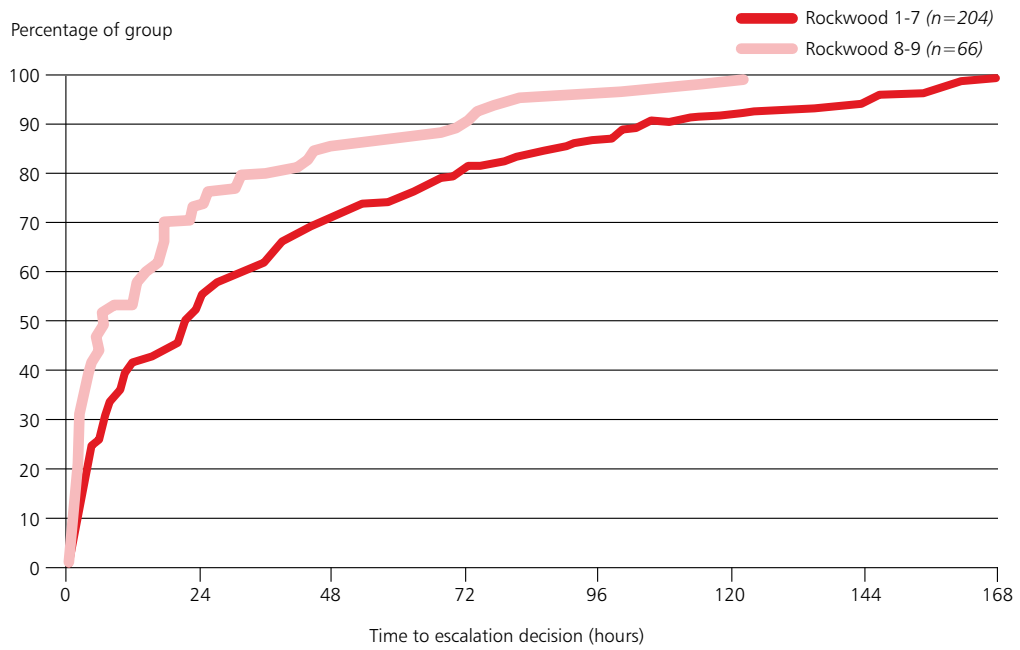

Figure 8.5 Escalation decision and frailty score

Table 8.6 Discussion of escalation of treatment

	Discussed with the patient		Discussed with the patient's family (or other/next of kin)	
	Number of patients	%	Number of patients	%
Yes	160	44.3	346	86.3
No	201	55.7	55	13.7
Subtotal	**361**		**401**	
Unknown	45		5	
Total	**406**		**406**	

Table 8.6 shows that the escalation decision was discussed with 160/361 (44.3%) patients and 346/401 (86.3%) relatives. Where the decision was not discussed with the patient, the reason for this was documented in 116/199 (58.3%) cases (Table 8.7). If no discussion took place, and the reason for the lack of discussion was documented, this was almost always because the patient's underlying medical condition made this impossible (109/112; 97.3%).

Table 8.7 If not discussed, was the reason for this documented

	Number of patients	%
Yes	116	58.3
No	83	41.7
Subtotal	**199**	
Not answered	2	
Total	**201**	

Despite the short length of stay for the patients studied, most of the decision making about escalation was made in a planned manner. In general, decisions were not made immediately before death, except for a small number of patients who were clearly dying on arrival at the hospital. In 181/272 (66.5%) cases the escalation decision was made more than 24 hours before the patient died (Figure 8.6).

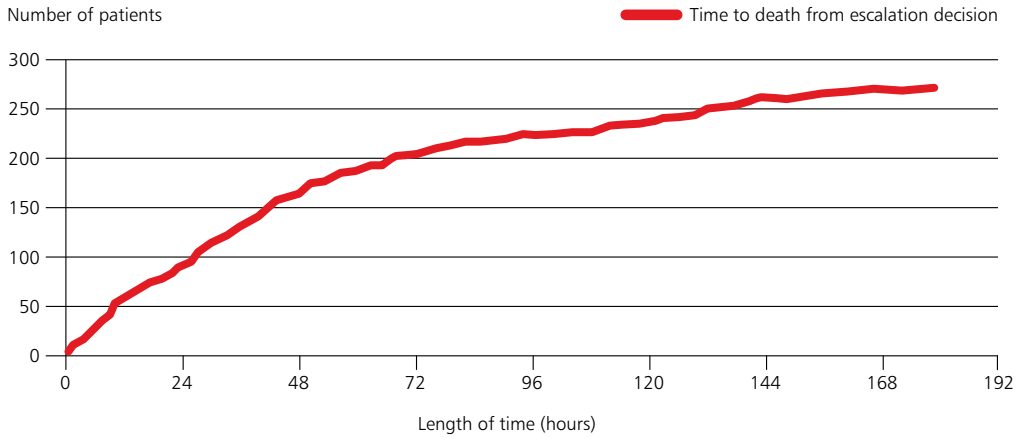

Figure 8.6 Timing of escalation decisions *(n=272)*

The grade of doctor who made the escalation decision where this was documented is listed in Table 8.8. In almost half of the cases (187/383; 48.8%), the decision was made by a consultant. Where the decision was not initially made by a consultant, in line with best practice, the initial decision was confirmed by a consultant in 131/195 (67.2%) cases. There was therefore room for improved practice in 64/383 (16.7%) cases where the decision was not made or confirmed by a consultant (Table 8.9).

Table 8.8 Grade of doctor that made the escalation decision

	Number of patients	%
Consultant	187	48.8
Senior trainee	131	34.2
Junior doctor	47	12.3
Staff grade	18	4.7
Subtotal	**383**	
Not documented	23	
Total	**406**	

CASE STUDY 6

A frail elderly patient with established heart failure due to ischaemic cardiomyopathy was admitted following gradual deterioration in breathlessness and oedema over several months at home. The patient deteriorated despite appropriate titration of medications by the outpatient and community heart failure team. On the day of admission, the heart failure consultant discussed the poor prognosis with the patient and their family and with their agreement involved the palliative care team to advise on symptom control and end of life care. The patient died peacefully three days later.

The reviewers considered that, although the admission might have been avoidable, this was an excellent example of collaborative decision making that included senior healthcare professionals, the patient and their family. They commented on the good relationship between the heart failure and palliative care teams.

Table 8.9 The decision was confirmed by a consultant if not made by non-consultant

	Number of patients	%
Yes	131	67.2
No	64	32.8
Subtotal	**195**	
Not answered	1	
Total	**196**	

Key Findings

- 127/462 (27.5%) patients were referred for escalation to a higher level of care. Of the 127 patients referred, 55 (43.3%) were not admitted to a higher dependency area
- The reviewers identified a further 31/212 (14.6%) patients where they considered that escalation in care did not occur but was indicated
- In the majority of patients (406/451; 90%) a treatment escalation decision was made at some point during the admission
- In the group of patients with a frailty score of eight or nine, escalation decisions were more frequently made at an earlier stage of the admission (48/66; 72.7% vs 110/204; 53.9% within 24 hours)
- In 181/272 (66.5%) patients the escalation decision was made more than 24 hours before the patient died
- The grade of doctor who made the escalation decision was a consultant in almost half of the cases (187/383; 48.8%). Where the decision was not initially made by a consultant it was confirmed by a consultant in 131/195 (67.2%) cases. There was therefore room for improved practice in 64/383 (16.7%) cases where the decision was not made or confirmed by a consultant.

SEE RECOMMENDATIONS 8•9

**Please refer to the chapter tables for the changes in denominator*

End of life and palliative care

Back to contents

Advanced heart failure is associated with an increased risk of death. During times of acute deterioration, judging whether a patient is actually reaching the end of their life can be difficult. A variety of models have been used to predict mortality in heart failure patients but have been shown to have only moderate accuracy.[29]

Admission to hospital for control of symptoms at the end of life can also be appropriate and is sometimes requested by patients who previously stated that they wanted to die at home. This is not therefore a straightforward area of clinical medicine.

This study selected patients who died during the hospital admission. Death was anticipated in the majority (373/459; 81.3%) of the cases reviewed (Table 9.1). It was more likely for death be anticipated in patients with an NYHA grade of III or IV prior to admission than in those with grade I-II (74.0% vs 83.4%) (Figure 9.1), in patients with a prior diagnosis of heart failure than in newly diagnosed patients (82.9 vs 75%) (Figure 9.2) and in older patients (Figure 9.3).

Table 9.1 Death was anticipated

	Number of patients	%
Yes	373	81.3
No	86	18.7
Subtotal	**459**	
Not answered	5	
Total	**464**	

The degree of frailty also helped to identify patients where death was anticipated. For patients in whom death was anticipated, 90/370 (24.3%) had a Rockwood score or five (mild frailty) or lower (Table 9.2). When death was not anticipated, the Rockwood score was five or less twice as frequently (42/85; 49.4%).

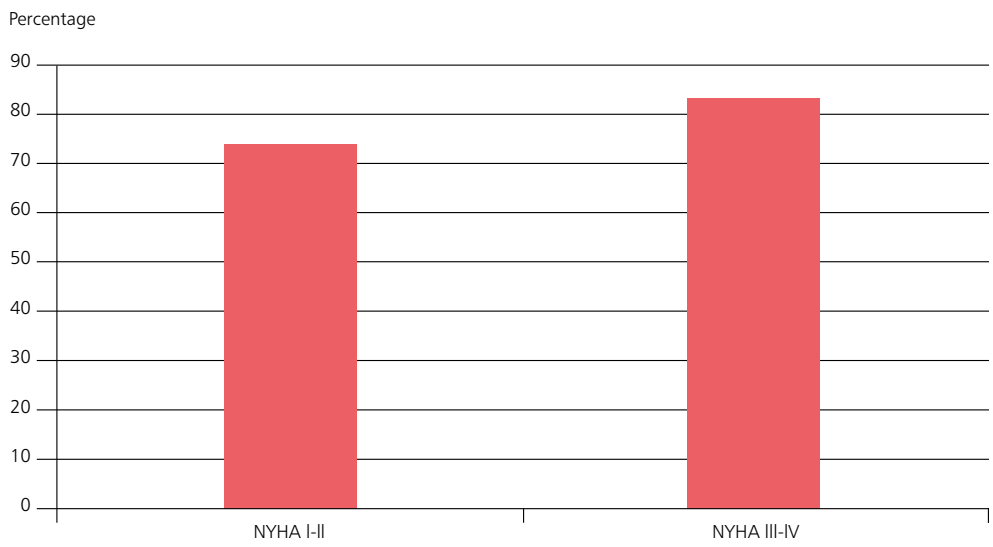

Figure 9.1 Death anticipated – percentage of group by NYHA classification

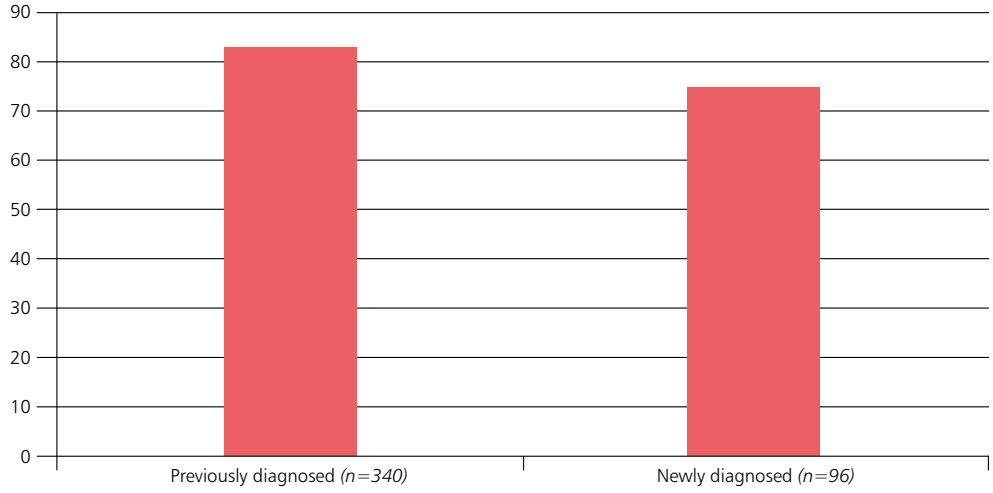

Figure 9.2 Death anticipated – percentage of group by a new or existing diagnosis of heart failure

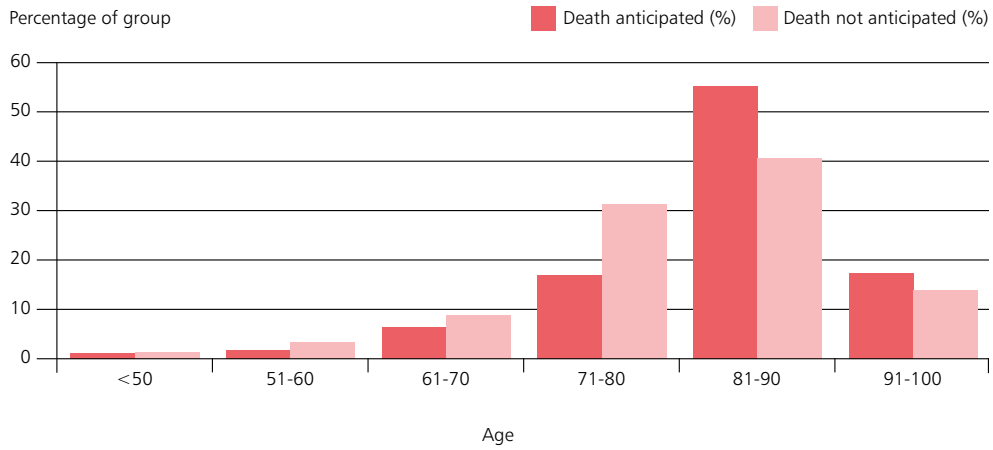

Figure 9.3 Age and death anticipated *(n=373)* **/ not anticipated** *(n=86)*

Table 9.2 Anticipation of death by Rockwood score

Rockwood score	Death anticipated (number of patients)	Death not anticipated (number of patients)	Total
1 to 5	90	42	132
6 to 9	280	43	323
Total	**370**	**85**	**455**

Two thirds (49/73; 67.1%) of cardiopulmonary resuscitation (CPR) attempts reported took place in patients where death had not been anticipated. These 49 patients were more than half (49/84; 58.3%) of the overall number where death had not been anticipated (Table 9.3).

Table 9.3 Death anticipated and CPR attempt

	Death anticipated				
	Yes		No		
CPR attempted	**Number of patients**	**%**	**Number of patients**	**%**	**Total**
Yes	24	6.5	49	58.3	**73**
No	344	93.5	35	41.7	**379**
Subtotal	**368**		**84**		**452**
Not answered	2		1		**3**
Total	**370**		**85**		**455**

Advanced heart failure is often associated with distressing physical symptoms, in particular breathlessness. As well as physical disability, anxiety, depression and social impairment are common. Specialist palliative care input can help with assessment and control of symptoms as well as addressing patients' emotional needs and provide support for families.

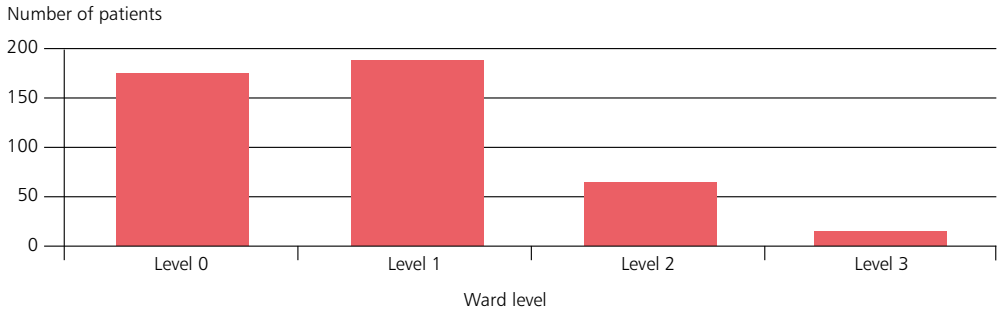

Figure 9.4 Place of death

Most of the patients in this study died on general wards rather than in an enhanced care environment (Figure 9.4). Treatment was withdrawn prior to death in more than half of the cases reviewed (250/445; 56.2%) (Table 9.4). There were 74/464 (16.1%) patients where CPR was attempted prior to death.

Table 9.4 Treatment was withdrawn

	Number of patients	%
Yes	250	56.2
No	195	43.8
Subtotal	**445**	
Not documented	12	
Total	**457**	

As already noted in chapter 2 (organisational data) it was reported that almost all hospitals had palliative care services available for heart failure patients.

Of the patients with an established diagnosis of heart failure prior to the final admission, 45/361 (12.5%) were already receiving input from a palliative care service (Table 9.5).

Table 9.5 Patient was under the care of the palliative care team

	Number of patients	%
Yes	45	12.5
No	316	87.5
Subtotal	**361**	
Unknown	91	
Total	**452**	

Table 9.6 The Rockwood and Karnofsky scores for the patients who were already under the palliative care team

Rockwood score	Number of patients	Karnofsky score	Number of patients
2 - Well	1	80%	1
3 - Managing well	0	70%	1
4 - Vulnerable	1	60%	3
5 - Mildly frail	2	50%	2
6 - Moderately frail	2	40%	2
7 - Severely frail	9	30%	2
8 - Very severely frail	6	20%	16
9 - Terminally ill	23	10%	18
Subtotal	**44**		
Not answered	1		
Total	**45**	**Total**	**45**

The Rockwood and Karnofsky scores for the patients who were already under the palliative care team are shown in Table 9.6. Of these 45 patients, 27 were NYHA grade IV and 13 were grade III prior to their final admission (data not shown).

During the final admission, 118/464 (25.4%) patients were referred to or discussed with the palliative care team. Of the remaining patients, the reviewers felt that a discussion would have been useful in a further 121/335 (36.1%) (Figure 9.5). Overall therefore, in over half of the cases reviewed, (239/464; 51.5%) palliative care involvement was indicated.

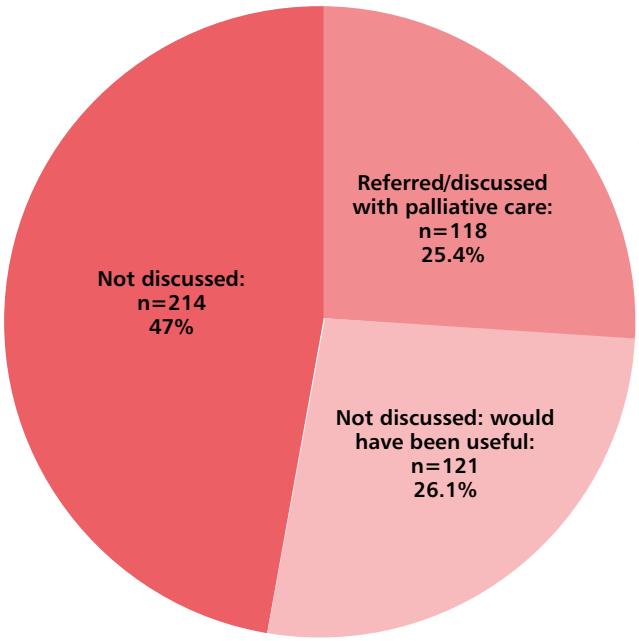

Figure 9.5 Number of patients referred to or discussed with palliative care and number where discussion would have been useful

As discussed in chapter 4 (previous hospital admissions), the final admission was considered to be avoidable in 104/353 (29.5%) cases. The main reason given was that hospital admission could be considered inappropriate in patients who are predictably at the end of their life.

Figure 9.6 shows that for 348 patients where the reviewer gave an opinion, in patients with a score of eight (very severely frail) or nine (terminally ill) the admission was more likely to be considered avoidable (34/84: 40.5%) than in less frail patients (67/237: 28.3%). Less severe frailty did not appear to have as much impact in the view of the reviewers, with the admission being considered avoidable in approximately a quarter of less frail patients.

Similarly, Figure 9.7 shows that for patients with a Karnofsky score of 40% or less, over a third of admissions were considered avoidable. Higher Karnofsky scores were associated with a lower chance of the admission being considered avoidable.

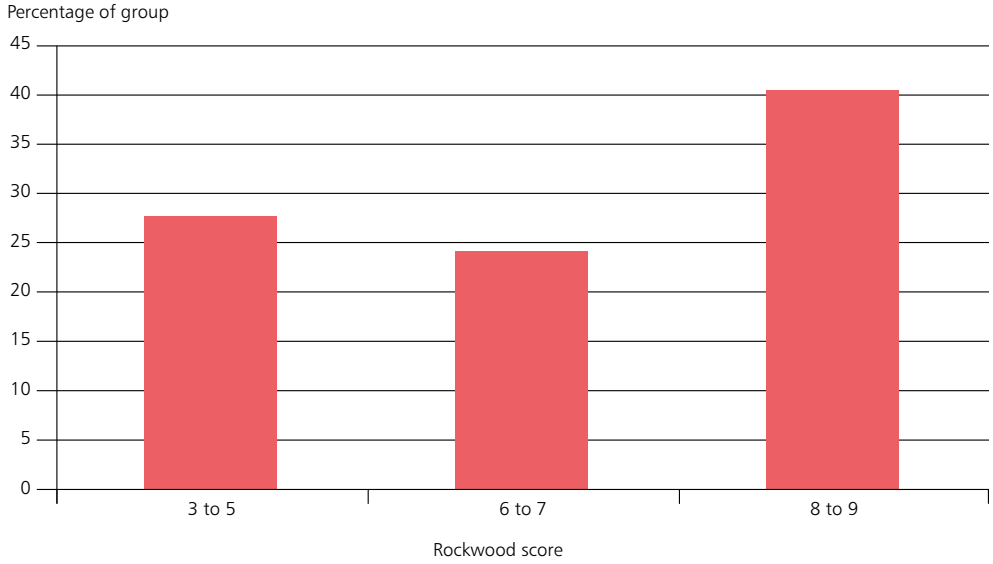

Figure 9.6 Rockwood vs % avoidable admissions *(n=348)*

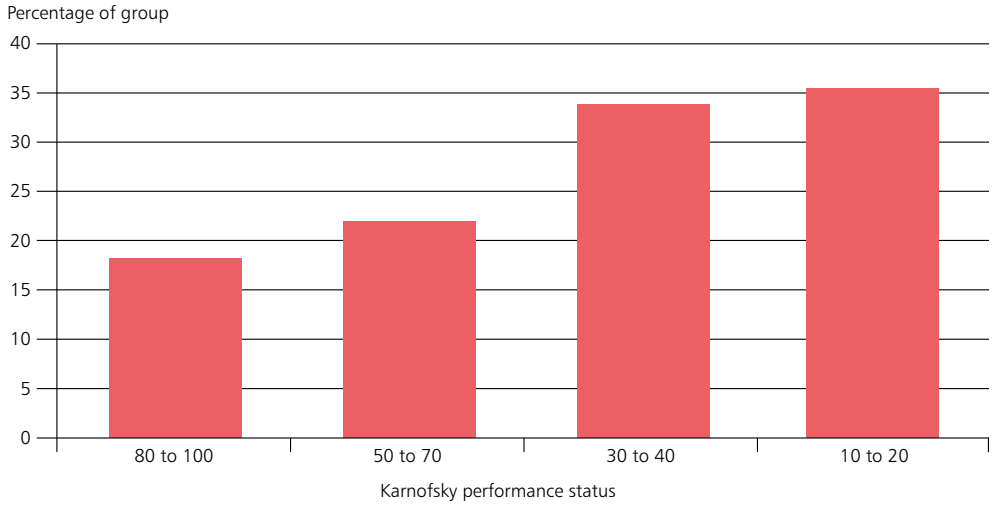

Figure 9.7 Karnofsky vs percentage of avoidable admissions *(n=352)*

For 33 patients with a Rockwood score of eight or nine, the specific comments of the case reviewers were analysed. In 29 of these cases (and in 48 cases overall), the reviewer considered that palliative care in the community would have been more appropriate. In 11 of these cases, the reviewer specifically commented that the patient was already resident in a care home and in several of these cases the patient was documented as having agreed their preferred place of death was at home.

When the very severely frail and terminally ill patients were grouped together, 35/79 (44.3%) died within the first 48 hours of admission. In the less severely frail cases, 75/257 (29.2%) died within this time period (Figure 9.8).

CASE STUDY 7

A frail elderly nursing home resident with advanced heart failure, dementia and chronic kidney disease became breathless and was taken to hospital by ambulance. In hospital, the advanced nature of their condition was immediately recognised, no active treatment for heart failure was given and palliative medicines were administered to ensure comfort. The patient died shortly after hospital admission.

The reviewers considered that hospital admission could have been avoided if a more robust advance care plan had been in place.

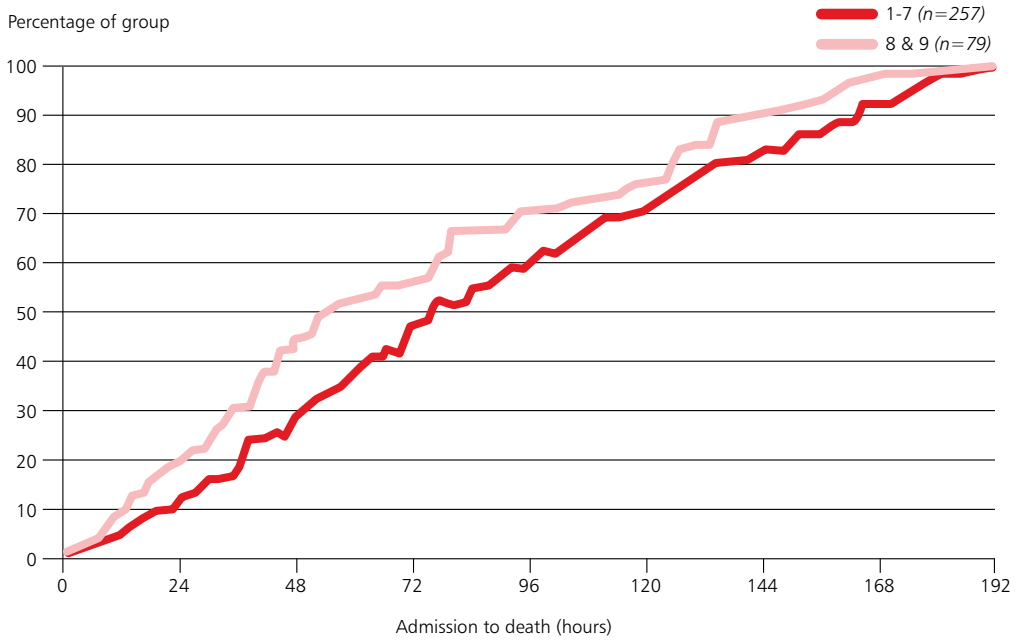

Figure 9.8 Rockwood score and time to death

Key Findings

- The patient's death was anticipated in the majority (373/459; 81.3%) of the cases reviewed
- There were 74/464 (16.1%) cases where CPR was attempted prior to death. Two thirds (49/73; 67.1%) of CPR attempts reported took place in patients where death had not been anticipated
- Of the patients with an established diagnosis of heart failure prior to the final admission, 45/361 (12.5%) were already receiving input from a palliative care service
- Just over a quarter of the peer reviewed cases (118/464; 25.4%) were referred to or discussed with the palliative care team. Of the remaining patients, the reviewers felt that a discussion would have been useful in a further 121/335 (36.1%) cases.

SEE RECOMMENDATION 2

**Please refer to the chapter tables for the changes in denominator*

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10

Clinical governance and audit

Back to contents

The national heart failure audit has helped to drive improvements in treatment update and outcome for patients with heart failure.[2] Local audit with comparison against national performance and published quality standards can help to identify areas for improvement in local hospitals. Most hospitals contributed to the national heart failure audit (165/175; 94.3%) (Table 10.1). Fewer kept a register of heart failure patients locally (119/171; 69.6%) (Table 10.2). Annual audit of heart failure services took place in 107/178 (60.1%) hospitals. Components of the annual audit are listed in Table 10.3.

Table 10.1 Hospital contributes to the national heart failure audit

	Number of hospitals	%
Yes	165	94.3
No	10	5.7
Subtotal	**175**	
Not answered	3	
Total	**178**	

Table 10.2 A register of patients with heart failure was kept at the hospital

	Number of hospitals	%
Yes	119	69.6
No	52	30.4
Subtotal	**171**	
Not answered	7	
Total	**178**	

More than nine out of ten hospitals reported that they were aware of gaps in the service they provided for heart failure patients (156/169; 92.3%) (Table 10.4), and there were plans to fill these gaps in 141 of these hospitals (Table 10.5).

Table 10.3 Component of audit

	Yes	No	Unknown
Audit includes time from referral to clinic visit	50	51	6
Audit includes staff competencies	24	77	6
Audit includes readmissions	85	18	4
Audit includes mortality	96	9	2
Audit includes achieved medication goals	85	19	3
Audit includes device implantation rates	61	41	5

Table 10.4 Gaps had been identified in their current heart failure service

	Number of hospitals	%
Yes	156	92.3
No	13	7.7
Subtotal	**169**	
Not answered	9	
Total	**178**	

Table 10.5 Plans were in place to develop the service to fill the gaps

	Number of hospitals	%
Yes	141	90.4
No	15	9.6
Total	**156**	

The areas where it was reported that there were plans to improve hospital services, are summarised in Table 10.6 for 141 hospitals from which specific information about this was provided. In terms of staff groups, an increase in heart failure specialist nursing staff was planned in 60 (42.5%) and in medical staffing in 42 (29.9%). Plans to develop palliative care (14) or psychology support (6) were being made in a smaller number of hospitals.

There were plans to develop clinical pathways distributed across all parts of the service (outpatients, 29; community services, 21; inpatients, 20; rehabilitation, 14 hospitals). There were also ten hospitals in which it was reported that there were plans to introduce a service for device implantation.

There were a limited number of responses from hospitals that specifically stated plans to improve access to investigations (echocardiography, BNP measurement and CT or MRI scanning).

Table 10.6 Planned service improvements

Staff groups/ services	Number of hospitals	Clinical pathways	Number of hospitals	Investigation	Number of hospitals	Other	Number of hospitals
Nursing	60	Community	21	Echocardiography	4	Devices	10
Medical	42	Outpatients	29	BNP measurement	6	Guidelines	10
Palliative care	14	Inpatients	20	CT/MRI	7		
Psychology	6	Rehabilitation	14				

Table: Areas of planned service development; themed free text answers for 141 hospitals

Table 10.7 Death discussed at a morbidity and mortality meeting

	Number of patients	%
Yes	150	38.0
No	245	62.0
Subtotal	**395**	
Not answered	208	
Total	**603**	

Table 10.8 Remediable factors in the care of this patient

	Number of patients
Yes	18
No	129
Subtotal	**147**
Not answered	3
Total	**150**

Mortality and case note review

When patients die, there is an opportunity to learn and improve care for future similar patients. The case notes had been reviewed for a morbidity and mortality meeting in 150/395 (38.0%) cases. It is of note that in 208 cases the clinician was unable to inform NCEPOD if a morbidity and mortality meeting had taken place for the patient (Table 10.7). Of the 150 cases that were reviewed, remediable factors in the patients care were identified in eighteen (Table 10.8).

In addition, the clinician reviewing the case records in their own hospital using a structured form for this study was asked whether there were lessons they had identified that could be learned. In almost a quarter of cases (89/363; 24.5%) they considered that there were lessons to be learned (Table 10.9). This illustrates the value of structured/themed reviews.

When these answers were analysed, the clinicians identified the key themes of this study. They most commonly found a failure to make clear and early treatment escalation decisions (23 cases) or considered that review by the specialist heart failure team was indicated (20 cases). Potential improvements in medication or treatments (in particular diuretics), investigation (echocardiogram and natriuretic peptides) and documentation or communication were also identified.

Table 10.9 Lessons learned from this review - clinician's opinion

	Number of patients	%
Yes	89	24.5
No	274	75.5
Subtotal	**363**	
Not answered	90	
Total	**453**	

Key Findings

- It was reported that data from 165/175 (94.3%) hospitals contributed to the national heart failure audit. Fewer (119/171; 69.6%) kept a register of heart failure patients locally
- Annual audit of heart failure services took place in 107/178 (60.1%) hospitals
- More than nine out of ten respondents reported that they were aware of gaps in the service they provided for heart failure patients (156/169; 92.3%). There were plans to fill these gaps in 141 of these hospitals
- The case notes had been reviewed for a morbidity and mortality meeting in 150/395 (38.0%) cases. In 208 cases the clinician was unable to inform us if a mortality and morbidity meeting had taken place for the patient
- Of the 150 cases that were reviewed, remediable factors in the patients care were identified in eighteen cases
- The clinician reviewing the case records in their own hospital using a structured form for this study was asked whether there were lessons they had identified that could be learned. In almost a quarter of cases (89/363; 24.5%) where they gave an answer they considered that there were lessons to be learned.

SEE RECOMMENDATION 15

**Please refer to the chapter tables for the changes in denominator*

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Overall quality of care

Back to contents

The reviewers assessed the care of the cases they reviewed as good practice (a standard they would accept for their own patients) in 44% of cases. There was room for improvement in clinical care in 44% of cases, in the organisation of care in 20.8%. The care provided was considered to have fallen below an acceptable standard in a number of areas (less than satisfactory) in 4.2% of the cases reviewed (Figure 11.1).

There was no impact on the overall rating of care when services with or without a service lead were compared. The reviewers' rating of care was influenced by whether or not specialist review took place. When patients received appropriate specialist review, in 182/338 (53.8%) cases the care was rated as good practice and if specialist review did not take place, in only 13/105 (12.4%) was the care rated as good. There was room for improvement in clinical care in 124/338 (36.7%) and 72/105 (68.6%) respectively (Figure 11.2).

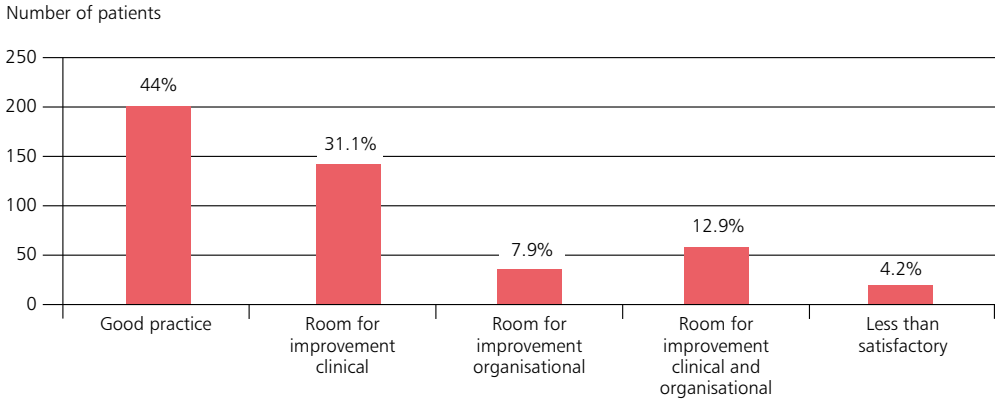

Figure 11.1 Overall assessment of care

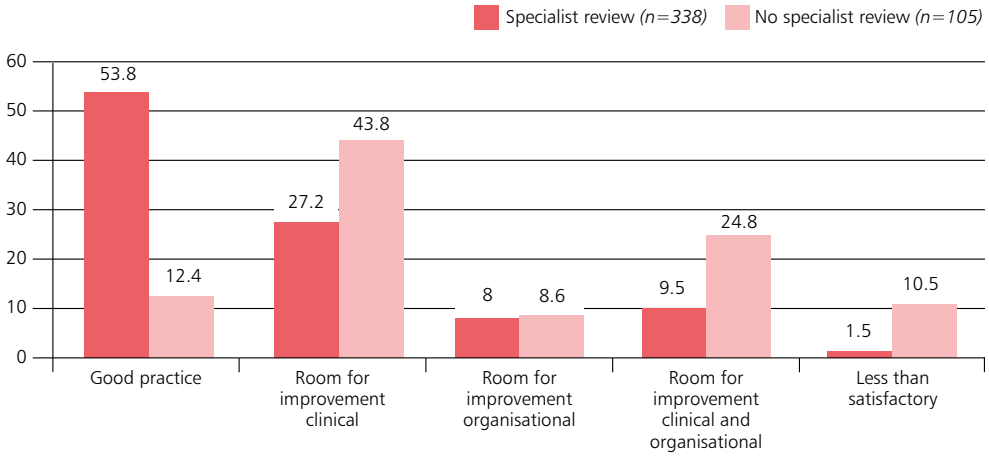

Figure 11.2 Overall assessment and specialist review (%)

As discussed earlier, specialist review of newly diagnosed heart failure patients is of particular value. When the overall rating of care for newly diagnosed patients was compared with that of patients with an established diagnosis, there was room for improvement in clinical care in 53% of newly diagnosed patients and in 39.5% of patients with a previous heart failure diagnosis (Figure 11.3).

Similarly in the 86 patients where the death was not anticipated (the reviewers thought survival was more likely), there was room for improvement in clinical care in a greater percentage of cases (53.5% vs 41.5%). This also identified 12/19 cases where the care was rated as less than satisfactory (Figure 11.4).

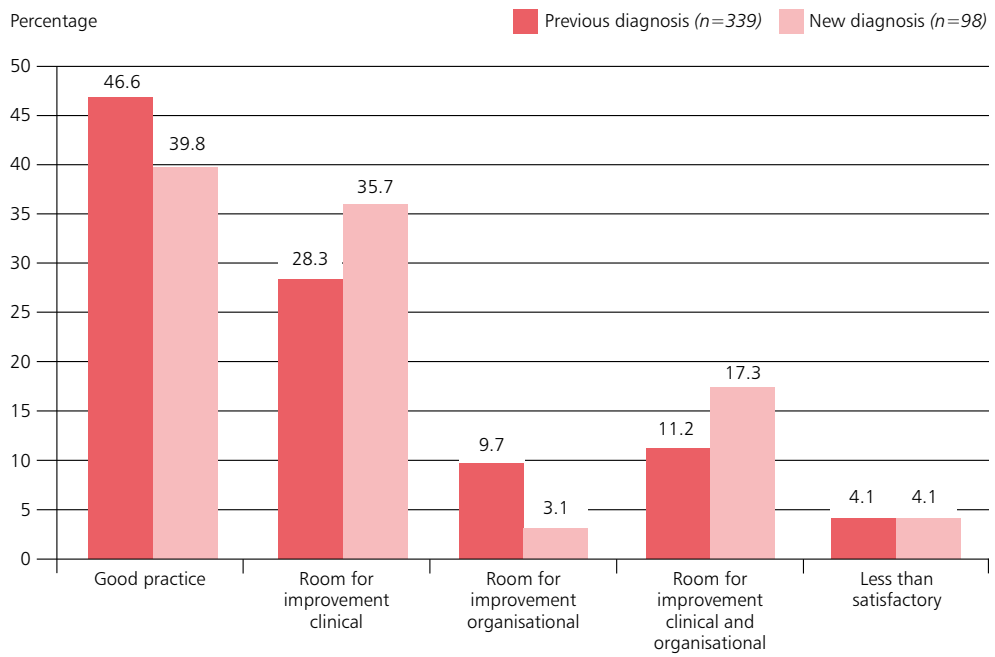

Figure 11.3 Overall assessment: new vs established heart failure

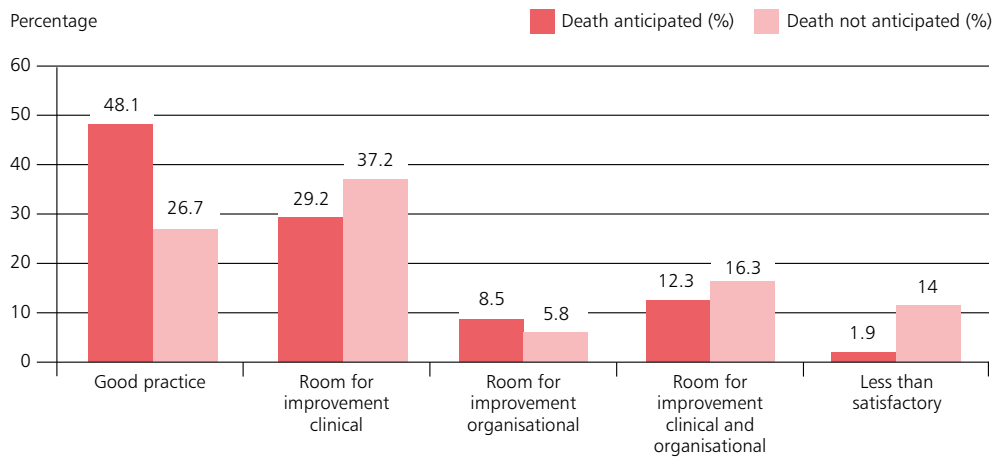

Figure 11.4 Overall assessment: death anticipated *(n=366)*/ **not anticipated** *(n=86)*

Summary

Back to contents

This study included patients who died before the end of the seventh day of an admission with acute heart failure. It has uncovered a number of areas where improvements are needed in both the organisation of services and in the clinical care provided to these patients. The presence of chronic heart failure in the majority of patients also ensured that it was possible to assess the long term care pathway for these patients.

There was room for improvement identified in clinical patient care in 44% (200/459) of the patient cases reviewed. This applied in particular to patients with newly diagnosed heart failure, where there was room improvement in 53% (182/338) of patients in the study.

It is already known that access to a heart failure specialist improves access to investigations, uptake of heart failure treatment and mortality rates. This study has reinforced the value of specialist input: after detailed review, care was rated as good in 53.8% of cases where the patient had been reviewed by a specialist but in only 12.4% of those who were not. Only 33% (199/603) of patients were reviewed by a specialist heart failure team during the inpatient episode. Better access to heart failure specialists is clearly needed.

There was also room for improvement the investigation of these patients. Despite guidelines recommending the use of serum natriuretic peptide measurements, and their wide availability in hospitals, they have not been accepted in clinical practice. Abnormal natriuretic peptide levels can highlight the need for echocardiography. Only 15.7% (50/319) of patients with established heart failure and 19.9% (17/95) of patients with a new diagnosis had this test. Furthermore, only 84% (144/171 of hospitals reported having a service to undertake the test.

Echocardiography is an essential part of the assessment of patients with acute heart failure. It is needed to make an accurate diagnosis, to assess prognosis and to guide specific treatment. Only 22.3% (71/319) of patients with established heart failure and 44.2% (42/95) of patients with a new diagnosis had an echocardiogram.

For patients with advanced heart failure, palliative care teams can help with assessment and control of symptoms while providing support for patients and their families. A quarter (25.4%; 118/464) of these patients were referred to or discussed with the palliative care team. There were an additional 121 patients where the reviewers stated that discussion would have been appropriate.

To deliver the standard of care that these patients deserve, all hospitals need a heart failure multidisciplinary team that includes membership from all professional groups that care for these patients. Local guidelines should include standards for specialist review, investigation and treatment and the performance of services should be assessed against these standards. In advanced heart failure, proactive discussion about treatment escalation and early involvement of palliative care services will also help to improve the experience of patients and their families. There are plenty of resources available to guide the care of acute heart failure but faster and accurate diagnosis and action is required.

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Recommendations

Back to contents

RECOMMENDATION 1:
A guideline for the clinical management of acute heart failure should be available in all hospitals.
These guidelines should include standards for:

- The location of care - which should be on a specialist unit
- Arrangements for heart failure service review within 24 hours
- Initial investigations required to diagnose acute heart failure, including a standard protocol for the use of:
  - BNP/NTproBNP testing
  - Echocardiography
- Immediate treatments (medications guidance for treatment prior to specialist review)

Hospitals should audit against these standards annually.
(Medical Directors, Directors of Nursing, Clinical Directors)
This recommendation supports NICE guideline CG187
This recommendation refers to the specialist heart failure/ cardiology team review - see also RECOMMENDATION 2 regarding all acute admissions and consultant review within 14 hours of admission.

RECOMMENDATION 2:
All patients admitted with acute heart failure should be reviewed by a consultant within 14 hours of admission, or sooner as the clinical need dictates (e.g. cardiogenic shock or respiratory failure) and discussed with a member of the heart failure multidisciplinary team. For patients with worsening symptoms despite optimal specialist treatment, this discussion should include their palliative care needs.
(Consultants)

RECOMMENDATION 3:
All heart failure patients should have access to a heart failure multidisciplinary team. Core membership of this team should include:

- A clinician with a sub-speciality interest in heart failure
- A specialist heart failure nurse
- A healthcare professional with expertise in specialist prescribing for heart failure
- The primary care team
- A specialist in palliative care

Other services such as cardiac rehabilitation, physiotherapy, occupational therapy, clinical psychology, elderly care, dietetics and clerical support should be involved as needed.
(Commissioners, Medical Directors, Directors of Nursing and Clinical Directors)
This recommendation supports the draft NICE guidelines for chronic heart failure management outlining the core membership with the addition of palliative care to the core group.

RECOMMENDATION 4:
Due to the complexity of medications used by patients with acute heart failure and their common co-morbidities, medications should be reviewed by a pharmacist with specialist expertise in prescribing for heart failure on admission to and discharge from hospital.
(Lead Pharmacists)

RECOMMENDATION 5:
Serum natriuretic peptide measurement should be included in the first set of blood tests in all patients with acute breathlessness and who may have new acute heart failure. It is central to the assessment of these patients to guide further investigation. *(All Clinicians)*
This recommendationsupports NICE guideline CG187 rec 1.2.2

RECOMMENDATION 6:
An echocardiogram should be performed for all patients with suspected acute heart failure as early as possible after presentation to hospital, and within a maximum of 48 hours as it is the key to diagnosis, risk stratification and specialist management of acute heart failure. *(All Clinicians, Lead Physiologists and Medical Directors)*
This recommendation supports NICE guideline CG187 rec 1.2.4

RECOMMENDATION 7:
Due to the poor sensitivity of individual physiological parameters (in particular heart rate) in identifying severity of illness in acute heart failure, use of a composite physiology score such as the National Early Warning Score is recommended. *(All Clinicians, Medical Directors and Directors of Nursing)*

RECOMMENDATION 8:
For all patients with heart failure, best practice in escalation decision making includes:

- Assessment of the goals and benefits of treatment escalation
- Inclusion of the patient (and their family where possible)
- Involvement of the cardiology or heart failure consultant
- Agreement among members of the multidisciplinary team
- Communication of the decision with healthcare professionals across the whole care pathway

For patients with advanced heart failure, pre-emptive discussion in the outpatient setting of treatments that would not be beneficial, along with consideration of palliative care needs, can prevent unnecessary admissions and should be encouraged. Escalation decisions should be reviewed at the time of all admissions with acute heart failure. *(Heart Failure Teams/Consultant Cardiologists)*
See also: Treatment and care towards the end of life: good practice in decision making (GMC 2010)

RECOMMENDATION 9:
All treatment escalation decisions that are not initially made by a consultant should be confirmed by a consultant at the earliest opportunity afterwards. The reasons for treatment escalation decisions should be fully documented in the patient's records. *(All Clinicians, Consultants)*

RECOMMENDATION 10:
On discharge from hospital, all acute heart failure patients should receive a summary that includes:

- A named healthcare co-ordinator and their contact details
- Their diagnosis and the cause of their heart failure
- Current medications and description of any monitoring required
- Individualised guidance on self-management
- Functional abilities and social care needs
- Follow up plans
- Information on how to access the specialist heart failure team and urgent care

(All Clinicians, Heart Failure/Cardiology Leads)
This recommendation adds to NICE guideline CG187

RECOMMENDATION 11:
After an admission with acute heart failure, all patients should be followed up by a member of the specialist heart failure team within two weeks of discharge from hospital as recommended in NICE guidance (CG187 rec 1.1.4). *(Heart Failure Teams/Consultant Cardiologists)*

RECOMMENDATION 12:
Patients with a confirmed diagnosis of heart failure benefit from ongoing review. In line with current NICE guidelines (CG108), this should occur at least every six months and more frequently in unstable patients or those with comorbidity. Review should include:

- Clinical assessment of cardiac rhythm and fluid status
- Assessment of functional and nutritional status
- Medication review; including side effects and the need for changes
- Measurement of renal function and electrolytes

The individual responsible and location of this review should be tailored to meet each individual patient's needs and be guided by the heart failure multidisciplinary team.
In advanced heart failure, the responsibility for follow-up may transfer from the heart failure team to the palliative care service. *(Heart Failure Teams/Consultant Cardiologists)*

RECOMMENDATION 13:
Heart failure patients should be offered an exercise based programme of cardiac rehabilitation that also includes education and psychological support. This is in line with the NICE quality standard (QS9) for chronic heart failure in adults. A record should be kept of the number (and percentage) of suitable heart failure patients who receive cardiac rehabilitation. *(Commissioners and Heart Failure Teams/Consultant Cardiologists)*

RECOMMENDATION 14:
Pathways should be in place for patients with advanced heart failure who deteriorate to access palliative care in the community, in a hospice or in hospital when appropriate. Referral to specialist palliative care services should be based on patient-need and choice and not delayed until deterioration is considered irreversible. A full anticipatory care plan should be agreed with the patient and this should be communicated to and available to all those involved in the acute heart failure pathway. *(Palliative Care Leads, Commissioners, Community Providers and Ambulance Services)*

RECOMMENDATION 15:
Hospitals should collect and audit data on the total number of heart failure patients under their care. These data should be submitted to the national heart failure audit. *(Medical Directors)*

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Back to contents

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Appendices

Back to contents

Glossary

Term	Abbreviation	Definition
Acute heart failure	AHF	This is a sudden worsening of the signs and symptoms of heart failure, which typically includes difficulty breathing, leg or feet swelling, and fatigue.
Angiotensin converting enzyme inhibitor	ACE inhibitor	This a pharmaceutical drug used primarily for the treatment of hypertension (elevated blood pressure) and congestive heart failure. This group of drugs causes relaxation of blood vessels as well as a decrease in blood volume, which leads to lower blood pressure
Angioplasty		Angioplasty, also known as balloon angioplasty and percutaneous transluminal angioplasty (PTA), is a minimally invasive, endovascular procedure to widen narrowed or obstructed arteries or veins, typically to treat arterial atherosclerosis.
Beta blockers		Beta blockers, also known as beta-adrenergic blocking agents, are medications that reduce blood pressure. Beta blockers work by blocking the effects of the hormone epinephrine, also known as adrenaline. Beta blockers cause the heart to beat more slowly and with less force, thereby reducing blood pressure.
Brain natriuretic peptide/ serum natriuretic peptide	BNP/NTProBNP	Also known as B-type natriuretic peptide, is a hormone secreted in the heart ventricles in response to stretching caused by increased ventricular blood volume.
Charlson co-morbidity index		This predicts the ten-year mortality for a patient who may have a range of comorbid conditions.
Chronic heart failure	CHF	This happens when the heart muscle gets damaged, then becomes weak and doesn't pump properly. The damage can be caused by a heart attack, or long-term health problems like high blood pressure, diabetes or heart disease. It can also be caused by cardiomyopathy, a disease of the heart muscle.
Coronary artery disease/ ischaemic cardiomyopathy		This is the most common type of heart disease and happens when the arteries that supply blood to heart muscle become hardened and narrowed.
C-reactive protein	CRP	This is a substance produced by the liver in response to inflammation. A high level of CRP in the blood is a marker of inflammation.
Cardiac resyncronisation therapy device	CRTD	Three leads connected to the device monitor the heart rate to detect heart rate irregularities and emit tiny pulses of electricity to correct them.

Term	Abbreviation	Definition
Computed tomography scan	CT	This scan combines many x-ray measurements taken from different angles to produce cross-sectional (tomographic) images of specific areas of a scanned object.
Continuous positive airways pressure	CPAP	This is a form of positive airway pressure ventilator, which applies mild air pressure on a continuous basis to keep the airways continuously open in people who are able to breathe spontaneously on their own.
CT pulmonary angiography	CTPA	This is a medical diagnostic test that employs a CT scan to obtain an image of the pulmonary arteries – those related to the lungs.
D-dimer test		This test is used to help rule out the presence of an inappropriate blood clot (thrombus).
Electrocardiogram	ECG	This is a simple test that can be used to check the heart's rhythm and electrical activity. Sensors attached to the skin are used to detect the electrical signals produced by the heart each time it beats.
Echocardiogram	ECHO	This scan used to look at the heart and nearby blood vessels. It's a type of ultrasound scan, which means a small probe is used to send out high-frequency sound waves that create echoes when they bounce off different parts of the body.
Estimated glomerular filtration rate	eGFR	This is a key indicator of renal function.
Heart attack	MI	This is a life-threatening medical emergency caused by the blood supply to the heart being blocked. Heart attacks can cause permanent damage to muscles in the heart. A heart attack is also known medically as a myocardial infarction (MI).
Hypertension		High blood pressure
Implantable cardioverter defibrillator	ICD	This is a small device that's placed in the chest or abdomen. Doctors use the device to help treat irregular heartbeats called arrhythmias.
Inotropic support		Inotropic agents, or inotropes, are medicines that change the force of the heart's contractions, either making it stronger or weaker.
Karnofsky performance status scale		This is an assessment tool for functional impairment. It can be used to compare effectiveness of different therapies and to assess the prognosis in individual patients.
New York Heart Association classification	NYHA	This is used to grade the severity of functional limitations in a patient with heart failure.
National Early Warning Score	NEWS	Used to aid early detection of deterioration by categorising a patient's severity of illness and prompting nursing staff to request a medical review at specific trigger.

Term	Abbreviation	Definition
Non-invasive ventilation	NIV	The provision of ventilatory support through the patient's upper airway using a mask or similar device. This technique is distinguished from those which bypass the upper airway with a tracheal tube, laryngeal mask, or tracheostomy and are therefore considered invasive.
Non ischaemic cardiomyopathy		This is heart disease not caused by reduced blood flow to the heart.
Point of care ultrasound		The practice of trained medical professionals using ultrasound to diagnose problems wherever a patient is being treated.
Renal replacement therapy	RRT	This replaces the normal blood-filtering function of the kidneys. It is used when the kidneys are not working well.
Right heart failure	RHF	When the right side loses pumping power, blood backs up in the body's veins. This usually causes swelling or congestion in the legs, ankles and swelling within the abdomen
Rockwood clinical frailty scale		A practical and efficient tool for assessing frailty.
Percutaneous coronary intervention (formerly known as angioplasty with stent)	PCI	This is a non-surgical procedure that uses a catheter (a thin flexible tube) to place a small structure called a stent to open up blood vessels in the heart that have been narrowed by plaque build up, a condition known as atherosclerosis.
Tachyarrhythmia/ tachycardia		This is a heart rate that exceeds the normal resting rate. In general, a resting heart rate over 100 beats per minute is accepted as tachycardia in adults.
Transcatheter aortic valve implantation		A new procedure that may be offered to aortic valve replacement.
Transthoracic Doppler echocardiography	TDE	This is a non-invasive tool for measuring coronary flow reserve in the epicardial coronary arteries.
Ventricular arrhythmias		These are abnormal heart rhythms that originate in the bottom chambers of the heart called the ventricles. These rhythms can occur as a result of damage to the heart muscle from a heart attack or cardiomyopathy
Ventricular assist device	VAD	This is a mechanical pump that's used to support heart function and blood flow in people who have weakened hearts. The device takes blood from a lower chamber of the heart and helps pump it to the body and vital organs, just as a healthy heart would.

Appendix 1

ROCKWOOD CLINICAL FRAILTY SCORE

Clinical Frailty Scale*

1 **Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 **Well** – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.

3 **Managing Well** – People whose **medical problems are well controlled,** but are **not regularly active** beyond routine walking.

4 **Vulnerable** – While **not dependent** on others for daily help, often **symptoms limit activities.** A common complaint is being "slowed up", and/or being tired during the day.

5 **Mildly Frail** – These people often have **more evident slowing,** and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 **Moderately Frail** – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

7 **Severely Frail** – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 **Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9. **Terminally Ill** - Approaching the end of life. This category applies to people with **a life expectancy <6 months**, who are **not otherwise evidently frail.**

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

* 1. Canadian Study on Health & Aging, Revised 2008.
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

DALHOUSIE UNIVERSITY *Inspiring Minds*

Reprinted with permission K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495

CHARLSON COMORBIDITY INDEX

The Charlson Comorbidity Index predicts the one-year mortality for a patient who may have a range of comorbid conditions, such as heart disease (a total of 22 conditions). Each condition is assigned a score of 1, 2, 3, or 6, depending on the risk of dying associated with each one. Scores are summed to provide a total score to predict mortality.

Clinical conditions and associated scores are as follows:

- 1 each: Myocardial infarct, congestive heart failure, peripheral vascular disease, dementia, cerebrovascular disease, chronic lung disease, connective tissue disease, ulcer, chronic liver disease, diabetes
- 2 each: Hemiplegia, moderate or severe kidney disease, diabetes with end organ damage, tumour, leukaemia, lymphoma
- 3 each: Moderate or severe liver disease
- 6 each: Malignant tumour, metastasis, AIDS.

Charlson, Mary E.; Pompei, Peter; Ales, Kathy L.; MacKenzie, C. Ronald (1987). "A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation". Journal of Chronic Diseases. 40 (5): 373–83

KARNOFSKY PERFORMANCE STATUS SCALE

100 % – Normal; no complaints; no evidence of disease
90% – Able to carry on normal activity; minor signs or symptoms of disease
80% – Normal activity with effort; some signs or symptoms of disease
70% – Cares for self; unable to carry on normal activity or to do active work
60% – Requires occasional assistance, but is able to care for most of their personal needs
50% – Requires considerable assistance and frequent medical care
40% – Disabled; requires special care and assistance
30% – Severely disabled; hospital admission is indicated although death not imminent
20% – Very sick; hospital admission necessary; active supportive treatment necessary
10% – Moribund; fatal processes progressing rapidly
00% – Dead.

Karnofsky DA, Abelmann WH, Craver LF, Burchenal JH. The Use of the Nitrogen Mustards in the Palliative Treatment of Carcinoma – with Particular Reference to Bronchogenic Carcinoma. Cancer. 1948;1(4):634-56

NEW YORK HEART ASSOCIATION (NYHA) CLASSIFICATION

NYHA Class	Symptoms
I	Cardiac disease, but no symptoms and no limitation in ordinary physical activity, e.g. no shortness of breath when walking, climbing stairs etc.
II	Mild symptoms (mild shortness of breath and/or angina) and slight limitation during ordinary activity.
III	Marked limitation in activity due to symptoms, even during less-than-ordinary activity, e.g. walking short distances (20–100 m).
IV	Severe limitations. Experiences symptoms even while at rest. Mostly bedbound patients.

The Criteria Committee of the New York Heart Association. (1994). Nomenclature and Criteria for Diagnosis of Diseases of the Heart and Great Vessels (9th ed.). Boston: Little, Brown & Co. pp. 253–256

Appendix 2 – Resources

British Society for Heart Failure
http://www.bsh.org.uk/

The British Society for Heart Failure (BSH) is a multi-disciplinary society and membership is open to all healthcare professionals involved with thediagnosis, treatment and management of heart failure, and research in this area.

British Heart Foundation
https://www.bhf.org.uk/heart-health

NICE National Institute for Health and Care Excellence

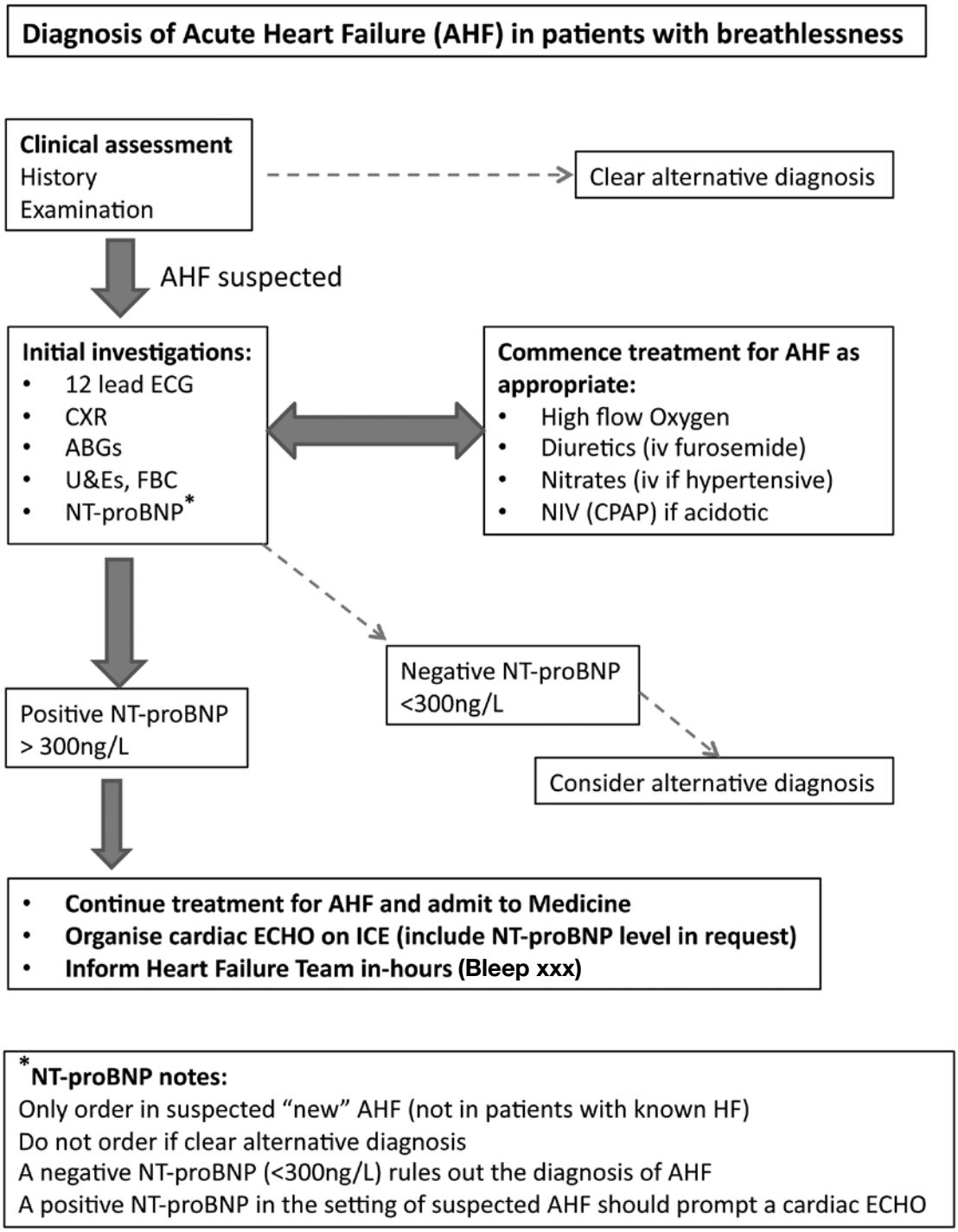
Acute heart failure: diagnosis and management
Clinical guideline [CG187] Published date: October 2014
https://www.nice.org.uk/guidance/cg187

Acute heart failure
Quality standard [QS103] Published date: December 2015
https://www.nice.org.uk/guidance/qs103

Chronic heart failure in adults: management
Clinical guideline [CG108] Published date: August 2010
https://www.nice.org.uk/guidance/cg108

Chronic heart failure in adults
Quality standard [QS9] Published date: June 2011 Last updated: February 2016
https://www.nice.org.uk/guidance/qs9

Appendix 3 – Acute Heart Failure algorithm



***NT-proBNP notes:**
Only order in suspected "new" AHF (not in patients with known HF)
Do not order if clear alternative diagnosis
A negative NT-proBNP (<300ng/L) rules out the diagnosis of AHF
A positive NT-proBNP in the setting of suspected AHF should prompt a cardiac ECHO

Jason Kendall on behalf of Chest Pain Working Group, April 2015, North Bristol NHS Trust

Appendix 4 - Elements of a good guideline

MANAGEMENT OF ACUTE HEART FAILURE

Link Consultants: Dr Robin Ray & Dr Lisa Anderson
St George's University Hospitals NHS Foundation Trust

Acute decompensated heart failure is a life-threatening condition with 30-day mortality of 15% in those with NT-proBNP > 5000ng/L and 5% in those with NT-proBNP < 5000ng/L1. Patients with heart failure should generally be discharged from hospital only when their clinical condition is stable and the management plan is optimised.

Community heart failure nurse follow-up reduces the 3-month risk of re-admission by 35%. Please contact heart failure nurse specialists (Bleep xxx/ Ext. xxx)) as soon as patients are admitted for specialist in-patient review and for long-term management planning.

DIAGNOSIS

Acute heart failure is the leading cause of hospital admission in people 65 years or older in the UK and one in seven people > 85years of age has heart failure. Therefore it should be in the differential of all elderly patients presenting with breathlessness. If heart failure is suspected, request serum NT-proBNP with the U+E sample.

Age (yrs)	<50	50-75	>75
Acute Heart Failure likely if NT-proBNP (ng/L) is	>450	>900	>1800

If the NT-proBNP is normal (< 300ng/L), search for an alternative diagnosis. If the NT-proBNP is significantly elevated (see above) acute heart failure is likely and should be confirmed by echocardiography if not already documented. All patients admitted with a new diagnosis of heart failure (with raised NT-proBNP) should have an in-patient echocardiogram prior to discharge (ideally within 48 hours of admission). If the NT-proBNP concentration is intermediate (above 300 ng/L but below acute heart failure levels), reconsider the diagnosis. If after full reassessment, heart failure is likely, request an echocardiogram.

Heart failure echo requests

1. NT-proBNP level must be documented on the request form.
2. Repeat echo is not necessary if there is an echo within the last 6 months, unless there has been a change in clinical condition or a new lesion (eg. new murmur) is suspected.

Management of acute heart failure

Acute pulmonary oedema:

- **Call the cardiology SpR (Bleep xxx) to arrange admission to CCU**
- O_2 to maintain SaO_2 (95-98%)
- IV furosemide 40-80mg bolus followed by an infusion at 5-20 mg/hr if required
- Consider IV GTN infusion (10-200 micrograms/min) for patients with concomitant myocardial ischaemia, severe hypertension or regurgitant aortic or mitral valve disease.
- Maintain systolic BP > 100mmHg and monitor in a level 2 area
- CPAP (with mechanical ventilation for respiratory failure, physical exhaustion and if appropriate for the patient)

General measures

- Monitor: pulse, check oximetry and blood pressure every 5-10 mins with continuous ECG. If cardiogenic shock develops, contact cardiology SpR immediately.
- Request chest X-ray; FBC, plasma U&E's, creatinine, NT-proBNP TFTs, LFTs, troponin, glucose and lipids; arterial blood gases if oxygen saturation is low or oxygen is required to maintain saturation.
- Review medication: stop Ca2+ channel blockers and NSAIDs where possible.
- In unstable patients with diabetes, switch to insulin sliding scale.
- Patients already on ACE and/or Beta-Blockers: efforts should be made to maintain usual medication doses even if the first dose(s) need to be omitted due to hypotension. Withdrawal of beta-blockers in acute heart failure patients has been shown to be associated with increased mortality risk.
- If patient presents in fast atrial fibrillation and pulmonary oedema, consider digoxin initially until beta-blockers can be initiated and up-titrated.

Management of Chronic Heart Failure with Left Ventricular Systolic Dysfunction[1]

Diuretics are used for the relief of congestive symptoms and fluid retention in patients. They should be titrated (up and down) according to need, following the initiation of heart failure therapies:

1. Start ACE inhibitor (e.g. ramipril) and titrate upwards. If not tolerated (e.g. due to persistent cough) try an angiotensin II receptor antagonist (e.g. candesartan).
2. Start a beta-blocker, unless contra-indicated, (e.g. bisoprolol) and titrate upwards
3. Add a Mineralocorticoid Receptor Antagonist (Spironolactone or Eplerenone 12.5–25mg od).

For those with isolated right ventricular failure, fluid balance and diuretic therapy is all that is required.

DISCHARGE AND FOLLOW-UP

All acute heart failure admissions need community heart failure nurse follow-up after discharge to reduce risk of re-admission. This can be arranged via the in-patient heart failure nurses (ext. 4404, Bleep 7376). Follow-up arrangements should be clearly documented.

- If ACE inhibitors, beta-blocker or spironolactone doses have been reduced or discontinued during the admission, state the reason (e.g. hypotension, renal impairment, hypo/hyperkalaemia) in the discharge summary so that re-initiation can be considered in the community.
- If a new diagnosis of heart failure, document key echocardiographic findings in discharge summary.
- Record patient's weight on discharge and presence of any residual oedema at this weight.

[1] *Chronic heart failure: Management of chronic heart failure in adults in primary & secondary care. NICE Clinical Guideline 108, August 2010*

[2] *Diagnosing and Managing Acute Heart Failure in Adults. NICE Clinical Guideline 187, October 2014*

The current NICE guidelines are being updated and for further information, please refer to the latest European Heart Failure guidelines published in May 2016: http://eurheartj.oxfordjournals.org/lookup/doi/10.1093/eurheartj/ehw128

Appendix 5 - The role and structure of NCEPOD

The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) is an independent body to which a corporate commitment has been made by the Medical and Surgical Royal Colleges, Associations and Faculties related to its area of activity. Each of these bodies nominates members on to NCEPOD's Steering Group.

Steering Group as at 5th July 2018

Dr M Nathanson	Association of Anaesthetists of Great Britain and Ireland
Vacancy	Association of Surgeons of Great Britain and Ireland
Mr K Altman	Faculty of Dental Surgery, Royal College of Surgeons of England
Dr A Tavare	Faculty of Public Health Medicine
Mr S Barasi	Lay Representative
Ms S Payne	Lay Representative
Dr J C Carey	Royal College of Anaesthetists
Dr K Ramachandran	Royal College of Anaesthetists
Dr J Butler	Faculty of Intensive Care Medicine
Vacancy	Royal College of Emergency Medicine
Vacancy	Royal College of General Practitioners
Dr N Ashby	Royal College of Nursing
Mr T Hillard	Royal College of Obstetricians and Gynaecologists
Mr W Karwatowski	Royal College of Ophthalmologists
Dr I Doughty	Royal College of Paediatrics and Child Health
Dr L Igali	Royal College of Pathologists
Mr M McKirdy	Royal College of Physicians and Surgeons of Glasgow
Dr M Jones	Royal College of Physicians of Edinburgh
Vacancy	Royal College of Physicians of London
Vacancy	Royal College of Physicians of London
Dr J Carlile	Royal College of Psychiatrists
Prof R McWilliams	Royal College of Radiologists
Mr W Tennant	Royal College of Surgeons of Edinburgh
Mr J Abercrombie	Royal College of Surgeons of England

Observers

Dr D Sharpstone	Coroners' Society of England and Wales

Trustees
Professor L Regan – Chair | Dr D Mason – Honorary Treasurer | Mr I Martin | Ms J Barber | Professor R Endacott | Professor T J Hendra

NCEPOD is a company, limited by guarantee (Company number: 3019382) and a registered charity (Charity number: 1075588) | **Company Secretary** Dr M Mason

Clinical Co-ordinators
The Steering Group appoint a Lead Clinical Co-ordinator for a defined tenure. In addition there are 8 Clinical Co-ordinators who work on each study. All Co-ordinators are engaged in active academic/clinical practice (in the NHS) during their term of office.

Lead Clinical Co-ordinator:
Dr V Srivastava (Medicine)

Clinical Co-ordinators:
Dr K Wilkinson (Anaesthesia)|Dr M Juniper (Medicine)
Dr A P L Goodwin (Anaesthesia)|Mr M Sinclair (Surgery)
Dr S McPherson (Interventional Radiology)
Dr A Michalski (Oncology)

Lay Representatives
NCEPOD has a number of lay representatives who assist in all aspects of NCEPOD's work.
Alice Joy | Ron Newall |Sharon North| Hayley Topping
Nigel Buck | Constantinos Regas

Commissioning and supporting organisations
The Clinical Outcome and Review Programme into Medical and Surgical Care is commissioned by the Healthcare Quality Improvement Partnership (HQIP) on behalf of NHS England, Welsh Government, the Health and Social care division of the Scottish Government, the Northern Ireland Department of Health, the States of Jersey, the Bailiwick of Guernsey, and the Isle of Man.

The organisations that provided additional funding to cover the cost of this study:
Aspen Healthcare | The Beneden Hospital Trust
BMI Healthcare | BUPA Cromwell | East Kent Medical Services Ltd | Fairfield Independent Hospital | HCA International | Hospital of St John and St Elizabeth
King Edward VII's Hospital Sister Agnes | New Victoria Hospital | Nuffield Health | Ramsay Health Care UK
Spire Health Care | St Anthony's Hospital | The Horder Centre | The London Clinic | Ulster Independent Clinic

Members of the Clinical Outcome Review Programme into Medical and Surgical Care Independent Advisory Group:
Rachel Binks | Mike Dent | Mark Ferreira | Margaret Hughes
Donal O'Donoghue | Terence O'Kelly | Joan Russell
David Saunders | Roger Taylor | William Taylor | Phil Willan
Paddy Woods

Members of the HQIP team
Mirek Skrypak | Jill Stoddart | Vivien Seagrove

Appendix 6 – Participation

Trust Name	Number of hospitals	Number of cases included	Number of clinician questionnaires sent	Number of clinician questionnaires received	Number of sets of cases notes received	Number of organisational questionnaires received	Number of excluded cases
Abertawe Bro Morgannwg University Health Board	3	14	14	14	14	3	5
Aintree Hospitals NHS Foundation Trust	1	2	2	2	2	1	5
Airedale NHS Foundation Trust	1	4	4	4	3	1	2
Aneurin Bevan University Health Board	3	11	11	4	4	0	3
Ashford & St Peter's Hospitals NHS Trust	1	5	5	4	4	1	1
Barking, Havering & Redbridge University Hospitals NHS Trust	2	5	5	5	5	2	4
Barnsley Hospital NHS Foundation Trust	1	3	3	1	1	1	3
Basildon & Thurrock University Hospitals NHS FoundationTrust	1	5	5	4	4	1	3
Bedford Hospital NHS Trust	1	3	3	1	1	0	3
Belfast Health and Social Care Trust	4	8	8	3	3	0	2
Betsi Cadwaladr University Local Health Board	3	0	0	0	0	3	0
Blackpool Teaching Hospitals NHS Foundation Trust	1	6	6	4	4	0	0
Bolton Hospital NHS Foundation Trust	1	0	0	0	0	1	0
Bradford Teaching Hospitals NHS Foundation Trust	1	5	5	4	4	1	2
Brighton and Sussex University Hospitals NHS Trust	2	9	9	7	7	2	3
Buckinghamshire Healthcare NHS Trust	2	10	10	9	9	1	2
Burton Hospitals NHS Foundation Trust	1	6	6	4	6	1	0
Calderdale & Huddersfield NHS Foundation Trust	2	10	10	5	8	2	4
Cambridge University Hospitals NHS Foundation Trust	1	4	4	4	4	1	3
Cardiff and Vale University Health Board	2	7	7	4	7	1	7
Chelsea & Westminster NHS Foundation Trust	2	8	8	7	2	2	3
Chesterfield Royal Hospital NHS Foundation Trust	1	3	3	3	3	1	5
City Hospitals Sunderland NHS Foundation Trust	1	5	5	5	5	1	1
Colchester Hospital University NHS Foundation Trust	1	3	3	1	1	1	3
Countess of Chester Hospital NHS Foundation Trust	1	4	4	4	4	1	3
County Durham and Darlington NHS Foundation Trust	2	11	11	5	8	2	4

Trust Name	Number of hospitals	Number of cases included	Number of clinician questionnaires sent	Number of clinician questionnaires received	Number of sets of cases notes received	Number of organisational questionnaires received	Number of excluded cases
Croydon Health Services NHS Trust	1	4	4	2	0	1	2
Cwm Taf University Health Board	2	7	7	7	7	2	6
Derby Teaching Hospitals NHS Foundation Trust	1	6	6	6	6	1	1
Doncaster and Bassetlaw Hospitals NHS Foundation Trust	2	9	9	8	2	2	3
Dorset County Hospital NHS Foundation Trust	1	6	6	6	6	1	0
East & North Hertfordshire NHS Trust	1	3	3	3	3	1	5
East Cheshire NHS Trust	1	5	5	1	1	0	1
East Kent Hospitals University NHS Foundation Trust	3	13	13	8	7	0	7
East Lancashire Hospitals NHS Trust	1	6	6	3	6	1	1
East Sussex Healthcare NHS Trust	2	9	9	9	9	2	4
Epsom and St Helier University Hospitals NHS Trust	2	12	12	2	0	1	4
Frimley Health NHS Foundation Trust	2	11	11	11	11	2	5
Gateshead Health NHS Foundation Trust	1	6	6	3	2	1	0
George Eliot Hospital NHS Trust	1	6	6	5	5	1	0
Gloucestershire Hospitals NHS Foundation Trust	2	8	8	4	3	2	4
Great Western Hospitals NHS Foundation Trust	1	5	5	5	5	1	1
Guy's & St Thomas' NHS Foundation Trust	1	2	2	1	1	1	4
Hampshire Hospitals NHS Foundation Trust	2	10	10	3	1	2	2
Harrogate and District NHS Foundation Trust	1	5	5	5	5	1	1
Hillingdon Hospitals NHS Foundation Trust	1	4	4	4	4	1	2
Homerton University Hospital NHS Foundation Trust	1	5	5	3	3	0	1
Hull and East Yorkshire Hospitals NHS Trust	2	10	10	8	8	1	3
Hywel Dda University Health Board	5	14	14	12	11	3	10
Imperial College Healthcare NHS Trust	3	8	8	6	8	3	14
Ipswich Hospital NHS Trust	1	5	5	5	5	1	1
Isle of Man Department of Health & Social Security	1	1	1	0	1	1	2
Isle of Wight NHS Trust	1	5	5	1	1	0	2
James Paget University Hospitals NHS Foundation Trust	1	4	4	4	4	1	2

Appendix 6 – Participation (continued)

Trust Name	Number of hospitals	Number of cases included	Number of clinician questionnaires sent	Number of clinician questionnaires received	Number of sets of cases notes received	Number of organisational questionnaires received	Number of excluded cases
Kettering General Hospital NHS Foundation Trust	1	5	5	2	2	1	1
King's College Hospital NHS Foundation Trust	2	7	7	4	3	1	5
Kingston Hospital NHS Foundation Trust	1	6	6	6	5	1	0
Lancashire Teaching Hospitals NHS Foundation Trust	2	9	9	2	3	0	3
Lewisham and Greenwich NHS Trust	2	10	10	10	10	2	3
London North West University Healthcare NHS Trust	3	10	10	10	10	3	4
Luton and Dunstable Hospital NHS Foundation Trust	1	5	5	3	2	1	1
Maidstone and Tunbridge Wells NHS Trust	2	12	12	6	5	0	1
Manchester University NHS Foundation Trust	3	6	6	4	4	1	3
Medway NHS Foundation Trust	1	5	5	5	5	1	3
Mid Cheshire Hospitals NHS Foundation Trust	1	4	4	0	0	1	4
Mid Essex Hospitals NHS Trust	1	5	5	5	5	1	1
Milton Keynes University Hospital NHS Foundation Trust	1	6	6	4	6	1	0
Newcastle upon Tyne Hospitals NHS Foundation Trust	2	10	10	5	10	2	3
NHS Dumfries & Galloway	0	0	0	0	0	0	0
NHS Forth Valley	1	4	4	2	2	0	3
NHS Grampian	2	14	14	14	14	2	4
NHS Greater Glasgow & Clyde	1	6	6	5	6	1	4
NHS Highland	6	0	0	0	0	0	1
NHS Lanarkshire	4	4	4	2	1	0	5
NHS Western Isles	1	1	1	1	1	1	0
Norfolk & Norwich University Hospital NHS Trust	1	7	7	7	7	1	1
North Bristol NHS Trust	1	4	4	1	3	1	3
North Cumbria University Hospitals NHS Trust	2	11	11	8	1	0	1
North Middlesex University Hospital NHS Trust	1	4	4	4	4	1	2
North Tees and Hartlepool NHS Foundation Trust	1	5	5	5	5	1	3
North West Anglia NHS Foundation Trust	2	7	7	7	7	2	5
Northampton General Hospital NHS Trust	1	5	5	5	5	1	2
Northumbria Healthcare NHS Foundation Trust	6	11	11	11	11	1	4

Trust Name	Number of hospitals	Number of cases included	Number of clinician questionnaires sent	Number of clinician questionnaires received	Number of sets of cases notes received	Number of organisational questionnaires received	Number of excluded cases
Nottingham University Hospitals NHS Trust	2	12	12	1	1	1	0
Oxford University Hospitals NHS Foundation Trust	3	11	11	3	3	3	3
Papworth Hospital NHS Foundation Trust	1	0	0	0	0	0	4
Pennine Acute Hospitals NHS Trust (The)	4	15	15	8	15	4	5
Poole Hospital NHS Foundation Trust	1	6	6	3	1	1	1
Portsmouth Hospitals NHS Trust	1	2	2	2	2	1	5
Rotherham NHS Foundation Trust	1	5	5	5	5	1	1
Royal Berkshire NHS Foundation Trust	1	4	4	4	4	1	3
Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	1	5	5	5	5	1	1
Royal Brompton and Harefield NHS Foundation Trust	2	9	9	3	1	2	4
Royal Cornwall Hospitals NHS Trust	1	6	6	3	3	1	0
Royal Devon and Exeter NHS Foundation Trust	1	4	4	3	3	1	3
Royal Free London NHS Foundation Trust	3	8	8	8	8	2	5
Royal Liverpool & Broadgreen University Hospitals NHS Trust	1	3	3	2	2	0	3
Royal Surrey County Hospital NHS Trust	1	6	6	6	6	1	0
Royal United Hospitals Bath NHS Foundation Trust	1	4	4	4	4	0	2
Salford Royal Hospitals NHS Foundation Trust	1	4	4	0	0	1	5
Salisbury NHS Foundation Trust	1	6	6	6	6	1	0
Sandwell and West Birmingham Hospitals NHS Trust	2	11	11	5	4	2	2
Sheffield Teaching Hospitals NHS Foundation Trust	3	7	7	7	7	3	3
Sherwood Forest Hospitals NHS Foundation Trust	1	3	3	3	3	1	5
Shrewsbury and Telford Hospitals NHS Trust	2	10	10	8	10	0	4
South Eastern Health & Social Care Trust	3	8	8	7	7	3	4
South Tees Hospitals NHS Foundation Trust	2	10	10	8	6	2	2
South Tyneside NHS Foundation Trust	1	6	6	6	5	1	1
South Warwickshire NHS Foundation Trust	2	7	7	4	1	1	0

Appendix 6 – Participation (continued)

Trust Name	Number of hospitals	Number of cases included	Number of clinician questionnaires sent	Number of clinician questionnaires received	Number of sets of cases notes received	Number of organisational questionnaires received	Number of excluded cases
Southend University Hospital NHS Foundation Trust	1	5	5	2	0	0	1
Southern Health & Social Care Trust	1	4	4	3	3	1	8
Southport & Ormskirk Hospitals NHS Trust	1	6	6	1	6	0	0
St George's University Hospitals NHS Foundation Trust	1	6	6	6	6	1	1
St Helens and Knowsley Teaching Hospitals NHS Trust	1	5	5	5	5	1	1
States of Guernsey Committee for Health & Social Care	1	4	4	3	2	1	0
States of Jersey Health & Social Services	1	3	3	3	3	1	0
Stockport NHS Foundation Trust	1	6	6	1	5	1	1
Surrey & Sussex Healthcare NHS Trust	1	3	3	0	0	1	3
Tameside and Glossop Integrated Care NHS Foundation Trust	1	4	4	4	4	1	2
Taunton & Somerset NHS Foundation Trust	1	5	5	5	5	0	2
The Dudley Group NHS Foundation Trust	1	2	2	2	2	1	5
The Leeds Teaching Hospitals NHS Trust	2	7	7	6	5	2	6
The Princess Alexandra Hospital NHS Trust	1	5	5	5	5	1	1
The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust	1	5	5	3	5	0	2
The Royal Wolverhampton Hospitals NHS Trust	1	6	6	2	4	1	0
The University Hospitals of the North Midlands NHS Trust	2	5	5	5	5	0	8
Torbay and South Devon NHS Foundation Trust	1	5	5	2	2	1	1
United Lincolnshire Hospitals NHS Trust	3	10	10	9	9	3	6
University College London Hospitals NHS Foundation Trust	2	2	2	2	2	2	4
University Hospital Southampton NHS Foundation Trust	1	2	2	2	2	1	4
University Hospitals Birmingham NHS Foundation Trust	4	19	19	19	19	4	11
University Hospitals Coventry and Warwickshire NHS Trust	1	4	4	4	4	1	2
University Hospitals of Bristol NHS Foundation Trust	1	6	6	1	1	1	0
University Hospitals of Leicester NHS Trust	2	7	7	6	7	0	8

Trust Name	Number of hospitals	Number of cases included	Number of clinician questionnaires sent	Number of clinician questionnaires received	Number of sets of cases notes received	Number of organisational questionnaires received	Number of excluded cases
University Hospitals of Morecambe Bay NHS Trust	2	9	9	8	8	2	4
University Hospitals Plymouth NHS Trust	1	6	6	6	6	1	0
Walsall Healthcare NHS Trust	0	0	0	0	0	0	0
Warrington & Halton Hospitals NHS Foundation Trust	2	4	4	3	0	2	2
West Hertfordshire Hospitals NHS Trust	1	4	4	3	4	1	2
West Suffolk NHS Foundation Trust	1	2	2	1	1	1	8
Western Health & Social Care Trust	3	12	12	2	1	2	0
Western Sussex Hospitals NHS Foundation Trust	2	10	10	8	9	2	2
Weston Area Health Trust	1	6	6	1	1	0	0
Whittington Health NHS Trust	1	3	3	3	3	1	3
Wirral University Teaching Hospital NHS Foundation Trust	1	6	6	2	1	0	0
Worcestershire Acute Hospitals NHS Trust	2	8	8	8	8	2	4
Wrightington, Wigan & Leigh NHS Foundation Trust	1	3	3	1	2	1	3
Wye Valley NHS Trust	1	4	4	3	1	1	2
Yeovil District Hospital NHS Foundation Trust	1	2	2	2	2	1	6
York Teaching Hospitals NHS Foundation Trust	2	11	11	5	2	2	2

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