Title: Is the implementation of a service improvement 'tool kit' associated with effective Heart Failure management in primary care? A service evaluation.

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Abstract

Background: Heart failure (HF) is a complex and highly debilitating clinical syndrome. International guidelines identify the optimum clinical management of patients living with HF in primary care but translation of these into practice remains inadequate. The aim of this service evaluation is to measure standards of HF diagnosis and management, before and after, the implementation of The Greater Manchester Heart Failure Investigation Tool (GM-HFIT), a facilitated 'tool kit' designed to optimise HF care. **Methods**: The GM-HFIT was developed as a means of assessing and improving care and was implemented as part of a facilitated service improvement and evaluation in primary care using a prospective, pre-test, post-test design. **Results**: Anonymised pre and post audit data were taken from a sample of 1130 cases entered on General Practice HF registers. These cases were from 2 clinical commissioning groups (39 General Practices) in the North West of England and were analysed to compare HF management and treatment parameters against clinical guidelines. Implementation of the GM-HFIT tool kit was associated with a reduction in the number of patients inappropriately placed on the HF register ($p<0.001$), an improvement in the recording and documentation of pulse rate and rhythm ($p=0.005$) and the proportion of patients receiving the target dose of Angiotensin Converting Enzyme Inhibitors and Beta Blockers ($p<0.001$). There was no significant difference in the recording and documentation of blood pressure levels or in documented target blood pressure levels across the time points.

Conclusion: The introduction of the GM-HFIT kit was associated with statistically significant improvements in the identification and clinical management of patients diagnosed with HF in primary care.

Key words: Heart Failure, Primary Care, Service evaluation

Background

Heart Failure (HF) is a non-communicable, life-limiting syndrome characterised by a constellation of unpleasant symptoms that have a negative impact upon quality of life [1]. HF has been described as a new 'epidemic' and will affect 1 in 15 people aged 65-85 by 2020, making it a significant burden nationally and globally [2]. The HF disease trajectory is characterised by frequent unplanned and costly admissions to hospital [3]. Moreover the prognosis for people living with HF, although improved in recent years, is poor with approximately one third of people diagnosed with HF dying within twelve months [4].

Accurate diagnosis and appropriate HF management reduces mortality and morbidity and the associated cost in human suffering and healthcare resources [1]. Diagnosis is far from straight forward and evidence suggests that diagnosis is missed in up to 70% of cases [6]. Little appears to have changed over the last decade in the way HF is diagnosed [7]. An additional complexity surrounds the evidence base, which focuses mostly on HF treatment for people diagnosed with HF due to Left Ventricular Systolic Dysfunction (LVSD) rather than HF with Preserved Ejection Fraction (HFpEF) adding to a lack of clarity [8].

Natyional and international guidelines [1,5] provide evidence-based recommendations for pharmacological and non-pharmacological management of patients with HF. However the translation of guidance from paper into practice remains rather patchy and patients do not always receive care that matches recommendations, which impacts negatively on morbidity and mortality rates [9].

In the UK, the Quality Outcomes Framework (QOF) [11] provides a financial incentive to primary care providers for four indicators of care related to heart failure:

1) Maintenance of a register of patients with heart failure;

2) Diagnosis of heart failure confirmed by echocardiogram;

3) Patients with LVSD being prescribed an angiotensin converting enzyme inhibitor (ACEI) or an angiotensin receptor blocker (ARB) if ACEI not tolerated, or contraindications documented; and

4) Patients with LVSD on a beta blocker (BB), or contraindications documented.

Although important, these recommendations are somewhat limited (for example they do not incentivise up-titration of ACEI or BB to recommended doses), and their influence on other aspects of evidence-based care for patients with HF is unknown.

What is known is that getting evidence into practice is difficult as behaviour change is required. Education alone is insufficient in promoting change as barriers and enablers to change exist at both organisational and individual levels [10]. Barriers to the implementation of best evidence in HF diagnosis and management in general practice include a lack of a confidence amongst health professionals around HF diagnosis and management compounded by a lack of awareness about current evidence; a scenario that appears to have altered very little over time [7]. The GM-HFIT was developed as a means of assessing and improving care and was implemented as part of a facilitated service improvement and evaluation in primary care using a prospective, pre-test, post-test design.

Service Improvement Initiative: The development and implementation of GM-HFIT

The GM Heart Failure Investigation Tool (GM-HFIT) originated from work conducted through the Greater Manchester Collaborative Leadership for Applied Health Research and Care (GM CLAHRC) programme; a collaboration between the University of Manchester and NHS partners funded by the National Institute of Health Research designed to improve care for patients with vascular disease. Improving the management of heart failure in primary care through evidence-based practice was identified as a priority by local NHS partners based on local and national data identifying high hospitalisation and re-hospitalisation rates for people diagnosed with HF.

GM-HFIT is unique because unlike other tools it is facilitated by an external team and is both evidence based, theoretically informed and context sensitive [12] drawing on the elements of the Promoting Action on Research Implementation in Health Services (PARiHS) framework [13] . Briefly, PARiHS postulates that successful implementation of evidence into practice (knowledge translation or transfer) is a function of the dynamic interaction of three components: evidence (nature, type and robustness), context (what elements characterise the organisation where evidence is

being implemented) and facilitation, the process in which an individual, or team, assists others to enable implementation [13, 14]. Accordingly the development of the GM-HFIT was directly informed by these three components. Firstly, robust evidence informed the tool development including relevant guidelines [1,5], systematic reviews of HF disease management programmes, and local knowledge from stakeholders and the Greater Manchester Cardiovascular and Stroke Clinical Network. Secondly a series of on-going discussions and prolonged engagement with stakeholders provided contextual information about the organisational culture and ideas to inform the nature of the facilitation process that would underpin the planned implementation. This included stakeholder meetings involving clinicians, managers and patients from primary and secondary care, a mapping exercise including interviews with key stakeholders across the PCT to provide detailed information about the environment and the perspectives of clinicians regarding problems and issues in HF management, available expertise, and key opinion leaders. Team members also sought to link directly with other ongoing HF improvement efforts to support collaborative working. The engagement process occurred over a 12 month period prior to implementation.

Thirdly facilitation specific roles (Knowledge Transfer Associates KTA) were created to support a robust implementation process of evidence into practice. KTA's received specific training to equip them with the necessary knowledge and skills to promote effective organisational change and knowledge transfer. Heart failure specialist nurses (HFSN) were seconded to work alongside the KTA's to provide the necessary clinical expertise. The facilitation process was supported by four factors;

- The provision of a service that benefited practices: case-finding and HF register verification provided an economic incentive through QOF.
- The acceptance of HFSNs as a 'link' across organisational boundaries.
- Formal and informal education was provided to participating CCGs delivered by team members as required and tailored to learning need.
- The provision of support to facilitate changes to practice.

GM-HFIT features

The GM-HFIT is an approach characterised by a facilitated audit process. GM-HFIT consists of three components; case-finding, register verification and audit. Figure 1

shows the key steps in each step of the implementation cycle. In brief, case finding was conducted using 15 discrete searches (available from corresponding author) in which 'Read Codes' (a coded system of clinical terms used in the NHS since 1985) for medications, echocardiography and associated conditions were entered into the general practice computer system to identify cases. The clinical audit criteria consisted of 21 indicators reflected in the relevant guidelines [1,5]. Composite scores were calculated according to the proportion of patients in the practice meeting each standard, and summed to a total of 80 possible points. Scores on the audit were based on data documented in the medical record, and included the patients on the HF register at the time of audit. The aim was to measure standards of HF diagnosis and management before and after the implementation of the GM-HFIT service improvement initiative.

Methods

Study Design

A service improvement and evaluation with clinical audit designed to measure standards of HF diagnosis and management before and after the implementation of GM-FIT 'tool kit' in primary care settings in the North West of England.

Fig 1. Steps in the implementation of the Greater Manchester Heart Failure Investigation Tool

INSERT FIGURE 1

Service Improvement Setting

England has 211 Clinical Commissioning Groups (CCGs) which are clinician led organisations, made up of General Practitioner Practices, who work with local authorities to plan and commission most community, mental health services and hospital care based on the needs of local populations. GM-HFIT was initially developed, piloted, refined, and implemented in one large primary care trust (PCT) which had identified cardiovascular health as a priority for improvement in Greater Manchester 2009 - 2011. Primary care practices were recruited from 3 different areas of the PCT, to reflect the diversity of services in these areas (e.g. community HFSN, local enhanced services [LES] for HF) and referral relationships with 3 acute care trusts across the PCT. Practices were recruited from the stakeholder groups, through clinical meetings, and recommendation and introduction by clinicians. Two GPs with a special interest (GPwSI) in heart failure assisted in recruiting practices and supporting the work. The initial piloting of GM-HFIT was done with six LES practices, which were not re-audited. In this study we report findings from a follow on audit and evaluation conducted from January 2012 to December 2013 with data collected from one complete CCG comprising, 27 practices, and one locality of another CCG comprising 12 practices in which the GM-HFIT was implemented.

Procedure

Recruited practices provided access to the practice information system and a place for the GM-HFIT team (One KTA and HFSN) to work collaboratively on case finding, audit, review and interpret medical records, discuss and make recommendations for patient management, and serve as a bridge between primary care and specialist services. The initial case-finding, register validation, and audit took between 2-4 days depending on the size of the practice. Medical records of patients identified in case finding and those patients on the HF register were reviewed by the HFSN for diagnostic tests and verification of HF diagnoses. Patients on the HF register without a verified HF diagnosis of HF were referred to the GP for further evaluation or requests made to follow up on test results. Case-specific recommendations and an action plan were developed for the practice based on the findings. Detailed feedback was given in conjunction with an individualised development pack. Practices had access to educational sessions delivered by local HFSNs and support by telephone. Practices were expected to add or remove patients from the HF register as recommended, arrange tests and follow-up as appropriate. Recommendations were made for the

management of individual patients along with suggestions for the improvement of systems used to coordinate ongoing patient review and management. Re-audit occurred at 6-12 months 6 - 9 months following the initial audit.

Ethical approval

Because this was an audit and service improvement programme, no ethical permission was needed according to advice from Ethics committees consulted by GM CLAHRC. Each practice consented to take part in the GM-HFIT programme, which included accessing records for the audit. Patient identifying data were only seen by NHS staff, and only anonymous patient data used for analysis.

Data Analysis

During the GM-HFIT process, anonymous patient data were entered into the GM-HFIT template and collected to an MS Excel file for the purpose of the audit, and then exported to a SPSS 20.0 database. The analysis took place in two phases to generate descriptive and inferential statistics. For the purpose of the analysis cases, which represented individual patients, were grouped into one of three discreet categories. These were; ‘case finding’ (Cases identified as appropriate for inclusion on the HF register during the audit period who were not currently included), ‘new cases’ (Cases identified at T2 as appropriate for inclusion on register but with no previous evidence of HF at T1 e.g. people who moved into the locality with a diagnosis of HF and registered at the practice or those who developed HF during the audit period), ‘existing cases’ (Cases not in the other groupings with data identified at both T1 and T2).

Analysis 1. The aim of analysis 1 was to determine whether cases that had been actively added to the register, as a result of the audit, differed from those identified at the beginning of the audit, by demographic characteristics or disease history. Records from ‘new cases’ and ‘case finding’ were extracted for comparison with ‘existing cases’. New cases and case findings were compared to existing patients’ data at T2. Demographics and disease characteristics across the three groups were compared using chi squared tests.

Analysis 2. The aim of Analysis 2 was to evaluate changes in the management and care of patients with HF between T1 and T2 according to key indicators that reflect best practice recommendations in clinical guidelines. All patients who had records at both Time 1 and Time 2 were extracted to form a matched dataset. Demographics and disease characteristics were compared using McNemar's test for matched pairs.

Results

A total of 1953 records were extracted, of which 33 (1.5%) were excluded for missing data across the majority of the variables (5 case findings, 14 new cases and 11 existing cases). Five patients (existing cases) deceased between Time 1 and 2 and their records were excluded from the analysis. The proportion of missing data was highest for new cases, at 6.4% of records, compared to 1% each for existing cases and case findings. The final analysed sample comprised 1130 existing patients (with records at Time 1 and Time 2 available for matched analysis), 205 new cases and 583 case findings (Table 1).

Analysis 1: At the second audit, 63% of the patients were male, and the majority of patients were aged between 70 and 90 years (59%). The median age of existing patients was 75 years, while new cases' median age was 76 years. Case findings had a median age of 73 years. Case findings were more likely to be male (71%) than new cases (59%) or existing cases (60%, $P<0.001$), and were younger (35% aged less than 50 years, compared to 22% of new cases and 30% of existing cases, $P<0.001$). Most patients identified through the case finding exercise were appropriately on the register (98%), significantly more so than new cases (80%) or existing cases (83%: $P<0.001$). The vast majority of case findings were diagnosed with LVSD (93%. In contrast, only 67% of new cases and 73% of existing cases had an LVSD diagnosis ($P<0.001$). Of those with LVSD, case findings were healthier in general than new cases or existing cases, with 40% having 'normal' or 'mild' ejection fractions (compared with only 27% of new cases and 32% of existing cases, $P<0.001$). The proportion of patients with haemodynamic parameters recorded at the recommended level (Blood pressure ≤130/80 hg/ml and pulse rate ≤70 bpm) did not differ between groups ($P>0.05$). Case findings were slightly more likely to have a regular rhythm. New cases were more likely to have had their pulse and rhythm

taken, but of those with LVSD, they were the least likely to have had an echocardiogram. There was no difference between the groups in the likelihood of the blood pressure being recorded.

Insert Table 1 here please

Analysis 2: In order to measure any improvement in compliance with best practice guidelines between the two time periods, analysis of cases that were on the register at both time points was carried out. Over the audit period, the proportion of patients who were appropriately on the register improved from 78.6% at Time 1 to 82.9%, while the proportion of patients who needed further investigation decreased from 15.5% to 10.2% ($P<0.001$). However, the proportion inappropriately on the register increased slightly from 5.9% to 6.9%. Table 2 shows that the proportion of patients having had an echocardiogram and their aetiology established improved between the periods, as did the proportion with pulse and rhythm recorded (blood pressure recording remained relatively high, at 95% in both periods).

Insert Table 2 here please

There was no significant improvement in the proportion of patients that were prescribed ACE inhibitors or BBs, but of those who were prescribed these medications, the proportion who were taking the appropriate dose, or were up-titrating, did improve markedly from 76% to 89% for ACE inhibitors, and 75% to 88% for BBs (both $P<0.001$). Audit indicators differed little between the two time periods, with around 62% having achieved target blood pressure (≤130/80 hg/ml).

Discussion

GM-HFIT was based on the best available evidence, used extensive stakeholder consultation to understand the context of care and had a robust method of facilitation involving formal and informal interactive education and support, audit, feedback and reminders. Analysis of the process revealed a complex interplay between context (from national initiatives to individual clinician and practice) and facilitation [15]. Contextual tensions including pressures on the service, reward for some (eg QOF indicators) but not all activities, and organisational issues needed to be negotiated between practice and GM-HFIT team. The extent to which practices engaged with the process varied based on motivation for the project (whether internal or externally

imposed), up-skilling staff and clinician willingness to take responsibility for making changes. HFSN were seen as being clinically credible and were able to work with clinicians to particularise evidence for individual patients [15].

The typical profile of the 1130 audited cases of patients drawn from 39 GP practices in Greater Manchester was of a male, aged 70-90 years of age with a diagnosis of LVSD and Ejection fraction of 45-54%. This profile bears some similarities to that of the sample reported in the National HF Audit [16]; which suggests there is some support for the generalizability of the audit findings. However this demographic profile is more typical of patients seen by a cardiologist rather than in a general practice setting, where a typical patient tends to be an older female diagnosed with hypertension [17]. Overall 95% of cases were appropriately on the HF register or awaiting investigation leaving 5% inappropriately included. Less than 5% of the audited cases had not had an echocardiogram. The case finding exercise tended to identify missed patient cases who were male, younger on average, with a diagnosis of LVSD (rather than being inappropriately on the register or requiring further investigation) and a higher ejection fraction than other new or existing cases. It is unclear why this occurred. One explanation may be that patients with a higher ejection fraction may report fewer symptoms on presentation to their General Practitioner thereby reducing their likelihood of being included on the HF register. Studies have shown that more than 50% of patients diagnosed with LVSD show no signs or symptoms of HF [18,19].

Overall about 95% of patient cases had their blood pressure recorded, and 64% their pulse recorded, but this did not lead to a high level of patient cases showing parameters that aligned with recommendations. A meta-analysis demonstrated the importance of heart rate reduction and survival in patients diagnosed with chronic heart failure; an 18% reduction in death as associated with each heart rate reduction of 5bpm [20]. These findings suggest that interventions to support guidelines informed HF care are necessary.

Considering the findings from the audit of the 1130 matched cases, conducted before and after the introduction of GMHF-IT, findings showed that the implementation of the GM-HFIT was associated with an improvement in several clinical audit indicators of

gold standard HF diagnosis and management. Patients were more likely to have had an echocardiogram and have their aetiology established, were more likely to be prescribed appropriate disease modifying treatments at target doses, or be in the process of up-titration. Before the service improvement intervention, patients were just as likely to be appropriately prescribed disease modifying treatments but were less likely to be on (or working towards) the appropriate target dose. Interestingly the proportion of patients, eligible for, and appropriately prescribed disease modifying treatments (ACEI/ARB or BB), was impressively high (>90%) compared to National Audit Data (80-85%). These data appear, however, to be closer to those reported in Registry data collated across Europe [21].

This suggests either that practices were already delivering gold standard level HF management in the prescription rates of disease modifying treatments, or that the planning and facilitation phase of the GM-HFIT, which took over a year elicited change. This could potentially minimise the significance of any association between the service improvement intervention and changes in audit indicators recorded at the two time points.

Interestingly the improvements in the prescription rates was not reflected in significant changes in physiological parameters, although this would not necessarily indicate a lack of clinical benefit. An area for improvement concerned the recording and documentation of pulse rate and rhythm, as only 68% and 49% respectively had pulse and rhythm documented after the audit. This improved during the audit period but was still not at an optimum level. Heart rate and rhythm control is particularly important in this patient population given their predisposition to arrhythmias such as atrial fibrillation. Moreover inadequate heart rate control in patients diagnosed with chronic HF leads to poorer clinical outcomes and is relatively common, despite treatment with beta-blocker therapy [22].

The provision of lifestyle advice, although improved, remained at a low level and may be due to a health professional's lack of confidence, or pressure of time. Around 70% of patients post audit had not been given lifestyle advice according to the records. This may be explained by a lack of record keeping. However other studies have reported

that patients with HF often do not receive self-management advice, and even if they do, they do not remember it [23].

The study has a number of limitations which could have influenced findings and therefore warrant attention. Although changes in practice were seen, the short time between initial audit and re-audit meant that practices reported being in the midst of implementing recommended changes and still evaluating patients who needed further investigation. The practices involved in this initial work were willing to participate, so represent a self-selected group interested in improving management of patients with HF and the sustainability of improvements in these practices is not known. That said the study presents a novel service improvement that is theoretically based and based in a 'real' life setting. While there are improvements in HF care, there remains a need to improve the accuracy of HF registers, identification and management of patients in primary care. Patients who are not allocated the correct code corresponding with a diagnosis of HF are unlikely to receive optimum care.

A greater emphasis on the provision of self-management support and advice for patients and their families is warranted. The individualised education provided to the clinical team of participating sites was an important part of the implementation process and enabled an ongoing improvement process. The collaborations that were developed between HFSNs and practices made it easy for informal consultations and advice seeking about particular patients to occur. In conclusion modest but significant improvements can occur with appropriate support using approaches such as the GM-HFiT.

Fig 1. Steps in the implementation of the Greater Manchester Heart Failure Investigation Tool

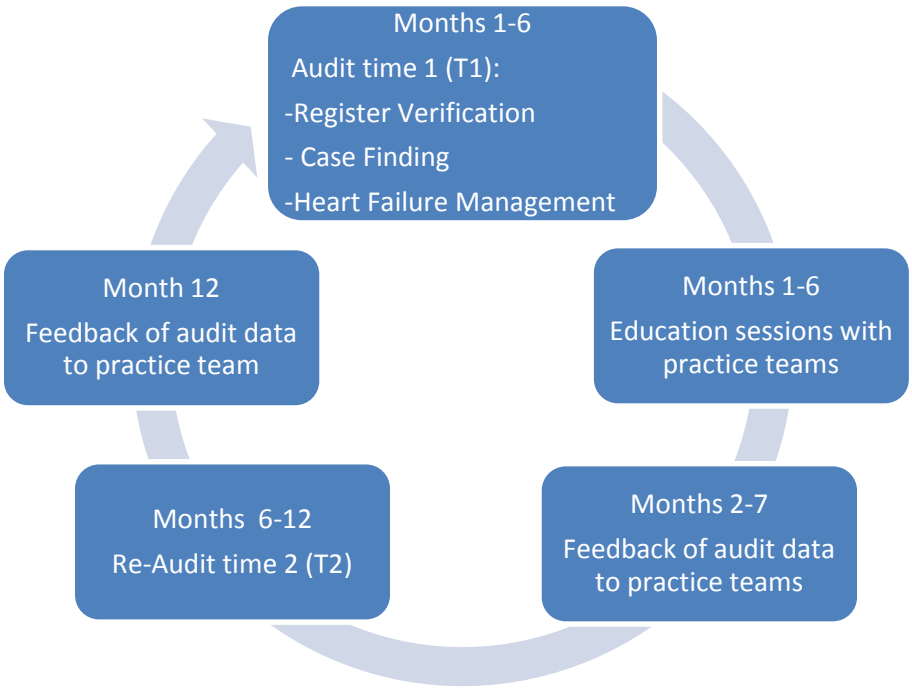

Table 1: Participant characteristics

	All cases Total (1918)	**Case finding** (n=583)	**New cases** (n=205)	**Existing cases** (n=1130)	Chi square
Gender					Chi=23.9 Df=2 P<0.001
Male	1213 (63.3%)	416 (71.4%)	120 (58.6%)	677 (60%)	
Female	705 (36.8%)	167 (28.7%)	85 (41.5%)	453 (40.1%)	
Age group (years)					
< 50	92 (4.8%)	29 (5%)	18 (8.8%)	45 (4%)	Chi=26.8 Df=6 P<0.001
50-<70	584 (30.5%)	202 (34.7%)	45 (22%)	337 (29.9%)	
70-<90	1131 (59%)	333 (57.2%)	127 (62%)	671 (59.4%)	
90+	111 (5.8%)	19 (3.3%)	15 (7.4%)	77 (6.9%)	
Appropriately on Register					
Appropriate	1675 (87.4%)	574 (98.5%)	164 (80%)	937 (83%)	Chi=96.7 DF=4 P<0.001
Inappropriate	94 (5%)	3 (0.6%)	13 (6.4%)	78 (7%)	
Needs further investigation	149 (7.8%)	6 (1.1%)	28 (13.7%)	115 (10.2%)	
Diagnosis					
LVSD	1508 (78.7%)	540 (92.7%)	137 (66.9%)	831 (73.6%)	Chi=125 DF=8 P=<0.001
HF with Preserved Ejection Fraction	109 (5.7%)	29 (5%)	16 (7.9%)	64 (5.7%)	
Right Sided	29 (1.6%)	4 (0.7%)	6 (3%)	19 (1.7%)	
Other	33 (1.8%)	1 (0.2%)	8 (4%)	24 (2.2%)	
NA*	239 (12.5%)	9 (1.6%)	38 (18.6%)	192 (17%)	
Echo taken					Chi=40.0 DF=2 P<0.001
Yes	1835 (95.7%)	580 (99.5%)	184 (89.8%)	1071 (94.8%)	
No	83 (4.4%)	3 (0.6%)	21 (10.3%)	59 (5.3%)	
Blood pressure recorded					Chi=5.64 DF=2 P=0.060
yes	1813 (94.6%)	541 (92.8%)	198 (96.6%)	1074 (95.1%)	
no	105 (5.5%)	42 (7.3%)	7 (3.5%)	56 (5%)	
Pulse recorded					Chi=38.0 DF=2 P<0.001
yes	1215 (63.4%)	329 (56.5%)	165 (80.5%)	721 (63.9%)	
no	703 (36.7%)	254 (43.6%)	40 (19.6%)	409 (36.2%)	
Rhythm recorded					Chi=41.2 DF=2
yes	925 (48.3%)	236 (40.5%)	136 (66.4%)	553 (49%)	

no	993 (51.8%)	347 (59.6%)	69 (33.7%)	577 (51.1%)	P<0.001
Blood pressure					Chi=0.780 DF=2 P=0.677
BP > 130/80	682 (37.7%)	210 (38.9%)	70 (35.4%)	402 (37.5%)	
BP =< 130/80	1131 (62.4%)	331 (61.2%)	128 (64.7%)	672 (62.6%)	
Pulse rate					Chi=3.57 DF=2 P=0.168
Rate => 70	608 (50.1%)	150 (45.6%)	85 (51.6%)	373 (51.8%)	
Rate < 70	607 (50%)	179 (54.5%)	80 (48.5%)	348 (48.3%)	
Rhythm					Chi=23.2 DF=2 P<0.001
Regular	602 (65.1%)	184 (78%)	84 (61.8%)	334 (60.4%)	
Irregular	323 (35%)	52 (22.1%)	52 (38.3%)	219 (39.7%)	
Of those with LVSD:					
Ejection Fraction recorded					Chi=9.72 DF=2 P=0.008
Yes	1486 (98.6%)	538 (99.7%)	132 (96.4%)	816 (98.2%)	
No	22 (1.5%)	2 (0.4%)	5 (3.7%)	15 (1.9%)	
Ejection Fraction					
≥55% (Normal)	6 (0.5%)	1 (0.2%)	0 (0%)	5 (0.7%)	Chi=34.7 DF=6 P<0.001
45 - 54% (Mild)	503 (33.9%)	214 (39.8%)	36 (27.3%)	253 (31.1%)	
36 - 44% (Moderate)	485 (32.7%)	193 (35.9%)	43 (32.6%)	249 (30.6%)	
≤35% (Severe)	492 (33.2%)	130 (24.2%)	53 (40.2%)	309 (37.9%)	

LVSD= Left Ventricular Systolic Dysfunction. *Not applicable owing to: No HF/requires further investigation/iappropriately on register.

Table 2: Clinical audit indicators identified at Time 1 and Time 2 and rate of compliance with best practice recommendations.

	n			Exact p
		Time 1	Time 2	
Clinical audit indicators		Compliant (%)	Compliant (%)	
Echocardiogram recorded	1130	92.2	94.8	<0.001
Aetiology established	1130	86.5	92.0	<0.001
Blood Pressure recorded	1130	94.6	95.0	0.668
Pulse recorded	1130	57.7	68.3	<0.001
Rhythm recorded	1130	44.0	48.9	0.003
Prescribed ACE I	792[a]	91.2	90.3	0.382
Prescribed BB	792[a]	84.5	85.6	0.38
ACE target dose/or uptitrating in progress	636[b]	76.1	88.7	<0.001
BB target dose /or up titrating	534 [b]	75.3	87.6	<0.001
Given self-care advice	1130	22.4	31.6	<0.001
BP ≤130/80	1028 [c]	61.0	63.0	0.257
Pulse rate ≤70	524 [c]	46.2	51.1	0.045
Rhythm regular	348[c]	57.5	58.9	0.615

McNemar exact P values (binomial distribution)

[a] Of those with LVSD, the proportion either taking ACE I or BB or contraindicated

[b] Of those taking ACE I or BB, the proportion either uptitrating or on target dose

[c] Of those with BP/Pulse/Rhythm recorded at both T1 and T2

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