Research

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Route to heart failure diagnosis in English primary care:

a retrospective cohort study of variation

Abstract

Background
Despite the existence of evidence-based guidelines supporting the identification of heart failure (HF) in primary care, the proportion of patients diagnosed in this setting remains low. Understanding variation in patients' routes to diagnosis will better inform HF management.

Aim
To identify the factors associated with variation in patients' routes to HF diagnosis in primary care.

Design and setting
A retrospective cohort study of 13 897 patients diagnosed with HF between 1 January 2010 and 31 March 2013 in English primary care.

Method
This study used primary care electronic health records to identify routes to HF diagnosis, defined using the National Institute for Health and Care Excellence (NICE) guidelines, and adherence to the NICE-recommended guidelines. Multilevel logistic regression was used to investigate factors associated with the recommended route to HF diagnosis, and funnel plots were used to visualise variation between practices.

Results
Few patients (7%, $n = 976$) followed the recommended route to HF diagnosis. Adherence to guidelines was significantly associated with younger age ($P = 0.001$), lower deprivation level ($P = 0.007$), HF diagnosis source ($P<0.001$), not having chronic pulmonary disease ($P<0.001$), receiving further consultation for symptom(s) suggestive of HF ($P<0.001$), and presenting with breathlessness ($P<0.001$). Route to diagnosis also varied significantly between GP practices ($P<0.001$).

Conclusion
The significant association of certain patient characteristics with route to HF diagnosis and the variation between GP practices raises concerns about equitable HF management. Further studies should investigate reasons for this variation to improve the diagnosis of HF in primary care. However, these must consider the complexities of a patient group often affected by frailty and multiple comorbidities.

Keywords
general practice; guideline adherence; heart failure; practice guideline; primary health care.

INTRODUCTION

The UK's National Institute for Health and Care Excellence (NICE) outlines an evidence-based route to heart failure (HF) diagnosis in primary care[1,2] to assist GPs in initial management of patients presenting with symptoms suggestive of HF. Recommendations include serum natriuretic peptide (NP) testing, echocardiography ('echo'), specialist referral, and prescription of medications shown to improve symptoms and prognosis in HF. Despite this, the diagnosis of HF in primary care remains difficult.[3,4]

Barriers to HF diagnosis and lack of implementation of evidence-based guidelines have been described previously in various primary care settings worldwide.[3–7] In the UK, substantial variation in adherence to recommended management of hospitalised patients with HF has been shown,[8] but this has not been evaluated in primary care.

The authors have previously shown that few patients in England follow the route to diagnosis recommended by NICE guidelines, particularly within NICE's timeframe.[9] The present study aims to identify factors associated with adherence to national guidelines, and describe the variation in adherence by GP practices and thus routes to HF diagnosis.

METHOD

Data sources
The Clinical Practice Research Datalink (CPRD) is a database of anonymised primary care electronic records covering 7% of UK general practices and is representative of the UK population.[10] Primary care records are linked to hospital admissions in England (Hospital Episode Statistics, HES) and the death registry (Office for National Statistics).

Study population
The researchers searched for patients with HF diagnosed between 1 January 2010 and 31 March 2013 in English general practices. The diagnosis date was defined as the earliest recorded HF either in the primary care record, using Read codes, or in hospital admission data, using ICD-10 codes.[11] The strategy used to identify diagnosis dates has been described previously by the authors.[9]

Seeking to analyse management after presentation with symptoms suggestive of HF, the authors excluded patients with no recorded symptoms before diagnosis (tracking back up to 5 years). Additionally, they excluded patients who died or were hospitalised with HF within 6 months of first recorded HF symptom as rapid deterioration following presentation with symptoms may interrupt GPs' management and completion of the NICE pathway (further exclusion criteria are available from the authors on request).

Pathway definitions and timeframe
The researchers included data from 1 January 2005 to 31 March 2013 to allow

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How this fits in

Diagnosis of heart failure (HF) in primary care remains challenging despite evidence-based guidelines supporting its identification in this setting. This study identifies specific patient characteristics associated with adherence to guidance on HF diagnosis and management, and illustrates variation between GP practices. Further research is needed to clarify the reasons behind these associations and for variation between practices. There is a continued need to support primary care in the early identification and management of HF.

at least 5 years before diagnosis to identify management between presentation and diagnosis. Published clinical codes for tests, medications, and referrals were used (a list of codes used are available from the authors on request) to classify management into four 'Pathways'.[9] Pathway 1 (NICE-recommended pathway) comprised patients investigated in accordance with NICE recommendations: serum NP test and/or echocardiogram, and referral to a specialist. Pathway 2 referred to partial concordance with recommendations. Patients who had no investigations but were either already taking or started relevant treatment (angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, and HF-specific beta-blockers prescribed between 1 year before and after HF symptom) were categorised as Pathway 3. Pathway 4 covered those who received none of the key NICE-recommended elements of care.

The authors allocated each patient to a pathway according to how they had been managed in the first 6 months and 5 years following presentation with HF symptom(s). This was to accommodate two NICE guidelines during the study period: 2010 guidelines introduced a recommended timeframe of 6 weeks for investigation and a separate pathway for patients with a history of acute myocardial infarction (AMI) recommending echocardiography without NP testing.[1,2]

The authors' pathway definitions and timeframes would have been able to accommodate either guideline followed by GPs.

Explanatory variables

Potential explanatory variables were key patient demographics and clinical history: sex, age, deprivation quintile (using the Index of Multiple Deprivation score 2010),[12]

diagnosis source, history of selected comorbidities (tracking back up to 5 years),[13] symptom type at first presentation (breathlessness only, ankle swelling only, fatigue only, or two or more), and whether patients had another consultation for HF symptoms within 6 months of first presentation. The authors also included one practice-level variable that could be computed from the dataset, the number of patients with HF per practice, as quintiles.

Statistical analysis

Patient characteristics and practice-level information were summarised. Categorical data were summarised using absolute number and percentages, and continuous data using median and interquartile range (IQR).

The primary outcome was adherence to the NICE-recommended pathway (Pathway 1). To identify factors associated with this, potential risk factors and management pathway were cross-tabulated, and Pearson's χ^2 test was used to assess the overall significance.

An adjusted logistic regression model was used to investigate the association between patient characteristics and adherence to the NICE-recommended pathway.

To measure the extent to which practices accounted for the variation in adherence to NICE, the authors used a multilevel logistic regression model, which accounts for the hierarchical structure of the data, that is, patients clustered within GP practices. First, the researchers fitted an unconditional (empty) model with only the practice-level random intercept to calculate the intraclass correlation coefficient (ICC). The ICC estimated the proportion of the variation in the outcome that was attributable to the between-practice variation. Next, patient-level explanatory variables were added to the empty model and, finally, the practice-level variable, number of patients with HF, to the last model. For all models, the adjusted odds ratios (ORs) were reported and the model fit assessed.

Funnel plots were used to visualise variation between practices, plotting the proportion of patients adhering to NICE against the number of patients with HF per practice. The 95% (2SD) and 99.8% (3SD) control limits were constructed using the exact binomial methods to identify outliers.[14,15] These control limits reflect 'moderate' and 'moderate to strong' evidence, respectively, against the null hypothesis that the proportions adhering to NICE by practice are as expected, given

Table 1. Management pathway taken within 6 months or 5 years of initial symptom, *N* = 13 897

Pathway	Within 6 months of symptom, *n* (%)	Within 5 years of symptom, *n* (%)
1 NICE guidelines (echo/NP and referral)	976 (7.0)	3409 (24.5)
2 Guidance partially followed (echo/NP or referral)	2589 (18.6)	4657 (33.5)
3 Treatment only (HF medications but no echo/NP or referral)	5117 (36.8)	3938 (28.3)
4 No NICE-recommended care (no echo/NP, referral, or HF medications)	5215 (37.5)	1893 (13.6)

Echo = echocardiography. HF = heart failure. NICE = National Institute of Health and Care Excellence. NP = natriuretic peptide testing.

purely random variation.

The analyses were carried out for 6-month and 5-year management pathways. All analyses were carried out using SAS (version 9.4).

RESULTS

Patient characteristics

A total of 13 897 patients and 349 GP practices were included in the analysis (an average of 12 new patients were diagnosed per year per practice). The management pathway taken by patients within each timeframe is presented in Table 1, and practice-level data are summarised in Table 2. In both timeframes, modest proportions of patients received care aligned with the NICE-recommended pathway, and there was variation between practices.

Patient characteristics are summarised in Table 3. Over half (52.0%, *n* = 7225) of the cohort were female, and, at first presentation of symptom, patients were generally older and had at least two comorbidities (58.1%, *n* = 8084). The majority of patients first presented with breathlessness only (65.5%, *n* = 9096), and less than one-third (27.3%, *n* = 3793) received another consultation for HF symptoms within 6 months of their first one.

Patient factors associated with adherence to NICE guidance

Bivariate analysis (Table 3) and the adjusted logistic regressions (Table 4) showed that patients of relatively younger age (<75 years), lower deprivation, with a primary care diagnosis of HF, higher comorbidity, no history of chronic pulmonary disease, presenting with breathlessness only, having further consultations for symptoms suggestive of HF, and with a primary care diagnosis of HF, were significantly associated with adherence to the NICE pathway (at 6 months). The ORs from the adjusted multilevel logistic regression associations were similar.

Sex was significantly associated with adherence to the NICE pathway in the bivariate analysis only. A history of AMI did not affect the likelihood of NICE adherence in either analysis.

Variation by GP practice

The practice-level intercept in the empty model of the multilevel logistic regression showed that 9% of variation in NICE adherence was attributable to practices (ICC = 8.6%, *P*<0.001). When patient characteristics were included, the model fit improved and the practice-level variance reduced to 5% (ICC = 4.9%, *P*<0.001), indicating that variation in patient characteristics explained almost half of the total variability among practices. The number of patients with HF per practice was not significantly associated with the outcome (*P* = 0.728, results not shown), and its addition only marginally improved the model fit.

Table 2. Practice-level information, *N* = 349 GP practices

Practice-level summary statistics	Median (IQR)	Minimum–maximum
Patients with HF per practice, *n*	37 (21–53)	1–154
Patients on NICE within 6 months of symptom, %	6 (2–11)	0–40
Patients on NICE within 5 years of symptom, %	22 (13–32)	0–67

HF = heart failure. IQR = interquartile range. NICE = National Institute of Health and Care Excellence.

Table 3. Patient characteristics at symptom and frequency distribution of management pathway taken within 6 months of initial HF symptom by these characteristics, *N* = 13 897

Variable	*n* (%)	1. NICE guidelines (echo/NP and referral), *n* (%)	2. Guidance partially followed (echo/NP or referral), *n* (%)	3. Treatment only (HF medications but no echo/ NP or referral), *n* (%)	4. No recommended care (no echo/NP, referral, or HF medications), *n* (%)
Sex					
Male	6672 (48.0)	535 (8.0)[a]	1315 (19.7)[a]	2416 (36.2)	2406 (36.1)[a]
Female	7225 (52.0)	441 (6.1)[a]	1274 (17.6)[a]	2701 (37.4)	2809 (38.9)[a]
Age group at symptom, years					
<45	234 (1.7)	17 (7.3)	32 (13.7)	43 (18.4)[a]	142 (60.7)[a]
45–64	2052 (14.8)	156 (7.6)	403 (19.6)	651 (31.7)[a]	842 (41.0)[a]
65–74	3422 (24.6)	278 (8.1)[a]	628 (18.4)	1284 (37.5)	1232 (36.0)[a]
75–84	5401 (38.9)	375 (6.9)	1032 (19.1)	2107 (39.0)[a]	1887 (34.9)[a]
≥85	2788 (20.1)	150 (5.4)[a]	494 (17.7)	1032 (37.0)	1112 (39.9)[a]
IMD quintile					
1 (least deprived)	2731 (19.7)	221 (8.1)[a]	557 (20.4)[a]	994 (36.4)	959 (35.1)[a]
2	3233 (23.3)	257 (7.9)[a]	631 (19.5)	1189 (36.8)	1156 (35.8)[a]
3 (average)	2931 (21.1)	206 (7.0)	525 (17.9)	1062 (36.2)	1138 (38.8)
4	2631 (18.9)	170 (6.5)	466 (17.7)	986 (37.5)	1009 (38.4)
5 (most deprived)	2371 (17.1)	122 (5.1)[a]	410 (17.3)	886 (37.4)	953 (40.2)[a]
Diagnosis source					
Primary care	3388 (24.4)	469 (13.8)[a]	868 (25.6)[a]	1141 (33.7)[a]	910 (26.9)[a]
Hospital	10 509 (75.6)	507 (4.8)[a]	1721 (16.4)[a]	3976 (37.8)[a]	4305 (41.0)[a]
Number of comorbidities at symptom					
0	2252 (16.2)	185 (8.2)[a]	369 (16.4)[a]	366 (16.3)[a]	1332 (59.1)[a]
1	3561 (25.6)	244 (6.9)	572 (16.1)[a]	1083 (30.4)[a]	1662 (46.7)[a]
2	3419 (24.6)	226 (6.6)	665 (19.5)	1411 (41.3)[a]	1117 (32.7)[a]
3	2452 (17.6)	174 (7.1)	491 (20.0)	1141 (46.5)[a]	646 (26.3)[a]
≥4	2213 (15.9)	147 (6.6)	492 (22.2)[a]	1116 (50.4)[a]	458 (20.7)[a]
History of AMI					
Yes	667 (4.8)	51 (7.6)	165 (24.7)[a]	360 (54.0)[a]	91 (13.6)[a]
No	13 230 (95.2)	925 (7.0)	2424 (18.3)[a]	4757 (36.0)[a]	5124 (38.7)[a]
History of chronic pulmonary disease					
Yes	3685 (26.5)	134 (3.6)[a]	494 (13.4)[a]	1384 (37.6)	1673 (45.4)[a]
No	10 212 (73.5)	842 (8.2)[a]	2095 (20.5)[a]	3733 (36.6)	3542 (34.7)[a]
Symptom type					
Breathlessness only	9096 (65.5)	797 (8.8)[a]	1907 (21.0)[a]	3115 (34.2)[a]	3277 (36.0)[a]
Ankle swelling only	2251 (16.2)	90 (4.0)[a]	356 (15.8)[a]	960 (42.6)[a]	845 (37.5)
Fatigue only	2355 (16.9)	76 (3.2)[a]	305 (13.0)[a]	972 (41.3)[a]	1002 (42.5)[a]
≥2 symptoms	195 (1.4)	13 (6.7)	21 (10.8)[a]	70 (35.9)	91 (46.7)[a]
Consultation for symptom					
Yes	3793 (27.3)	407 (10.7)[a]	909 (24.0)[a]	1303 (34.4)[a]	1174 (31.0)[a]
No	10 104 (72.7)	569 (5.6)[a]	1680 (16.6)[a]	3814 (37.7)[a]	4041 (40.0)[a]

[a]*Significant adjusted standardised residuals. All χ² tests significant at P<0.001. AMI = acute myocardial infarction. Echo = echocardiography. HF = heart failure. IMD = Index of Multiple Deprivation. NICE = National Institute for Health and Care Excellence. NP = natriuretic peptide testing.*

The funnel plot (Figure 1) shows moderate but statistically significant variation between practices in the proportion of patients adhering to the NICE pathway within 6 months of symptom: 45 (13%) outliers were identified, indicating more than just random variation. The number of outliers increased to 104 (30%) for the 5-year management pathway (Figure 2). Additionally, over half of the practices that were above the upper limit of the funnel distribution at 6 months remained so at 5 years (25 out of 39 practices). Similarly, half of the practices (three out of six) remained below the lower 3SD limit throughout both timeframes.

Analysis using 5-year management pathway

When using the longer timeframe, history of AMI became significantly associated with adherence to the NICE pathway. In addition,

Table 4. Odds ratios (95% CI) from adjusted logistic regression and adjusted two-level model for predicting adherence to the NICE-recommended pathway within 6 months of initial HF symptom[a]

Variable	Adjusted logistic regression		Adjusted two-level logistic regression	
	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Sex				
Male versus female	1.12 (0.97 to 1.28)	0.118	1.10 (0.96 to 1.27)	0.166
Age group, years		0.003		0.001
<45 versus ≥85	1.86 (1.09 to 3.20)	0.024	1.97 (1.13 to 3.42)	0.016
45–64 versus ≥85	1.47 (1.15 to 1.88)	0.002	1.50 (1.17 to 1.93)	0.002
65–74 versus ≥85	1.41 (1.14 to 1.75)	0.002	1.48 (1.19 to 1.84)	0.001
75–84 versus ≥85	1.18 (0.96 to 1.44)	0.107	1.20 (0.98 to 1.47)	0.081
IMD quintile	0.001		0.007	
1 (least) versus 5 (most)	1.60 (1.26 to 2.03)	<0.001	1.58 (1.22 to 2.05)	0.001
2 versus 5	1.52 (1.21 to 1.92)	<0.001	1.49 (1.16 to 1.91)	0.002
3 versus 5	1.34 (1.06 to 1.70)	0.015	1.34 (1.04 to 1.73)	0.024
4 versus 5	1.26 (0.99 to 1.61)	0.063	1.23 (0.95 to 1.60)	0.117
Diagnosis source				
Primary care versus hospital	2.75 (2.40 to 3.15)	<0.001	2.82 (2.45 to 3.25)	<0.001
Number of comorbidities per 1 unit increase				
	1.07 (1.02 to 1.13)	0.007	1.08 (1.02 to 1.13)	0.005
History of AMI				
Yes versus no	0.90 (0.65 to 1.25)	0.538	0.91 (0.66 to 1.27)	0.585
History of chronic pulmonary disease				
Yes versus no	0.37 (0.31 to 0.46)	<0.001	0.36 (0.30 to 0.45)	<0.001
Symptom type		<0.001		<0.001
Breathlessness only versus fatigue only	2.95 (2.31 to 3.76)	<0.001	3.07 (2.40 to 3.93)	<0.001
Ankle swelling only versus fatigue only	1.31 (0.95 to 1.79)	0.094	1.30 (0.95 to 1.79)	0.106
≥2 symptoms versus fatigue only	2.08 (1.12 to 3.86)	0.020	2.47 (1.28 to 4.73)	0.007
Consultation for symptom				
Yes versus no	1.88 (1.64 to 2.16)	<0.001	1.93 (1.67 to 2.22)	<0.001

[a]The variance at patient level is constrained to a binomial distribution with an assumed variance of $pi^2/3 = 3.29$. The random effects variance of the practice-level intercept was 0.311 (SD 0.06) for the empty model and 0.323 (SD 0.06) for model 1. The model fit (–2LL) was 6985.02 for the empty model and 6362.98 for model 1. Level of significance at $P<0.05$. AMI = acute myocardial infarction. CI = confidence interval. IMD = Index of Multiple Deprivation. OR = odds ratio. SD = standard deviation.

patients presenting with two or more symptoms were most likely to follow NICE, while those presenting with ankle swelling only were least likely compared with the reference group (the frequency distribution of management pathways taken within 5 years of initial HF symptom are available from the authors on request). The adjusted logistic regressions and multilevel logistic regressions also reflect these differences (ORs from adjusted logistic regression and adjusted two-level multilevel model for predicting adherence to the NICE-recommended pathway within 5 years of initial HF symptom are available from the authors on request). The variation in the outcome due to between-practice differences remained similar (ICC = 10.0%, *P*<0.001).

DISCUSSION
Summary
The authors identified significant relationships between adherence to the NICE guidelines for HF diagnosis and key patient factors. Patients who were younger, those living in less deprived areas, diagnosed in primary care, without a history of chronic pulmonary disease, who present with breathlessness only, or who receive further consultations followed care most closely aligned to NICE guidelines.

Variation in adherence to recommended management of patients presenting with symptoms suggestive of HF may indicate possible targets for identification and management of HF in primary care. However, these findings may also relate to

Figure 1. Funnel plot of proportion of patients following the NICE-recommended pathway within 6 months of initial HF symptom by number of HF patients per practice. Number of outliers (per cent of a total of 349 practices): above upper 3SD = 8 (2%); between upper 2SD and 3SD = 31 (9%); between lower 2SD and 3SD = 6 (2%); and below lower 3SD = 0 (0%).
HF = heart failure. NICE = National Institute for Health and Care Excellence.
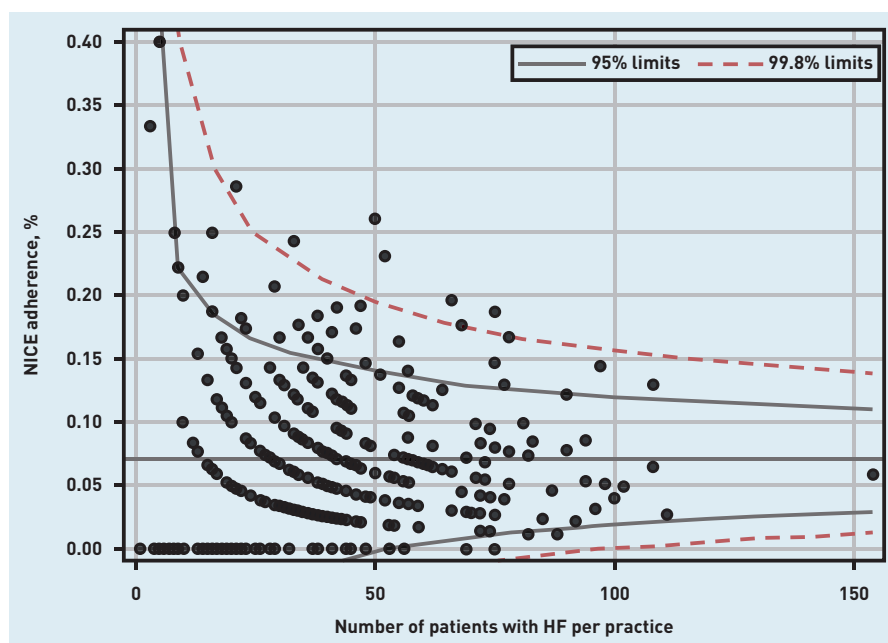
difficulties in applying clinical guidelines to complex populations. Future approaches to improving identification and management of HF in primary care should consider these complexities.

The authors found moderate but statistically significant variation between practices in adherence to NICE recommendations, which suggest variation greater than would be expected by chance; there may be practice- and/or GP-level characteristics unique to those practices with consistently higher or lower adherence.

Further work is needed to clarify the sources of the variation in adherence to guidelines identified between GP practices, but it is clearly essential that primary care is adequately resourced to manage this important and complex condition.

Strengths and limitations
To the authors' knowledge, this is the first study to investigate adherence to the recommended guidelines for HF diagnosis and how it varies by patients and practices. The data are routinely recorded and from a highly representative population;[10] therefore, the present findings are reflective

Figure 2. Funnel plot of proportion of patients following the NICE-recommended pathway within 5 years of initial HF symptom by number of HF patients per practice. Number of outliers (per cent of total 349 practices): above upper 3SD = 14 (4%); between upper 2SD and 3SD = 48 (14%); between lower 2SD and 3SD = 29 (8%); and below lower 3SD = 13 (4%).
HF = heart failure. NICE = National Institute for Health and Care Excellence.

of real practice and likely generalisable to the English population. The authors used multilevel modelling, giving more accurate estimates of associations of interest by accounting for the hierarchical nature of the data;[16] this also allows the partition of variance due to patient and practice factors.

However, CPRD data are derived from clinical codes and are not recorded for the purposes of research. The validity of the recording of major diagnoses in CPRD has been described previously,[17] but clinical coding is highly variable,[18] and much relevant information is likely entered in free text rather than as a coded entry.[19] Some patients may be suspected with HF but never coded, which could underestimate the problem.[4] In addition, incentivisation by the NHS Quality and Outcomes Framework (QOF) pay-for-performance scheme may influence certain aspects of HF coding,[20] particularly timing of coding. Echocardiogram results, for example, may not only be difficult to find and code from cardiology letters, but also be coded around the time when QOF achievements are calculated rather than the time of diagnosis, which could partly explain low adherence.

The authors assumed that referrals for echo and specialist assessment were made for suspected HF. In reality, referrals could have been made for other cardiac concerns. The authors did not include other recommendations made by NICE,[1] such as referral for an electrocardiogram, for similar reasons. Additionally, serum NP testing was only available for a minority of practices during the study period;[2,21] the authors therefore combined this with echo in their pathway definition.

Finally, the present data did not include any practice- or GP-level information, meaning that the role of practice-level factors in variation could not be examined. Further investigation is required to understand the sources of variation. These may include organisational factors at a practice level, or physician factors,[5] and unmeasured heterogeneity in case mix.

Comparison with existing literature

The results presented here are consistent with a general low adherence to the recommended management of patients presenting with symptoms suggestive of HF across Europe.[22,23] The authors agree with previous studies, which showed associations between HF diagnosis and various patient factors, including age, sex, and pre-existing comorbidities,[5,24–26] reinforcing evidence that HF diagnosis is challenging in patients with pulmonary diseases.[5,25]

Patients with a history of AMI were unlikely to receive more urgent care in the shorter term despite the NICE guidelines, supporting growing evidence of a lack of implementation of evidence-based guidelines.[7]

Studies have reported variation in the management of patients with HF across different health settings,[27,28] and limitations in adherence to previous quality standards in investigation and management of HF in primary care have been identified.[29] The present study extends these findings to primary care, comparing variation over different timeframes and quantifying the extent to which variation can be attributed to differences in GP practices.

Implications for research and practice

This study illustrates the difficulty in assessing the application of clinical guidelines to a complex population with multiple medical and social problems. The finding that adherence to the NICE guidelines is selective of certain groups may suggest inequitable access to health services. However, this may equally indicate rational, pragmatic choices made about the burden of treatment and investigation by clinicians and patients. Patients who are older and with multiple comorbidities may not be referred or investigated due to frailty or difficulty in accessing secondary care services,[30] and may be medically managed by their GP instead. QOF and guideline requirements may also disincentivise diagnostic coding of HF in such circumstances. Furthermore, medical management of HF, particularly in patients who are frail and older, may be limited by side effects of medications (or GPs' perceived risk of side effects).[6,31] Consequently, a more active approach to HF identification targeting specific patient groups may still be ineffective, and more tailored measures may be necessary.

An appropriate approach could mirror NICE's multimorbidity guidance in which patients receive individualised care based on personal needs, reducing risk and improving care coordination.[32] The majority of patients with HF have multiple morbidities at the time of diagnosis, so whether patients benefit from guidelines that consider multimorbidity at diagnosis should be explored. However, as this study has shown, identifying the nuanced health and sociological issues faced by patients who are older and with multimorbidity will be a challenge with the current coding systems.

This study also highlights the need to explore the sources of variation in HF identification and management between GP practices. In the UK, considerable resources are being directed to developing integrated HF services and expanding the remit of cardiology nurse teams and HF community clinics.[1] However, such measures are not universal. Variation in care across practices could be related to a lack of coordination between services and variation in availability of investigations, services, and resources; some areas still lack access to basic investigations recommended by guidelines.[6] Further study using scores for HF QOF achievement in individual practices could deepen understanding of variation and guide future resource allocation.

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