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Echocardiography Pathway Improvement to Increase Capacity (EPIIC): A National Scoping Survey of Scientist-Led Echocardiography Clinics in the UK

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Abstract

Background

Increasing demand for echocardiography in the United Kingdom (UK), alongside persistent workforce shortages, contribute to diagnostic delays. Scientist-led echocardiography clinics integrating imaging and clinical assessment in a single visit, may improve service efficiency and patient experience. However, the national extent of adoption is poorly characterised, and standardised guidance, competency frameworks and accreditation pathways are lacking.

Methods

A national cross-sectional online survey, the Echocardiography Pathway Improvement to Increase Capacity (EPIIC), was distributed electronically via British Society of Echocardiography (BSE) communication channels between 1 October 2025 and 15 January 2026. The survey evaluated six domains: demographics, service provision, clinic processes, perceived benefits and challenges, patient feedback and outcomes, and requirements for establishing scientist-led echocardiography clinics. Quantitative data were analysed descriptively to characterise current practice, while free-text responses underwent thematic categorisation.

Results

A total of 194 respondents completed the survey. Most identified as cardiac physiologists (67%) or clinical scientists (25%), with responses from all UK regions. An established scientist-led clinic was reported by 63% of respondents, with a further 13% reporting a service in pilot phase. Valve disease (81%) and heart failure (20%) were the most common indications. Clinics most frequently saw 0–10 patients per week (48%), with 60-minute appointments (56%). Internal cardiology referrals accounted for 89%. Echocardiography was included in 88% of protocols. Consultant cardiologist support was available in 72%, and structured escalation pathways were reported in 48%. Perceived benefits were strongly endorsed (>80% agreement) across domains including patient access, waiting times, efficiency, patient experience and staff retention. Key challenges included funding (56%), staffing shortages (51%), accreditation gaps (34%), and limited consultant support (33%). Only 43% of respondents reported routinely collected formal or informal patient feedback, although free-text responses indicate largely positive feedback.

Conclusion

Scientist-led echocardiography clinics were reported across UK regions and healthcare settings but have developed with substantial variation in governance, competency standards, accreditation and outcome measurement. National and cross-specialty standardisation of scientist-led echocardiography clinics is required, with a purposeful prospective evaluation to determine whether actual clinical, patient and workforce benefits can be delivered consistently and sustainably.

Keywords: Echocardiography; Clinical scientist; Cardiac physiologist; Scientist-led clinic; Advanced practice; Workforce; Service delivery

What is already known

- Demand for echocardiography in the UK continues to increase due to an ageing population, rising cardiovascular disease burden, and workforce shortages.
- Traditional care pathways often separate echocardiographic assessment from specialist clinical review, potentially resulting in duplicated appointments, delays in decision-making, and inefficiencies in service delivery.
- Scientist-led echocardiography clinics have emerged as a potential strategy to improve capacity and streamline patient pathways, but there are limited national data regarding their adoption, governance, competency requirements, and service delivery models.

What this study adds

- This national survey demonstrates that scientist-led echocardiography clinics are reported across UK practice, healthcare settings, and clinical indications.
- Respondents consistently perceived scientist-led clinics to improve patient access, reduce waiting times, enhance patient experience, improve workforce utilisation, and support staff retention.
- Substantial variation exists in scientist-led clinic structure, governance arrangements, competency assessment, escalation pathways, and outcome measurement**.**

How this study might affect research, practice or policy

- The findings demonstrate that scientist-led echocardiography clinics are an emerging part of cardiovascular service delivery across a range of UK settings.
- National guidance, standardised competency frameworks, accreditation pathways, and governance standards are required to support safe, consistent, and equitable implementation.
- Future evaluation of scientist-led clinics should incorporate clinical outcomes, patient-reported experience, safety, workforce impact and cost-effectiveness to inform commissioning decisions and wider national adoption.

Background

Echocardiography is central to the diagnosis, assessment and surveillance of a broad range of cardiovascular conditions, including valvular heart disease, heart failure and cardiomyopathies (1, 2). As cardiovascular disease (CVD) prevalence continues to rise alongside an ageing population, demand for echocardiography services has increased substantially across the United Kingdom (UK). This growth has created significant pressure on diagnostic services and workforce capacity, resulting in prolonged waiting times and delays throughout cardiovascular care pathways (3, 4). The challenge is increasingly recognised as both a service delivery and workforce issue. In February 2025, more than 151,000 patients in England were waiting for an echocardiogram (5). By March 2026, the waiting list had increased to over 158,000 patients, with almost one quarter waiting longer than six weeks (5). These delays occur against a backdrop of increasing CVD burden, with an estimated over 8 million people living with heart and circulatory disease in the UK (6). Such pressures are compounded by persistent workforce shortages affecting the cardiac physiology and healthcare science workforce, including those most often responsible for delivering echocardiography services.

Traditional patient pathways involve separate appointments for echocardiography acquisition and subsequent cardiology review, with patients often returning days or weeks later for review of results, resulting in duplicated appointments, increased healthcare utilisation, delayed clinical decision-making and inconvenience for patients. This model is widely acknowledged as inefficient for many stable patients undergoing routine follow-up surveillance and contributes to unnecessary anxiety for patients waiting.

Recognition of these challenges has led to increasing interest in advanced level practice models delivered by cardiac physiologists and clinical scientists. Within echocardiography, scientist-led clinics combine diagnostic imaging with varying degrees of clinical assessment, interpretation and follow-up planning within a single patient encounter. By reducing the separation between image acquisition and clinical review, these models have the potential to streamline care pathways, improve continuity of care, reduce unnecessary appointments and optimise utilisation of specialist workforce resources.

Role advancement has been sporadically reported across stress echocardiography, valve surveillance, inherited cardiac condition services, adult congenital heart disease, heart failure, and transoesophageal echocardiography (TOE) services, reflecting broader National Health Service (NHS) ambitions to maximise multidisciplinary team (MDT) workforce capability (3, 7-12). More broadly, the NHS workforce is expected to undergo substantial transformation over the coming decades, driven by increasing service demand, workforce pressures and technological innovation. The Topol Review highlighted the need for new advanced practitioner and clinical scientist roles, predicting that the vast majority of NHS jobs will require some degree of digital

capability and recommending expansion of specialist and advanced practice career pathways to support future healthcare delivery (13).

Other national policy documents have increasingly highlighted the importance of workforce transformation. The NHS England Getting It Right First Time (GIRFT) cardiology programme explicitly recognised the contribution of extended roles undertaken by cardiac physiologists and recommended greater utilisation and formalisation of advanced practice to address workforce shortages and improve service delivery (3). The report stated that upskilling the workforce and formalising extended roles are important mechanisms to improve service capacity while supporting retention through career development opportunities. More recently, the 2026 Cardiovascular Disease Modern Service Framework (CVD MSF) has reinforced this direction, calling for the development of a modern, MDT workforce capable of operating across digital, preventative and community-focused models of care, alongside workforce redesign to better align workforce capability with the needs of different patient populations (14).

Workforce sustainability represents a further driver for service redesign. Previous workforce scoping undertaken by the British Society of Echocardiography (BSE) identified substantial concerns regarding recruitment, retention and career progression among echocardiographers (15). Advanced scientist-led services have therefore been proposed not only as a mechanism to increase clinical capacity, but also as a strategy to support workforce development, professional recognition, and ultimately retention.

To inform future service development and potential national standardisation, a clearer understanding of the current landscape of scientist-led echocardiography services is required. Therefore, this national scoping survey aimed to characterise the current provision, organisation and governance of scientist-led echocardiography clinics across the UK and identify priorities for future standardisation, accreditation and service development.

Methods

Study design and survey development

A national cross-sectional online survey was conducted to evaluate the structure, delivery, and operational challenges of scientist-led echocardiography clinics within the UK. The EPIIC survey was co-developed by senior cardiac physiologists, consultant cardiologists, and administrative leads with direct experience in scientist-led clinic delivery. Questionnaire development was informed by stakeholder discussion and designed to capture contemporary practice across a broad range of service settings. The questionnaire was developed specifically for EPIIC and was not a previously validated survey instrument.

The final survey consisted of quantitative and qualitative items organised into six predefined domains: demographics, service provision, clinic processes, perceived benefits and challenges, patient feedback and outcomes, and requirements for establishing scientist-led echocardiography clinics. The survey incorporated a combination of multiple-choice, Likert-scale, dichotomous, and free-text questions to allow both structured reporting and contextual exploration of participant experiences.

Participant recruitment and data collection

Eligible participants included healthcare professionals involved in the delivery, organisation, or oversight of scientist-led echocardiography clinics, including cardiac physiologists and scientists, cardiologists, and managerial staff. Participants were recruited nationally through communication channels of the BSE, including electronic newsletters and social media platforms. To maximise geographical representation and participation across centres of varying size and service models, social media reminder prompts were disseminated at 2-week intervals throughout the data collection period. The survey was administered electronically using JISC online platform. Participation was voluntary and anonymous, and submission of the completed survey constituted implied consent to participate. The questionnaire required approximately 10 minutes to complete, and data collection occurred between 1 October 2025 and 15 January 2026. The study was approved by the University of Leeds ethics committee (MREC 3464).

Statistical analysis

Data analysis was performed using SPSS Statistics (IBM Corp., Armonk, NY, USA). Categorical variables are presented as frequencies and percentages. Continuous variables are reported as mean ± standard deviation for normally distributed data or median [interquartile range] where distribution was non-parametric. Free-text responses were analysed using descriptive thematic categorisation to identify recurring themes relating to operational challenges, perceived benefits and future service requirements. Responses were reviewed and grouped into recurring categories, which were subsequently discussed among the study team to refine interpretation and identify key themes. The frequency of responses coded to each theme was quantified to describe the relative prominence of identified themes. Individual responses could contribute to more than one theme where multiple concepts were expressed.

Denominators vary between items because not all questions were applicable to all respondents and some items permitted non-response; item-specific denominators are therefore reported where appropriate.

Results

Section 1: Demographics

Between 1 October 2025 and 15 January 2026, a total of 194 respondents completed the survey. Respondents identified as cardiac physiologists (130, 67%), clinical scientists (48, 25%), cardiologists (7, 4%), advanced clinical practitioners (3, 2%), and with other roles (6, 3%) (Table 1).

Responses were received from across the UK, with regional distribution as follows: Southwest (35, 18%), London (27, 14%), Midlands (26, 13%), Northwest (24, 12%), Northeast & Yorkshire (19, 10%), Southeast (20, 10%), East of England (13, 7%), Wales (13, 7%), Scotland (12, 6%), and Northern Ireland (5, 3%) (Figure 1). Respondents were primarily based in district general hospitals (105, 54%) or tertiary and university hospitals (83, 43%), with additional representation from private healthcare providers (5, 3%), community providers (10, 5%), and other settings (3, 2%). Nearly half of respondents worked in departments with current BSE accreditation (92, 47%).

The majority of respondents reported holding positions at Band 7 (97, 50%) or Band 8a (45, 23%), followed by Band 8b or above (23, 12%), Band 8 (9, 5%), Band 6 (7, 4%), and other roles (13, 7%). Overall, 119 respondents (61%) reported a leadership role, including managing a team (39, 20%) or a service (80, 41%).

Table 1 Respondent demographics

	Respondents, n (%)
Professional role	
Cardiac Physiologist	130 (67)
Clinical Scientist	48 (25)
Cardiologist	7 (4)
Advanced Clinical Practitioner	3 (2)
Other	6 (3)
Region	
Northern Ireland	5 (3)
Scotland	12 (6)
Wales	13 (7)
East of England	13 (7)
London	27 (14)
Midlands	26 (13)
Northeast & Yorkshire	19 (10)
Northwest	24 (12)
Southeast	20 (10)
Southwest	35 (18)
Clinic setting	
Tertiary Centre / University Hospital	83 (43)
District general hospital	105 (54)
Private healthcare provider	5 (3)
Community provider	10 (5)
Other	3 (2)
Department BSE accreditation (yes)	92 (47)
NHS Banding	
Band 6	7 (4)
Band 7	97 (50)
Band 8	9 (5)
Band 8a	45 (23)
Band 8b or above	23 (12)
Other	13 (7)
Lead a team or service (yes)	
Team	39 (20)
Service	80 (41)

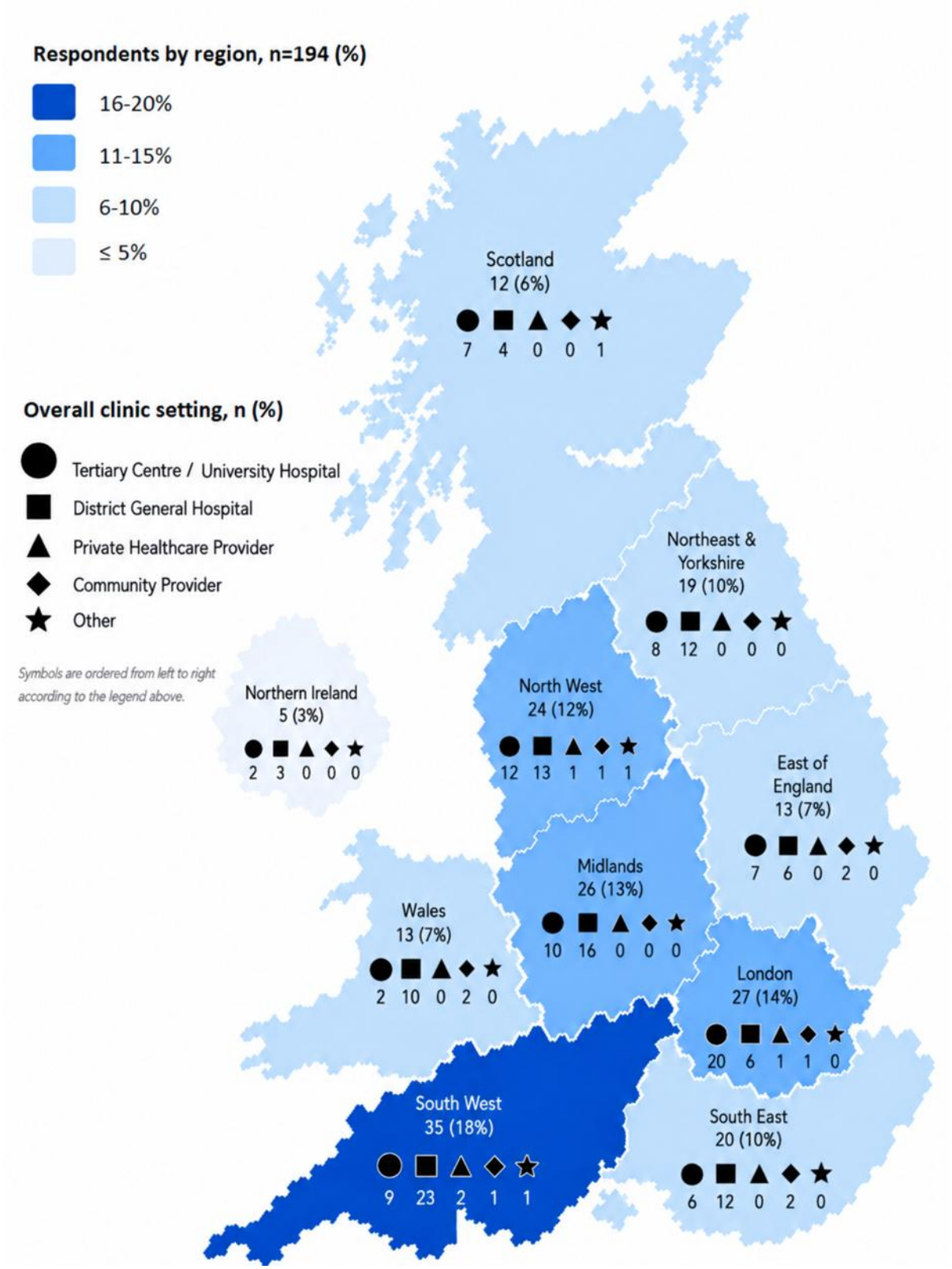
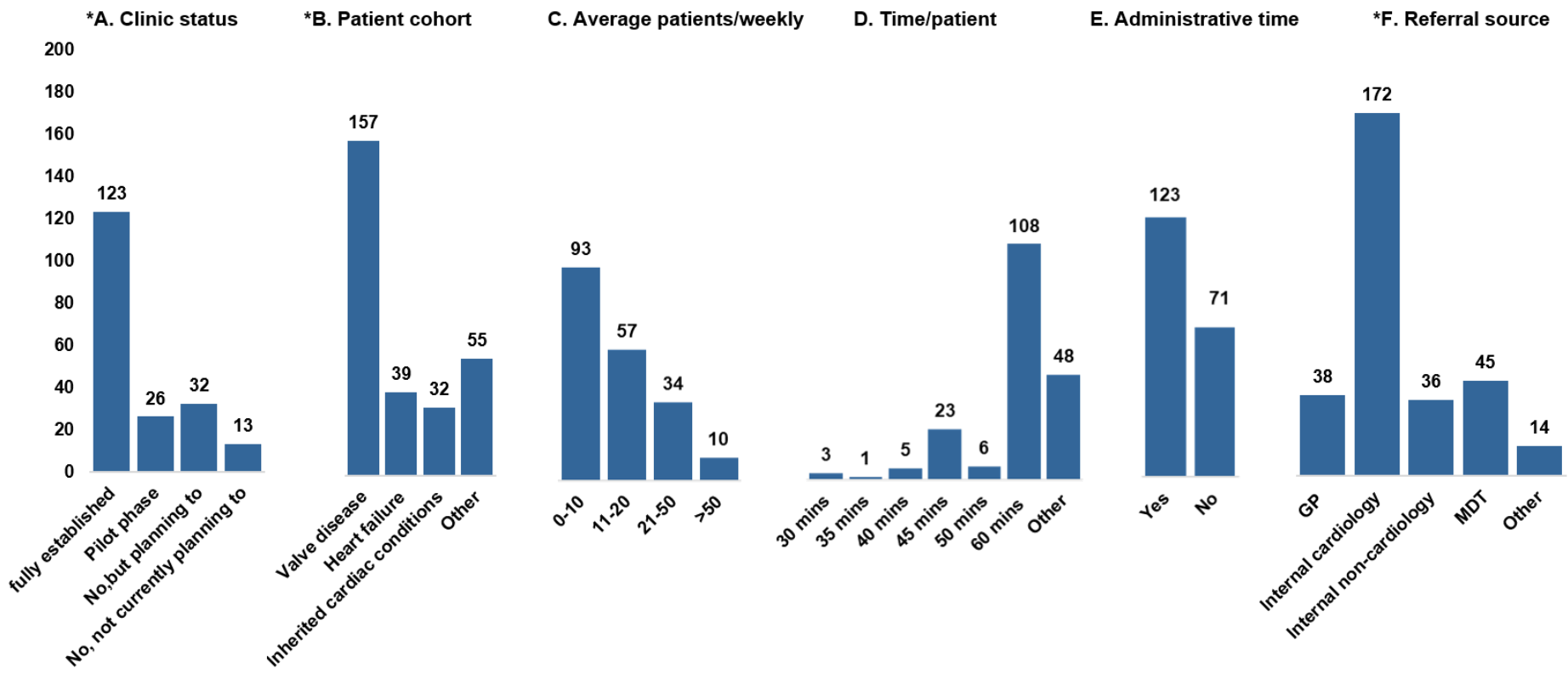


Figure 1 Geographical distribution and clinic settings of EPIIC survey respondents across the UK. Circle size identifies clinic-setting category according to the accompanying key; numbers below circles represent respondent counts. Respondents could select more than one clinic setting; therefore, clinic-setting counts may exceed the number of respondents within each region.

Section 2: Service Provision

Scientist-led echocardiography clinics were widely reported by respondents, with variation in service maturity, clinical scope and operational delivery (Figure 2). Of 194 respondents, 123 (63%) reported working within a service with a fully established scientist-led clinic and 26 (13%) reported a clinic in the pilot phase. A further 32 (16%) reported plans for future implementation, while 13 (7%) reported no current or planned service provision. Among respondents reporting established or pilot scientist-led clinics, 143 provided information on service duration; 84 (59%) reported scientist-led services operating for 0–5 years, 45 (31%) for 6–10 years and 14 (10%) for more than 10 years. Patient groups included valve disease (157/194, 81%), heart failure (39/194, 20%), inherited cardiac conditions (32/194, 16%), and other conditions (55/194, 28%), predominantly adult congenital heart disease (ACHD) and cardio-oncology. Reported clinic workload was 0–10 patients per week in 93 (48%) respondents, 11–20 in 57 (29%), 21–50 in 34 (18%), and >50 in 10 (5%). Clinic appointment duration was most commonly 60 minutes (108/194, 56%), followed by 45 minutes (23/194, 12%), 50 minutes (6/194, 3%), 40 minutes (5/194, 3%), 30 minutes (3/194, 2%), and 35 minutes (1/194, 1%). An additional 48 (25%) respondents reported other durations, most commonly 75 minutes. Provision of administrative time in addition to clinic appointment time was reported by 123 (63%) respondents. Free-text responses indicated broad variability in administrative time allocation, ranging from ‘none’ confirmed to ‘half a day per week’. The most commonly reported arrangements were ‘10 minutes’ per patient or ‘half a day per week’.



*Some questions allows respondents to choose more than one option.

Figure 2 Characteristics of scientist-led echocardiography service provision: (A) clinic status, (B) patient cohort, (C) average weekly patient volume, (D) appointment duration, (E) administrative time and (F) referral source.

Respondents reported that most referrals originated from internal cardiology sources (172/194, 89%), followed by MDT referrals (45, 23%), general practice referrals (38, 20%), and internal non-cardiology referrals (36, 19%). A further 14 (7%) were reported as other referral sources. Expected components of the clinic protocol were reported across a range of clinical activities. Clinical history taking was included in 148 (76%) responses, clinical measurements (e.g., blood pressure, heart rate, oxygen saturation, temperature) in 153 (79%), and clinical examination (e.g., auscultation and physical assessment) in 97 (50%). Echocardiography was incorporated into most clinic protocols, with 170 respondents (88%) reporting a minimum dataset and 53 (27%) a targeted protocol. Clinical reporting and correspondence were also commonly included, with 136 (70%) reporting generation of clinical reports and 125 (64%) reporting clinical correspondence. Additional components included 12-lead ECG (94, 48%), venepuncture (17, 9%), and clinical pedigree assessment (17, 9%). Onward testing referrals were reported by 63 (32%) respondents. Among 96 free-text responses describing onward referral pathways, 'MDT referral' and non-invasive cardiology investigations were most commonly reported.

Clinical assessment competencies had been or were planned to be obtained through an accredited course in 74 (38%) responses and via departmental or local competencies in 47 (24%). A further 63 (32%) reported that competencies had not been obtained but would be useful, while 10 (5%) reported no requirement for such competencies. Finally, nearly all respondents were unaware of the tariff used for clinic activity at their centre (190/194, 98%).

Section 3: Clinic Processes and Governance

Governance and support structures for scientist-led echocardiography clinics were variable, with differences in access to consultant oversight, escalation pathways, and MDT support. Among respondents providing information on clinic support structures (n=140), on-site consultant cardiologist support was available to 101 (72%), while 60 (43%) reported access to remote consultant advice. Overall, 67 respondents (48%) reported having a structured escalation protocol for complex cases. Access to remote consultant advice (60/140, 43%) and peer support from fellow scientists (59/140, 42%) was also frequently reported, whereas administrative support was less commonly available (48/140, 34%). Other support mechanisms were described by 13 respondents (9%). Escalation of care for complex or clinically deteriorating patients most commonly involved referral to a specialist registrar and/or consultant cardiologist (120/140, 86%).

Section 4: Perceived Benefits and Challenges

Perceived benefits of scientist-led echocardiography clinics were assessed using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Overall, responses demonstrated consistently positive perceptions across patient care and workforce domains (Figure 3).

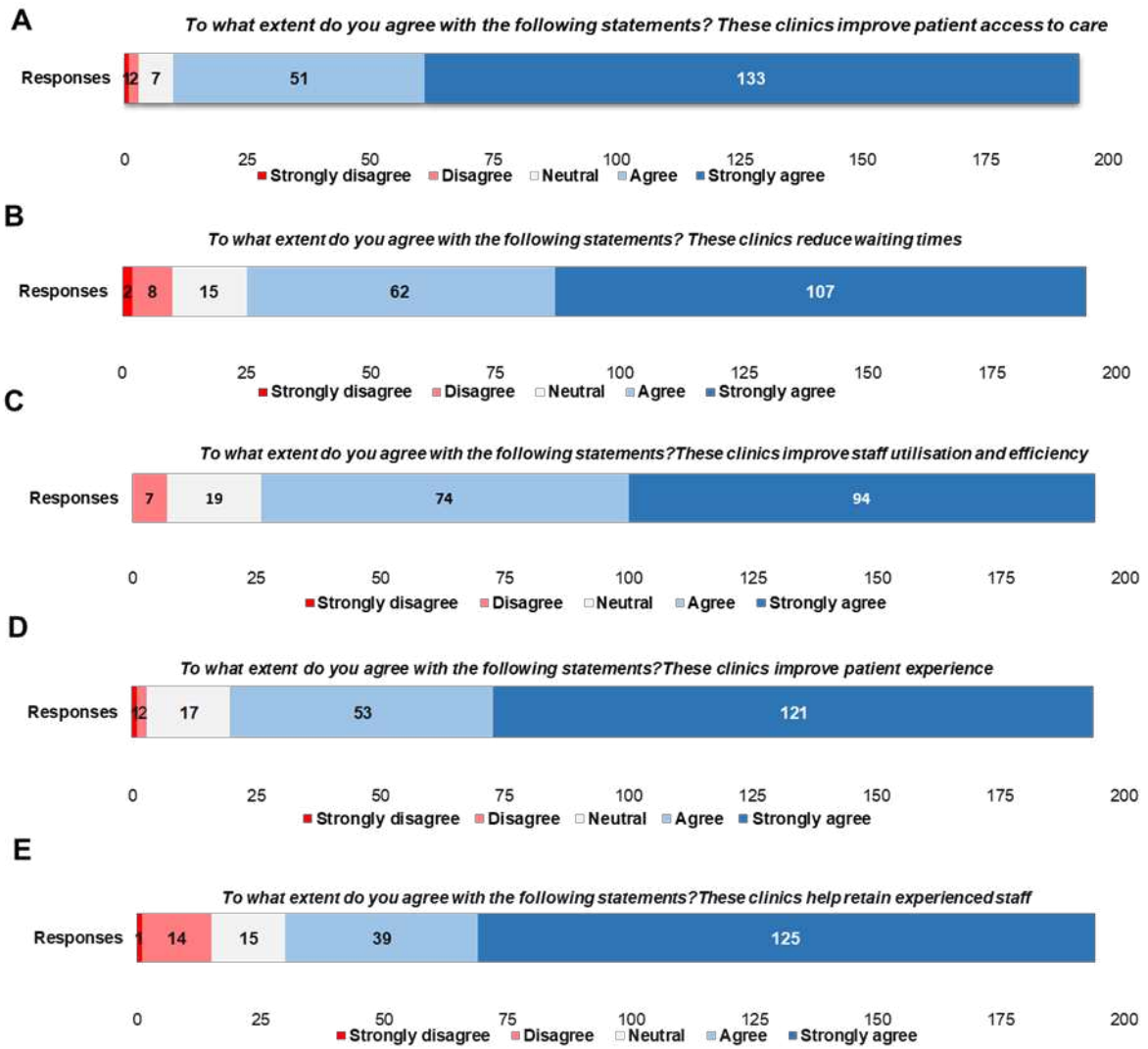


Figure 3 Perceived impact of scientist-led echocardiography clinics on (A) patient access to care, (B) waiting times, (C) staff utilisation and efficiency, (D) patient experience, and (E) retention of experienced staff.

Improvement in patient access to care was strongly endorsed, with 133 respondents (69%) selecting strongly agree and 51 (26%) agree. Respondents' perceptions on reductions in waiting times mirrored this pattern, with 107 (55%) strongly agree and 62 (32%) agree. Perceived benefits to workforce efficiency were also strongly endorsed. Improved staff utilisation was reported by 94 respondents (48%) who strongly agreed and 74 (38%) who agreed. Improvement in patient experience was similarly well supported, with 121 (62%) strongly agree and 53 (27%) agree. Impact on staff retention was thought to be positive, with 125 respondents (64%) selecting strongly agree and 39 (20%) agree. Free-text responses (Figure 4) identified several perceived benefits of scientist-led clinics, with the most frequently coded themes including reduced waiting times and improved patient experience. Additional reported perceived benefits included improved staff retention, opportunities for staff development and recognition of specialist skills, reduced consultant workload, and perceived improvements in patient outcomes, including better monitoring and consistency of care. Free-text responses identified recurring themes relating to the perceived benefits, challenges and limitations of scientist-led echocardiography clinics (Figure 4).

Perceived challenges to delivering scientist-led clinics included funding constraints (109/194, 56%), lack of trained staff (99/194, 51%), lack of accreditation frameworks (65/194, 34%), and limited consultant support (64/194, 33%). Limited patient awareness or referral pathways were reported in 24 (12%) responses. A further 43 (22%) respondents selected other challenges for which free-text responses predominantly described staffing and funding constraints, followed by the absence of accreditation frameworks and limited consultant and administrative support.

Section 5: Patient Feedback and Outcomes

Routine collection of patient feedback for scientist-led clinics was reported in 50 (26%) responses as formal (e.g., face-to-face feedback or surveys) and in 33 (17%) as informal, while 111 (57%) reported no routine feedback collection. Among free-text responses describing patient feedback, respondents predominantly characterised feedback as positive. Respondent-reported changes following the introduction of scientist-led clinics included improvements in patient experience in 51 (26%) responses, service efficiency in 48 (25%), and clinical outcomes in 22 (11%).

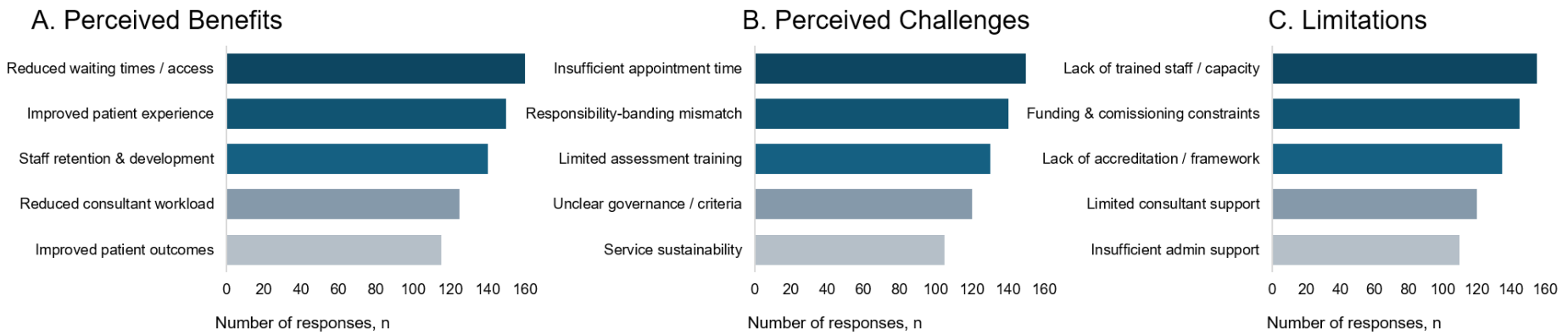


Figure 4 Frequency of themes identified from free-text responses regarding the perceived benefits, challenges and limitations of scientist-led echocardiography clinics. Bars represent the number of responses coded to each theme; individual responses could contribute to more than one theme.

Section 6: Requirements for Establishing Clinics

Free-text responses regarding support required to deliver or improve scientist-led clinics most frequently highlighted protected time, funding, national accreditation frameworks, development opportunities including appropriate banding, broader MDT support, and national standard operating procedures and guidance (Figure 5).

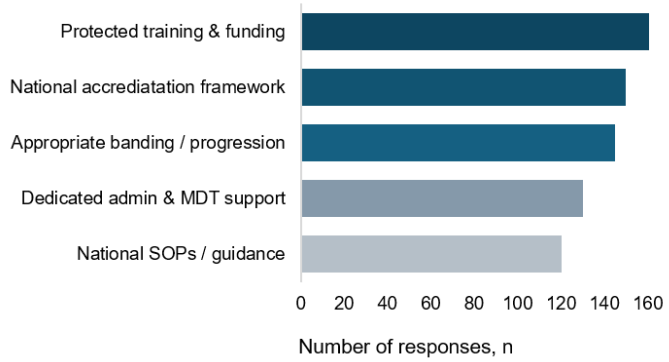


Figure 5 Frequency of themes identified from free-text responses regarding perceived requirements for the implementation and sustainability of scientist-led echocardiography clinics. Bars represent the number of responses coded to each theme; individual responses could contribute to more than one theme.

When asked about training or qualifications required for these roles, responses most commonly emphasised the need for clinical assessment skills, prior clinical experience, and equivalence to Scientist Training Programme (STP) level training. These themes were consistently identified across responses, with individual responses contributing to more than one category where multiple requirements were described. In additional free-text comments, respondents most frequently called for continued advocacy for physiologist and scientist workforce development, including clearer minimum entry requirements for staff undertaking these roles.

Discussion

This national scoping survey demonstrates that scientist-led echocardiography clinics are reported across a range of UK healthcare settings and clinical populations, with heart valve disease representing the most common clinic focus. Respondents overwhelmingly perceived these models to improve access to care, reduce waiting times, support more effective workforce utilisation and enhance patient experience and staff development. However, considerable variation was identified in how services were configured, including practitioner training and competency requirements, governance, escalation arrangements and evaluation of service outcomes. Importantly, the services described mostly operate within defined, pre-selected patient cohorts with protocol driven scopes of practice, and consultant cardiologist support and defined escalation pathways. Taken together, these findings suggest that scientist-led echocardiography services have begun to extend beyond isolated examples of role extension to broader participation in clinical pathway delivery, while the infrastructure supporting these clinics, and the echocardiographers who deliver them, remain inconsistently developed.

From diagnostic role extension to integrated clinical pathways

The trajectory of scientist-led echocardiography clinics identified in the EPIIC survey mirrors established patterns of development in UK echocardiography services. Early studies of physiologist-led stress echocardiography demonstrated the feasibility and safety of extending diagnostic delivery beyond medical staff, with close agreement in interpretation between experienced physiologists and cardiologists (16, 17). More recent national data suggest that this transition is now embedded within UK stress echocardiography practice (7). The EVAREST/BSE-NSTEP evaluated 8,506 stress echocardiograms across 34 hospitals and demonstrated substantial physiologist/scientist involvement in supervision and delivery, with growing, if still minority, involvement in reporting (7). EPIIC indicates that role development has progressed further still, extending to incorporate clinical assessment, communication of findings, and initiating protocolised follow-up plans.

The heart valve disease pathway illustrates this progression most clearly. Specialist valve clinics were first advocated as a means to improving surveillance through structured MDT pathways (18). Subsequent service evaluations have shown real-world application of guideline-based surveillance by physiologists and scientists (19, 20) and more recent quality-improvement work has shown improved adherence to surveillance intervals alongside favourable economic evaluation (9). Subsequent suggestion of a formal two-tier competency framework for clinical scientists and physiologists working within valve clinics supports standardisation in this pathway, incorporating prerequisite competencies, supervised practice, MDT involvement and defined escalation (21). Whilst a valve-specific model is unlikely to be directly transferable into other clinical populations and pathways, its underlying principles, such as defined entry criteria, structured training, supervised progression, competency assessment and ongoing evaluation, offer a template for wider standardisation.

Some scientist-led echocardiography services extend beyond a single investigation into structured pathway management. The clinical scientist-led ACHD service described by Freitas et al., combined history taking, examination, electrocardiogram (ECG), echocardiography, patient communication and correspondence within defined eligibility, competency and escalation arrangements (8), provides integrated assessment and imaging within a single attendance. A comparable scientist-led model in heart failure found equivalent clinical outcomes to the existing medical-led pathway with median time from echocardiogram to outcome falling from 30.1 days to 10.6 days (10). In each case, the echocardiographer operated within an explicitly defined patient population and scope, with medical escalation available rather than autonomous diagnostic responsibility for undifferentiated presentations. These integrated “one-stop” models raise the important question of whether reduced patient pathway steps translate into shorter overall pathways and fewer hospital attendances, redistributing the workload, rather than simply reallocating. Although we cannot answer these questions through EPIIC, it does seem that successful

scientist-led services depend on also having the appropriate organisational infrastructure and a clearly defined scope of practice as much as individual echocardiographer capability.

Governance variation in a wider professional context

The governance gaps identified in EPIIC are not unique to echocardiography, or to clinical cardiac physiology. Comparable variation has been documented during the development of clinical roles without nationally agreed scopes of practice, competency standards or supervision requirements. The first large-scale evaluation of advanced clinical practitioner roles in England, for example, found wide variation in job titles, competency mapping and supervision, with only a minority of organisations able to identify a formal governance lead or policy (22). A pan-European survey of 35 national nursing associations found similarly fragmented regulation of advanced practice nursing, with fewer than a third of countries with an established role underpinned by a minimum educational standard (23), and an international survey of advanced practice physiotherapy reports formal roles and standardised competency frameworks in only a minority of responding countries (24).

EPIIC respondents prioritised clearer governance, protected time, competency assessment, defined escalation pathways and national standard operating procedures. The absence of these arrangements is not simply a matter of professional role clarity. Without shared standards, thresholds for practice and clinical decision-making vary between services, weakening quality assurance and creating risk to patient safety. Differences in provision between organisations and regions create inequity in patients' access to expertise, while reliance on locally developed models produces uneven workforce capability and unequal opportunities for role development. Nationally consistent principles for competency, governance and escalation would address these problems at their source, supporting safer and more equitable services while leaving room for implementation to reflect local clinical pathways.

These principles cannot be developed in isolation from professional regulation. Many echocardiographers are clinical scientists, statutorily regulated by the Health and Care Professions Council (HCPC), whose standards of proficiency define expectations for safe and effective practice, whereas registration for healthcare science practitioners and cardiac physiologists remains voluntary, through the Academy for Healthcare Science. However, registration of any kind confirms only that a professional meets generic standards of proficiency and conduct of their profession; it does not define the service-specific competencies required to lead an individual echocardiography clinical pathway. Future frameworks for scientist-led echocardiography should therefore build on professional regulation rather than substitute for it, specifying the additional clinical competencies, supervised experience, governance arrangements and escalation processes required for each model of care.

Towards standardised, evidence-based practice

Across the echocardiography-specific and wider literature, a consistent pattern emerges that successful services are generally those built around defined patient selection, explicit competency requirements, structured supervision, medical or MDT escalation and ongoing evaluation (8-11, 16, 17, 21). As EPIIC shows, scientist-led echocardiography clinics are reported across UK settings and patient groups already, therefore, the research priority is shifting from documentation of individual examples of scientist-led delivery, which still remain useful and needed, towards establishing minimum competencies, supervision arrangements, scopes of practice and outcome measures for this model of care to be implemented safely, consistently and accountably across organisations.

Two main gaps were identified from EPIIC. First, perceived benefit currently exceeds evidence evaluation, particularly in relation to patient experience. Although EPIIC respondents strongly perceived improved patient experience, only 43% reported routine collection of formal or informal feedback and validated patient-reported experience measures were rarely used. Secondly, funding and workforce sustainability remain unresolved. Funding was the most frequently reported challenge with almost no respondents aware of the tariff applied to their scientist-led clinic activity, and existing economic evaluations largely remain model-based or drawn from single service-evaluations (8, 9). Future assessment across clinic settings and specialties which deliver prospective evaluation of clinical outcomes, patient-reported experience and whole-pathway impact are needed to determine whether the perceived benefits demonstrated through EPIIC are realised in real-world UK cardiovascular practice.

Limitations

Several limitations should be considered when interpreting these findings. First, as a cross-sectional scoping survey, this study was designed to characterise contemporary scientist-led echocardiography practice rather than determine comparative clinical or service effectiveness. The survey captured heterogeneous service models, practitioner roles, patient populations and governance arrangements, limiting direct comparison between individual services.

The survey achieved broad geographical coverage, with responses from all four UK nations and across regions, and included respondents from tertiary/university hospitals, district general hospitals and other healthcare settings. However, cardiac physiologists and clinical scientists comprised 92% of respondents, with less representation achieved from cardiologists and other professional groups. Survey distribution was primarily facilitated through the BSE, including promotion at its annual conference and through its website, which likely preferentially reached professionals more engaged with echocardiography, the BSE or scientist-led practice, introducing selection and self-selection bias. As the survey was openly promoted rather than distributed to a defined sampling frame, the number of eligible individuals exposed to the invitation was unknown and a conventional response rate

could not be calculated. In addition, responses were collected at the individual rather than organisational level, and multiple respondents could originate from the same hospital or service. The findings therefore describe the proportion of respondents reporting particular service models and should not be interpreted as estimates of the proportion of unique UK centres providing scientist-led echocardiography clinics.

The questionnaire was developed specifically for EPIIC and was not a previously validated instrument, which may affect the reliability and comparability of some survey constructs. Finally, survey findings were self-reported and therefore reflect respondents' perceptions of service delivery and impact rather than independently verified clinical or operational outcomes. Reported benefits in access, waiting times, workforce utilisation, patient experience and staff retention should therefore not be interpreted as evidence of objective service improvement.

Conclusions

Despite growing interest, implementation of scientist-led echocardiography clinics remains heterogeneous. Existing services have largely developed locally in response to operational pressures, resulting in variation in referral criteria, clinic structure, governance arrangements, competency requirements and consultant support. There is currently no nationally agreed competency framework, accreditation pathway or clinical guidance defining the knowledge, skills and governance requirements necessary for scientist-led echocardiography clinics. The absence of standardisation limits wider adoption, promotes inconsistency in practice and poses challenges for workforce planning, quality assurance and clinical governance, with potential implications for patient safety and equitable access to consistently governed models of care. Existing single clinic evaluations demonstrate what can be achieved within well-defined service models. Thus, the priority now is to determine whether these benefits can be reproduced across centres and clinical services through standardisation and prospective evaluation.

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Authors' contributions

MFP researched the topic and devised the study. NAS, FJ and MFP provided the first draft of the manuscript. NAS managed the survey, collected the data, and conducted the analysis supported by MFP. All authors critically reviewed and approved the final manuscript.

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Data availability

The data that support the findings of this study are not currently publicly available. Anonymised data may be made available from the corresponding author upon reasonable request, subject to appropriate approvals and data-sharing requirements.

Conflicts of interest

MFP reports research funding from the NIHR, British Heart Foundation (BHF), Medtronic, Abbott, and GE Healthcare; consultancy and speaker fees from Medtronic, Abbott, AstraZeneca, and GE Healthcare; and is a Trustee and Chair of Research for the British Society of Echocardiography (BSE), a board observer for the British Society of Heart Failure. All other authors declare no competing interests.

List of abbreviations

ACHD : Adult Congenital Heart Disease
BRC : Biomedical Research Centre
BSE : British Society of Echocardiography
CVD : Cardiovascular Disease
ECG : Electrocardiogram
EPIIC : Echocardiography Pathway Improvement to Increase Capacity
MDT : Multidisciplinary Team
NHS : National Health Service
NIHR : National Institute for Health and Care Research
TOE : Transoesophageal Echocardiography
UK : United Kingdom

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