Provision, organization and models of heart valve clinics within The United Kingdom

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Summary

Background: Specialist clinics are recommended for the assessment and follow-up of patients with heart valve disease. We sought to identify the current provision of specialist valve clinics in UK.

Methods: A database of all UK National Health Service hospitals was created. An online survey was distributed to each hospital to examine the model of heart valve clinic, patient population, provision of advanced imaging modalities and biochemical markers and provision of patient information services.

Results: Valve clinics were run in 48/228 (21%) hospitals, in 27/45 (60%) tertiary centres and 21/183 (11%) district hospitals. The survey was completed by 34 (71%). A consultant cardiologist ran the clinic in 19 (56%), a cardiac sonographer in 8 (24%), a nurse specialist in 3 (9%) and a hybrid model was used in 4 (12%). Patients with native valve disease were seen in 32 (94%), after heart valve surgery in 19 (56%), pre-/post-transcatheter valve intervention in 10 (29%) and with Marfan syndrome in 9 (26%). Stress echocardiography, cardiac magnetic resonance imaging, computed tomography and positron emission tomography were available in 21 (62%), 19 (56%), 22 (65%) and 6 (18%) hospitals, respectively.

Conclusion: There is an underprovision of specialist heart valve clinics within the UK, and there is a 5-fold difference between cardiac centres and district general hospitals.

Background

The incidence of heart valve disease is rising¹ and its diagnosis, assessment and management are becoming increasingly complex. New transcatheter treatments and non-invasive imaging techniques are available, and the timing of surgery, particularly in the elderly with multiple comorbidities, may be hard.² The recommendations in recent European and American guidelines³,⁴ may not be feasible for physicians without specialist competencies in valve disease.⁵,⁶ International societies therefore recognise the need for dedicated valve clinics.⁷,⁸ To plan the development of such clinics, it would be important to know what the current provision is. However, no published information exists for any healthcare system. The aim of this study was therefore to determine the current provision and organization of specialist valve clinics in the UK.
Methods

Identification of hospitals and survey distribution
A list of all hospitals within the UK was obtained from the National Health Service website (www.nhs.uk). From this list, we excluded community hospitals, single speciality hospitals (oncology, orthopaedic, obstetrics/gynaecology, paediatric, ophthalmology, dental, neurology, infectious disease and ear nose and throat) and rehabilitation hospitals. The remaining hospitals were either district general hospitals or teaching hospitals. The cardiology department of each of these hospitals was contacted by telephone to determine whether there was a heart valve clinic and if so an electronic survey was e-mailed to the cardiology clinical lead via an online platform. The survey was re-sent to non-responders on a biweekly basis. The study period covers data collected between September 2013 and December 2013.

Data acquisition
Information was requested as follows:
Hospital demographics: The type of hospital (district general or tertiary). The number of consultant cardiologists employed. The presence of onsite cardiothoracic surgery.
Valve clinics demographics: The presence, frequency and number of patients seen in the valve clinic.
Valve clinic model: The type of healthcare professionals seeing patients in the clinic and the subspecialty of the clinical lead/director of the valve clinic (intervention, cardiovascular imaging, heart failure, general cardiology and cardiothoracic surgery).
Referring specialties to the valve clinic: General practitioner, cardiothoracic surgery, cardiology or general medicine.
Referral model: Outpatient or inpatients referrals.
Type of referrals received: Patients with native valve disease, for transcatheter aortic valve implantation or transcatheter mitral intervention valve assessment, or after valve replacement or repair. Patients with Marfan syndrome for serial monitoring of the aorta. Patients after medical treatment for endocarditis.

Available imaging/investigative modalities: Transthoracic echocardiography, transoesophageal echocardiography, stress echocardiography, cardiac magnetic resonance imaging, cardiac computed tomography, positron emission tomography and brain natriuretic peptide.
Valve clinic guidelines used: European Society of Cardiology (ESC) or American Heart association/American College of Cardiology (AHA/ACC) or local guidelines.
Additional valve clinic service: Patient information booklets, patient website information, patient helpline and endocarditis team.

Statistics
Data are presented as median and inter-quartile range or number and percentage. The chi squared test was used to compare categorical variables. All tests of significance were two sided. A probability value ($P$) of $<0.05$ was considered significant. Statistical analysis was performed using StatsDirect Version 2.5.7 (StatsDirect, UK).

Results
Of a total of 228 hospitals, 48 (21%) operated a valve clinic. Valve clinics were more common in tertiary centres (27/45 (60%)) than in district general hospitals (21/183 (11%)); $P<0.0001$). Thirty four (71%) of the 48 hospitals with a valve clinic completed the survey.

Valve clinic demographics
Of the 34 hospitals completing the survey, 17(50%) were district general hospitals while 17 (50%) were teaching/tertiary centres. A total of 16 (47%) of all centres had onsite cardiothoracic surgery. No district general had onsite cardiothoracic surgery. There was a median six cardiologists per district general hospital (interquartile range 5–8) and 10 per tertiary centre (interquartile range 9–11).

Valve clinic organization and model
Valve clinics were undertaken daily in one (3%) hospital, weekly in 30 (88%) hospitals and monthly in 3 (9%) hospitals. The lead clinician for the valve clinic was a general cardiologist in 5 (15%), a cardiologist with expertise in cardiovascular imaging in 22 (65%), or heart failure in 2 (6%), an interventional cardiologist in 4 (12%) and a cardiothoracic surgeon in 2 (6%). The clinic was delivered by a consultant cardiologist in 19 (56%), cardiac sonographer in 8 (24%), a nurse in 3 (9%) and by a combination of disciplines in 4 (12%). A median of five new (interquartile range 2–6 patients) and 10 follow-up patients (interquartile range 6–25) were seen in each clinic.

Valve clinic referrals
All valve clinics performed out-patient consultations while 12 (35%) offered an inpatient referral service.
An endocarditis service was provided in 7 (21%), all in tertiary centres. Referrals were received from general practitioners in 19 (56%) valve clinics, from cardiologists in 32 (94%), cardiothoracic surgeons in 11 (32%) and general physicians in 12 (35%) valve clinics. The types of valve disease managed are listed in Table 1. All consultant-led clinics saw patients with native valve disease although one saw only aortic stenosis. As expected devolved nurse-led clinics mainly reviewed patients after valve replacement while sonographer-led clinics also saw patients with stable native valve disease. Of note, only 19 (56%) clinics reviewed patients after repair or replacement surgery and 11 (32%) clinics reviewed patients after an admission with endocarditis. 10 (29%) clinics assessed and followed-up patients for transcatheter valve therapies.

Valve clinic guidelines

The reference for clinical decisions was the ESC guidelines for heart valve disease in 18 (53%) hospitals, the AHA/ACC guidelines in 6 (18%), a combination of ESC and AHA/ACC guidelines in 6 (18%), and locally developed guidelines in 3 (9%) hospitals while 1 (3%) hospital reported no use of guidelines.

Biochemical and cardiovascular imaging assessment

Transthoracic and transoesophageal echocardiography were available in all 34 hospitals. A full transthoracic study was available on the day of clinic for all patients in 28 (82%) hospitals. Three (9%) hospitals performed a focussed study. Patients had to return for an echocardiogram in 3 (9%) hospitals. Stress echocardiography was available in 21 (62%), cardiac magnetic resonance imaging in 19 (56%), computed tomography in 22 (65%) and positron emission tomography in 6 (18%). B-type natriuretic peptide testing was available in 18 (53%) hospitals. Table 2 lists the distribution of biochemical and imaging markers by type of hospital. There was significantly greater access to cardiac magnetic resonance imaging ($P = 0.001$) and positron emission tomography ($P = 0.02$) in tertiary centres compared to district general hospitals.

Valve clinic educational material

Nine (26%) hospitals provided patient information leaflets. Two (6%) hospitals provided a patient information helpline and two (6%) hospitals provided information via a dedicated website.

Discussion

This is the first study to identify the provision and organization of specialist heart valve clinics within a healthcare system. Overall, 21% of hospitals in the UK operated a heart valve clinic and most were supervised by a cardiologist specialising in imaging. A hub and spoke arrangement is recommended with specialist valve clinics in a district general hospital referring patients to the cardiac centre as thresholds for intervention are reached.\textsuperscript{7,8} However, there was a 5-fold greater proportion of valve clinics located in tertiary centres (60%) compared to district general hospitals (11%). This may reflect differences in work-force since there was a median of 10 cardiologists at cardiac centres compared with only 6 at district general hospitals with valve clinics. Guidelines advocating valve clinics were only published in 2013\textsuperscript{7,8} and it is hoped that our data demonstrating an under-provision of valve clinics will provide a

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Types of valve assessment</th>
</tr>
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<tbody>
<tr>
<td>Indication</td>
<td>Overall $(n = 34)$</td>
</tr>
<tr>
<td>Native left-sided valve disease</td>
<td>32 (94%)</td>
</tr>
<tr>
<td>Native right-sided valve disease</td>
<td>31 (91%)</td>
</tr>
<tr>
<td>TAVI assessment</td>
<td>10 (29%)</td>
</tr>
<tr>
<td>Percutaneous mitral valve assessment</td>
<td>4 (12%)</td>
</tr>
<tr>
<td>Post-transcatheter intervention</td>
<td>10 (29%)</td>
</tr>
<tr>
<td>Postsurgical prosthesis</td>
<td>19 (56%)</td>
</tr>
<tr>
<td>Post-mitral valve repair</td>
<td>19 (56%)</td>
</tr>
<tr>
<td>Post-endocarditis</td>
<td>11 (32%)</td>
</tr>
<tr>
<td>Serial monitoring of aorta</td>
<td>9 (26%)</td>
</tr>
</tbody>
</table>

Number (percentage), transcatheter aortic valve implantation (TAVI).
stimulus for expansion and development of these clinics.

Infective endocarditis has a high mortality and patients are frequently referred to specialist centres too late or do not receive care recommended by guidelines. A recent consensus working group has advocated management by a multidisciplinary endocarditis team composed of specialists in valve disease, echocardiography, complex valve surgery and infection/medical microbiology. This approach improves outcome. Our data show that specialist overview was only available in 21% of hospitals. As it may be difficult to develop such teams in smaller hospitals links to larger centres with infection endocarditis teams are advocated.

Valve clinics were managed by a range of different clinicians including interventional cardiologists, general cardiologists, heart failure specialists and cardiothoracic surgeons. More than two-thirds were overseen by cardiologists with expertise in cardiovascular imaging which is appropriate in view of the key role of imaging in assessing and risk stratifying patients with valve disease. Unlike cardiac intervention, heart failure or imaging there are no sub-specialty training programmes in valve disease. We propose the development of a specialist valve disease curriculum including attendance at valve clinics, valve multi-disciplinary meetings and specialist training events.

The majority of clinics used the model proposed by the recent ESC position paper whereby a cardiologist with expertise in valve heart disease leads the clinic. However, nearly a third of clinics used a cardiac sonographer-led, specialist nurse-led or hybrid model. Preliminary evidence suggests that this approach is safe with supervision from a cardiologist and improves adherence to guidelines.

Table 2 Distribution of advanced imaging/biological investigative modalities

<table>
<thead>
<tr>
<th></th>
<th>District general</th>
<th>Tertiary</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress echocardiography</td>
<td>9 (53%)</td>
<td>12 (71%)</td>
<td>0.48</td>
</tr>
<tr>
<td>Cardiac MRI</td>
<td>6 (35%)</td>
<td>16 (94%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Cardiac CT</td>
<td>10 (59%)</td>
<td>12 (71%)</td>
<td>0.10</td>
</tr>
<tr>
<td>PET</td>
<td>0 (0%)</td>
<td>6 (35%)</td>
<td>0.02</td>
</tr>
<tr>
<td>BNP</td>
<td>9 (53%)</td>
<td>9 (53%)</td>
<td>0.10</td>
</tr>
</tbody>
</table>

BNP, brain natriuretic peptide; CT, computed tomography; MRI, magnetic resonance imaging; PET, positron emission tomography.

There was considerable heterogeneity in the type of patient evaluated in the heart valve clinic. The majority of valve clinics assessed and managed patients with native left or right sided valve disease. As expected, assessment and follow-up of patients for transcatheter valve intervention was limited to clinics in teaching/tertiary centres performing the technique. All hospitals are expected to have patients with replacement valves or repaired mitral valves while only 56% of valve clinics reported follow-up of these cases. The durability of mitral valve repair varies and annual clinical assessment and echocardiography are recommended. The follow-up of replaced valves is controversial. Although recommended annually in AHA and ESC guidelines, it has been suggested that uncomplicated patients can be discharged to the community for referral should clinical problems develop. The current survey suggests that this is common practice. However, a small survey has shown that systematic community follow-up does not in fact occur and suggests that problems can only reliably be detected by specialist follow-up.

Access to advanced imaging modalities was variable. ‘One-stop’ transthoracic echocardiograms are necessary for decision-making and convenient for the patient. However these were only available in 82% of clinics. Focussed studies alone were performed in 9% of clinics and these might miss important abnormalities and are not recommended. Stress echocardiography was only available in 61% of clinics. Exercise stress echocardiography is useful when patients with symptoms have only moderate regurgitation at rest. Furthermore, both ESC and AHA/ACC guidelines suggest dobutamine stress echocardiography is useful to differentiate moderate or severe aortic stenosis in patients with low gradient, low flow aortic stenosis. Three dimensional echocardiography can improve assessment of the aetiology and severity of valve disease and may additionally be used to guide transcatheter therapies. Although our data did not specifically identify the availability of this technique, it should be incorporated into the range of services available in valve clinics. Cardiac magnetic resonance imaging was available in over 50% of clinics. It may be used to quantify the severity of valve lesions where there are discrepant findings between other modalities and is also important for assessing the aorta.

Limitations of the study include a lack of participation of all valve clinics within UK. However, 71% of clinic did complete the survey and is therefore likely to representative. The data provided by clinics was not cross-validated.
Conclusion

There is an underprovision of specialist heart valve clinics within the UK and there is a 5-fold difference between cardiac centres and district general hospitals.

Conflict of interest: None declared.

References


