A survey-based triage tool to identify patients potentially eligible for referral to an advanced heart failure centre

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Abstract

Aims Accurate prevalence data for ambulatory advanced heart failure (HF) in European countries remains limited. This study was designed to identify the population of patients potentially eligible for referral for assessment for advanced surgical HF therapies to a National advanced HF and cardiac transplant centre.

Methods and results A survey comprising 13 potential clinical markers of advanced HF was developed, modified from the ‘I NEED HELP’ tool from the 2018 position statement of the Heart Failure Association of the European Society of Cardiology, and distributed to all HF clinic services (secondary and tertiary units) nationwide. Each HF clinic unit was asked to complete the survey on consecutive patients over a 3 month period fulfilling the following three criteria: (i) age < 65 years; (ii) ejection fraction < 40% and (iii) HF of >3 months duration. As a comparison, the number of actual referrals to the advanced HF clinic were also audited over a 9 month period. In all, 21 of 26 HF clinic units participated in the survey. Across the period of inclusion, 4950 all-comer HF patients were seen across all sites. Of these, 375 (7.5%) fulfilled the inclusion criteria and were surveyed (74.4% male, median age 57 years [IQR: 11 years]). In total, 246 (66%) of the surveyed patients had ≥1 potential markers for advanced HF, representing just under 5% of the total all-comer HF population seen across the same time period. Of these, 67 patients (27%) had ≥2, 48 (20%) had 3 and 40 (16%) had ≥4 potential markers. The most frequently noted markers were ≥1 HF hospitalization or unscheduled clinic review (56%), intolerance to renin-angiotensin-aldosterone system inhibitors due to hypotension or renal dysfunction (29%) and intolerance to beta-blockers due to hypotension (27%). Almost one-quarter of patients reported NYHA Class III or IV symptoms. During the advanced HF clinic audit, the number of patients actually referred to the advanced HF clinic during the same time period was < 5% of this potentially eligible cohort.

Conclusions In this index prospective National survey, approximately 5% of an all-comer routine HF clinic population and two-thirds of a pre-selected HF with reduced EF under 65 years cohort were found to have at least one clinical or biochemical marker suggesting advanced or impending advanced HF. Almost one-quarter of patients in this chronic outpatient ‘snapshot’ population have NYHA III-IV symptoms. This simple one-page triage survey—modified from the ‘I NEED HELP’ tool—is useful to identify a population potentially eligible for referral to an advanced HF centre for assessment for advanced surgical therapies, thereby aiding resource and service planning.

Keywords Chronic heart failure; Advanced heart failure; Cardiomyopathy; Mechanical circulatory support; Cardiac transplantation

Background

Contemporary epidemiological data focused on the prevalence of advanced heart failure (HF) in European countries is limited. The burden of advanced HF is expected to increase in parallel with the increased incidence of chronic HF alongside improved survival of these patients due to greater access to, and expanding range of, evidence-based therapies.

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Identifying those patients potentially suitable for advanced surgical therapies (cardiac transplantation and/or left ventricular assist device therapy) in a timely fashion, prior to the development of progressive disease-related frailty and/or end organ dysfunction which could render them ineligible, is essential.

**Aims**

This study aimed to prospectively identify the proportion of patients potentially eligible for referral for assessment to a National (European) advanced HF and cardiac transplant centre, providing a cross-sectional snapshot of the prevalence of ambulatory advancing chronic HF in younger patients (<65 years) as assessed via attendances at chronic HF outpatient units nationwide. A secondary aim was to compare the proportion of patients potentially eligible for referral for advanced therapies assessment to the actual observed referral rate over the study period.

**Methods**

**Study population**

All 26 hospitals with specialist HF units in the Republic of Ireland were invited to participate. The Clinical Lead for each hospital was asked to distribute the survey to all patients in their unit who met the criteria for potential referral for advanced therapies assessment.

**Figure 1** Survey of clinical and biochemical markers of advanced HF, modified from the HFA-ESC ‘I NEED HELP’ mnemonic, distributed to 26 HF units nationally. ACE-i, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor/neprilysin inhibitor; BP, blood pressure; EF, ejection fraction; HF, heart failure; ICD, implantable cardioverter defibrillator; NYHA, New York Heart Association.

| National survey of clinical markers of advanced heart failure |
|---------------------------------------------------------------|
| Complete survey on this heart failure outpatient if 3 criteria below are fulfilled: |
| • Age <65 years |
| • Duration of HF >3 months |
| • Most recent LVEF <40% |

**Question** | **Response** (tick as appropriate) |
---|---|
1 | Age |
2 | Sex | Male | Female |
3 | Ejection fraction (%) |
4 | NYHA class III-IV |
5 | ≥1 HF admission or unplanned visit to HF clinic for HF in past 12 months |
6 | Intolerant of beta blocker or needing dose reduction due to HF or hypotension |
7 | Intolerant of ACEI/ARB/ARNI or needing dose reduction due to worsening renal function or hypotension |
8 | Systolic blood pressure <90mmHg |
9 | Cachexia (loss of ≥5% total body weight over past 12 months without other non-HF cause) |
10 | Escalating diuretic doses to maintain euvolaemia |
| - Furosemide equivalent daily dose ≥160mg |
11 | Recent or frequent appropriate ICD shock(s) |
12 | Progressive decline in renal function |
| - Creatinine >160µmol/L |
13 | Hyponatraemia (serum sodium <133mEq/L) |
HF unit was contacted by the study personnel and provided with a study information leaflet and survey example. If agreeable to participate, each HF unit was assigned a 3 month period during which consecutive outpatients meeting the inclusion criteria were prospectively enrolled. The surveys were completed by Heart Failure Nurse Specialists if the patient fulfilled three pre-specified inclusion criteria: (i) age < 65 years, (ii) ejection fraction < 40% and (iii) a diagnosis of HF of > 3 months duration. Patients previously referred to the National advanced HF outpatient clinic in the Mater Misericordiae University Hospital were excluded. This survey was completed as part of the National Clinical Program for Heart Failure, a government strategy for delivery of best practice heart failure care nationwide, with consent provided by each individual hospital regarding participation and the need for individual informed consent waived.

Survey

A survey comprising 13 potential clinical and biochemical markers of advanced HF was developed (Figure 2), modified from the ‘I NEED HELP’ mnemonic included in the 2018 position statement on advanced HF from the HF Association of the European Society of Cardiology (HFA-ESC).1 An unscheduled clinic visit in the preceding 12 months and the presence of hyponatraemia were included, to increase the sensitivity of the survey for detecting advanced HF.2–4

Actual National Advanced Heart Failure clinic referrals

A separate audit was performed on referrals to the specialist advanced heart failure ambulatory clinic over a 9 month period from May 2019 to February 2020, to provide a comparison between potential numbers for referral and the actual observed rate. A 3 month average was then calculated.

Results

In all, 21 of 26 HF clinic units across secondary and tertiary hospital centres (including all but one major regional centre) agreed to participate in the study. During the period of inclusion, approximately 4950 all-comer HF patients were seen across all n = 21 units who subsequently returned completed surveys in 380 unique patients (Figure 2). Of these, 375 (7.5%) fulfilled the inclusion criteria (n = 279 [74%] males, median age of 57 years [IQR: 11 years]), with five excluded as they did not meet reduced ejection fraction criteria.

In total, 246 (66%) of the 375 completed surveys identified ≥1 potential marker(s) for advanced HF, representing just under 5% of the total all-comer HF population seen across the same time period. Of these, 67 patients (27%) had ≥2, 48 (20%) had 3 and 40 (16%) had ≥4 potential markers. The most frequently noted markers were ≥1 hospitalization or

Figure 2 Graphic outlining the total number of patients seen in participating HF centres nationally and the criteria for inclusion and survey completion. The important findings of this study are also represented in this figure. HFH, heart failure hospitalization; NYHA, New York Heart Association; OP, outpatient; RAASI, renin-angiotensin-aldosterone inhibitors.
unscheduled clinic review (56%), intolerance to renin-angiotensin-aldosterone system inhibitors due to hypotension or renal dysfunction (29%) and intolerance to beta-blockers due to hypotension (27%). The least commonly reported survey items in this cohort were cachexia, implantable cardioverter-defibrillator shocks and hyponatraemia. Almost one-quarter of patients reported New York Heart Association Class III or IV symptoms. The total percentage of patients with each of the advanced HF markers is illustrated in Figure 3.

During the 9 month audit of observed referrals to the specialist advanced HF ambulatory clinic, 32 patients were referred for evaluation, giving a 3 month average of \( n = 11 \) patients, representing just 4.5% of the population with \( \geq 1 \) potential marker(s) for advanced HF.

**Conclusions**

This epidemiological study is the first of its kind to report the National prevalence of advanced HF in the Republic of Ireland. There is a paucity of epidemiological data on advanced HF patients in Europe. Data regarding HF prevalence in European countries is largely derived from registry data, healthcare claims or from primary care data collection without a specific focus on overall advanced HF prevalence or combined analysis of the individual markers of advanced HF as proposed by the ESC HFA.\(^5\)\(^-\)\(^8\) Our study addresses this important knowledge gap in the area of advanced HF in Europe and found that approximately 5% of an all-comer routine HF clinic population and two-thirds of a pre-selected HF with reduced EF under 65 years cohort had at least one clinical or biochemical marker suggesting advanced HF, information which can serve as a practical resource for planning of advanced HF care.

‘I NEED HELP’ was proposed as a mnemonic in 2017 to serve as a prompt for clinicians to help identify patients who should be considered for early referral to an advanced HF centre and was later included in the ESC HFA statement on advanced HF,\(^1\)\(^,\)\(^9\) with the included components validated as markers of poor prognosis either individually or as a component of validated HF risk scores.\(^9\) In addition to these, we included additional validated advanced HF markers to increase the sensitivity of our survey for the detection of advanced HF. The first parameter modified slightly is that in addition to \( \geq 1 \) HF hospitalization(s), we included unscheduled HF clinic visits as a common clinical surrogate for HF hospitalizations, commonly used as an endpoint in landmark clinical trials.\(^10\)\(^-\)\(^12\) We chose to include ‘1 or more’ HF hospitalization, instead of the ‘\( > 1 \)’ in the I NEED HELP tool, in this \( < 65 \) years HFrEF population, given that already following a first hospitalization in community HF, median survival is significantly decreased.\(^2\) The second modification we made was to include hyponatraemia as a marker of advanced HF. This is included in the 2015 Heart Failure Society of America definition of advanced (stage D) HF\(^11\) and is included in validated HF survival models and portends a poor prognosis.\(^3\)\(^,\)\(^4\)

The ‘Hub and Spoke’ model for management of advanced HF patients included in the ESC 2018 position statement on advanced HF,\(^1\) recommends concentrating sub-specialized advanced HF services in designated centres that are resourced to provide a range of mechanical circulatory support devices in parallel with cardiac transplantation, with appropriate patient referrals to these hubs from ‘spoke centres’ focusing on routine care and surveillance. It is essential that referring health care personnel within these HF units are attuned to the signs of progression to advanced HF, which may be subtle or more gradually progressive, particularly in a chronic ambulatory chronic HF clinic setting. A recent Danish Nationwide cohort study looked at factors influencing referral for advanced HF evaluation and found that those diagnosed with HF during an outpatient visit or in a non-tertiary hospital were less likely to be referred for advanced HF evaluation.\(^14\)

This study has estimated the real-world prevalence of advanced HF patients who may be suitable for advanced therapies in the Irish population—based on standard HFrEF and age criteria—to be approximately 5% of the ambulatory chronic HF population. Over a similar 3 month time period, the number of referrals to the advanced HF clinic was less than 5% of this potentially eligible cohort, demonstrating the disparity in real-world practice between potential need for assessment and actual referral for assessment. The simple one-page questionnaire used in our National survey may be a useful triage tool to feasibly and quickly identify these
patients potentially eligible for referral to an advanced HF centre for assessment for LVAD and/or heart transplantation.

Limitations

The reporting of outcomes in advanced HF was beyond the scope of this study. Additionally, it was not designed to assess subsequent confirmed progression to advanced HF or need for mechanical circulatory support/cardiac transplantation in surveyed patients.

This study did not account for patients outside of the inclusion criteria who may also require assessment for advanced therapies (such as those with cardiac phenotypes other than HFrEF or presenting with acute de novo HF patients requiring urgent assessment). However, as the majority of patients with congenital heart disease, hypertrophic and restrictive cardiomyopathies are primarily managed in specialist centres and account for <10% of patients undergoing transplant, it is unlikely that excluding them significantly impacted on applicability of the survey data. Further, although patients >65 years can be suitable for durable LVAD implantation, with increasing age there is also an increased risk of multiple co-morbidities, which may preclude candidacy for advanced HF therapies. The aim of this point prevalence survey was not to identify the prevalence of all-comer advanced HF in Ireland, including all potentially eligible age groups, but to pragmatically focus on the most common cohort likely to be both potentially eligible and possibly under-recognized in our ambulatory clinics nationally.

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Conflict of interest

The authors declare that they have no conflict of interest.
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