

Title

The Evolution from Cardiac Physiologists to Clinical Scientists in the UK: A Guide to Attaining

Equivalence**Authors**

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Abstract

At its inception, Transthoracic Echocardiography (TTE) was employed as a basic screening tool for the diagnosis of heart valve disease and as a crude indicator of left ventricular function. Since then, echocardiography has developed into a highly valued non-invasive imaging technique capable of providing extremely complex data for the diagnosis of even the subtlest cardiac pathologies. Its role is now pivotal in the diagnosis and monitoring of heart disease. With the evolution of advanced practice and devolving care, ordinarily performed by senior doctors, to the cardiac physiology workforce in the UK, significant benefits in terms of timely patient care and cost savings are possible. However, there needs to be appropriate level of accountability.

This accountability is achieved in the UK with statutory regulation of healthcare professionals and is a crucial element in the patient protection system, particularly for professions in patient facing roles. However, statutory regulation for staff practising echocardiography is not currently mandatory in the UK, despite the level of responsibility and influence on patient care. Regulatory bodies maintain patient safety through oversight of registered individuals by stipulating codes of conduct and level of practice; to fall below the standards of expected practice risks removal from the register and the prevention to practice. The current cardiac physiology workforce can be recognised as registered Clinical Scientists using equivalence process through the Academy for Healthcare Science and this review aims to describe the process in detail.

Introduction

The British Society of Echocardiography (BSE), through education and quality benchmarking offers the UK workforce a formal process to certify competence in echocardiography; accreditation with the society demonstrates that the individual has achieved the required minimum level of competence to practice independently. Within the UK, echocardiography is not performed by a single professional body, but by a range of healthcare professionals from different specialist backgrounds, these include cardiac physiologists, clinical scientists, radiographers, nurses and doctors.

Most echocardiograms are performed by cardiac physiologists (CP) or clinical scientists (CS). A number of titles for this particular workforce has evolved over time. Such titles include 'Cardiac Technician', 'Cardiac Physiologist', 'Sonographer', and now the protected title of 'Clinical Scientist' (for those members of the workforce regulated by the Health and Care Professions Council (HCPC)) reflecting the numerous training routes leading to this role. The majority of existing CP have followed a standardised academic training course. They have undertaken a degree in cardiac physiology accredited by the Registration Council for Clinical Physiologists (RCCP) or, more recently, the Academy for Healthcare Science. Prior to 2002, much of the training occurred in-house with additional academic education, usually Level 3 BTEC (Business and Technology Education Council) Diploma or a Higher National Diploma (HND) provided externally. Although this format of training varied from Trust to Trust, staff would then have a period of in-house training and follow the BSE accreditation process. In addition to this route, a significant number of professionals were trained specifically in echocardiography through a pathway previously supported by the British Heart Foundation. Further to this, many individuals qualified in other countries and with various training backgrounds and experience (including medical, nursing and allied-health professionals) have gained accreditation through the BSE process or the European equivalent, the European Association of Cardiovascular Imaging (EACVI).

It is clear that in order to provide high-quality services focused on delivering safe and effective patient care, we need to better define this heterogeneous group. Furthermore, a cohesive approach to training, education, continuous professional development and an appropriate level of statutory regulation will support a safe, high-quality and effective service and allow for further innovative ways of working.

What is a ‘Clinical Scientist’ and why is this role now necessary?

At its inception, Transthoracic Echocardiography (TTE) was employed as a basic screening tool for the diagnosis of heart valve disease and as a crude indicator of left ventricular function. Since then, echocardiography has developed into a highly valued non-invasive imaging technique capable of providing complex data for the diagnosis of a wide range of cardiac pathologies. Therefore, competent practice in this speciality requires a comprehensive understanding of not only normal cardiac anatomy, haemodynamics and mechanics, but also the vast array of cardiac pathologies and their severity. Echo is accessible and cost effective. Its role is now pivotal in not only diagnosis, but also monitoring disease progression, guidance for complex structural procedures and determining success post intervention. Academic standards for those performing echocardiography has mirrored evolution of these diagnostic techniques and is now embedded in the Scientist Training Programme (STP) at post graduate academic level 7. As a result of this development the healthcare system has seen an opportunity to further advance the skills and roles of clinical scientists. As demand for medical healthcare services outstrips current resources, devolving care, ordinarily performed by senior doctors, to highly trained Clinical Scientists is an attractive prospect with significant benefits in terms of timely patient care and cost savings¹. Although training to post-graduate academic level is standard for training programmes in North America, Canada, Australia and New Zealand, where professional accreditation is also mandatory, there is currently no provision of advanced echocardiographic

services by the non-medical scientific workforce. In developing these senior scientific roles with advanced responsibilities, the UK is leading the way.

So why is statutory regulation as a Clinical Scientist essential for the UK echocardiography workforce? Primarily, statutory regulation of any healthcare or medical profession exists to ensure the safety of patients within healthcare services. Such bodies aim to ensure patients receive evidence based safe and effective care, appropriate for their needs. Therefore, one of the fundamental requirements is a workforce that upholds high-quality standards. Benchmarked practise is achieved through career-long education and training. National regulation by a recognised body such as the HCPC, whose primary function is to protect the public, is the optimal way to ensure professionals attain and maintain high standards and should be mandatory for all staff who practice and report echocardiography autonomously within the National Health Service in the UK.

Becoming a Clinical Scientist

The training structure for the cardiac physiology workforce practising echocardiography in the UK has changed dramatically over the last forty years and has led to two pathways to becoming registered as a Clinical Scientist in Cardiology. The first is to complete the three-year post-graduate Scientist Training Programme (STP). The second is for qualified individuals to demonstrate that the knowledge, experience, skill and professional practice competencies they have developed over the course of their career is equivalent to those acquired through the STP route. This process of equivalence is crucial in order to facilitate the transition in the workforce from an old to a new career framework and allow appropriately skilled individuals routes for progression. The potential barriers to achieving equivalence are not as insurmountable as they might first appear.

Delving into the Department of Health archives shows how a series of consultation documents led directly to this transformation of the training pathway, not just for cardiac physiologists, but for all of

healthcare science. The parallel between the development of cardiac physiology services and healthcare science is striking. Within cardiology the publication of the National Standards Framework (NSF) for Coronary Heart Disease in 2000² brought national attention to cardiology services.

The NSF for Coronary Heart Disease highlighted the roles of the cardiac physiology workforce, which were essential to achieving key standards within the framework. These included, standard eleven, where services 'offer appropriate investigations (e.g. electrocardiography, echocardiography) that will confirm or refute the diagnosis', and standards nine and ten that emphasised the multi-disciplinary team requirements to deliver appropriate angiography services. The Society for Cardiological Science and Technology (SCST) had been seeking statutory regulation for over two decades when, in 2001, they came together with several other physiology professions and created the Registration Council for Clinical Physiologists voluntary register as a step towards full statutory regulation, which included the introduction of the accredited degree programmes³.

In parallel to the developments specific to cardiology, the wider NHS Plan⁴ was published in 2000 and set in motion a series of ambitious aims and objectives designed to ensure that the NHS was 'modernised from top to toe'. This included extending practice for non-medical professionals and modernising professions including healthcare scientists. In 2001, the publication of 'Making the Change, A strategy for the Professions in Healthcare Science'⁵ recognised that all professions in healthcare science are key to the development of the NHS Plan and introduced the umbrella group of 'Healthcare Science'. Of note, the first profession referred to within the document was that of cardiac physiologists⁴.

During the 60th Anniversary of the NHS in 2008, the publication of a 'High Quality Care for All'⁶ laid the foundation for the Modernising Scientific Careers consultation⁷ and the current training pathway we have today. A key element for the cardiac physiology workforce was the introduction of a direct pathway to statutory regulation as a 'Clinical Scientist', either through 'attainment' through completion of the Scientist Training Programme (STP) or by 'demonstration of equivalence'. This

process of equivalence demonstrates that an individual's qualifications, experience, conduct and practice are of an equivalent standard to those qualifying via the STP route.

The Academy of Healthcare Science (AHCS) is the single overarching body for the Healthcare Science workforce in the UK and issues the certificate of attainment for the STP in conjunction with the National School of Healthcare Science (NSHCS). The AHCS work alongside the professional bodies such as the SCST with input from specialist interest groups such as the British Society of Echocardiography (BSE) and the British Heart Rhythm Society (BQRS) in setting the academic and clinical standards for process regulation. Although the register for clinical scientists is maintained by the HCPC, it is through the AHCS that equivalence is demonstrated and statutory regulation as a Clinical Scientist attained.

Process of Equivalence

Preliminary Application

Achieving STP equivalence is a four-phase process. The first phase is online registration and completion of the preliminary screening process. This stage is straight forward and includes standard due diligence components such as: proof of identity; a Disclosure and Barring Services (DBS) check; two professional references and the key component at this point, the 'summary of professional experience'. This is a brief summarisation of the applicant's professional history limited to just 1000 words. At this juncture the applicant should review the STP curriculum⁸ and Good Scientific Practice⁹ (GSP) guidance, bearing in mind that the summary needs to broadly demonstrate evidence of the key aspects within both. It is not necessary to cover all aspects of the STP curriculum or GSP domains at this point, but demonstrating continued professional development, maintaining clinical governance standards and evidence of leadership is very important. It is also important to be aware that STP graduates have around 90 weeks of workplace training. Any applications from individuals with less experience are unlikely to be successful.

A recommended structure for the initial summary would be:

- Summary of initial training period and graduate qualifications
- Summary of clinical experience with emphasis on the more recent/senior roles
- Summary of further education, CPD and post-graduate qualifications
- Summary of management responsibilities
- Summary of education responsibilities (to who and how you have provided training/teaching)

Portfolio of Evidence

After submission, the applicant will be informed that they may or may not proceed to the second phase of the process, the production of a personal portfolio in no more than 5000 words. The portfolio, which is submitted online, builds upon the professional summary and provides a comprehensive description of the applicant's career to date, describing how all standards across the five domains have been achieved. As the portfolio is numerically cross-referenced to each individual standard within the GSP guide, it is now essential that the applicant becomes familiar with each of these standards and which aspects of their training and practice they should refer to for evidence. It is important that the applicant now considers all aspects of the STP curriculum including generic, theme and specialist, though mapping is not required. There are five domains within the GSP guidance, these are:

1. Professional Practice
2. Scientific Practice
3. Clinical Practice
4. Research, Development and Innovation
5. Leadership

Most physiologists considering applying for STP equivalence will find that they have already achieved the majority, if not all these standards through their day-to-day practice over the course of their career. While each portfolio submission will be a unique compilation of experiences, there are many roles and responsibilities that are common amongst echocardiographers throughout the NHS. The following points are therefore recommended as evidence of achieving the standards within each domain.

A recommended structure for the written aspect of the portfolio is summarised in Table 1. The focus should be on the post-graduate qualifications and work experience.

Professional Practice

Professional practice relates to a wide range of professional work-based topics such as: personal adherence to professional codes of conduct; probity and ethics; your performance within or as a lead of a team and the training/development of others. Primarily, assessors are looking for evidence that the applicant places the patient at the centre of their working practice and that roles undertaken are within the individual's scope of practice i.e. only performing tasks/procedures following a period of appropriate training. It is also crucial to evidence continual professional development (CPD), not just within the specialism, but of more generic and mandatory CPD as well. It is also necessary to evidence how you work within the team environment and how you contribute to the education and development of colleagues. Examples of evidence that can be used to demonstrate the standards within the domain include:

- Evidence of training, including courses and conferences attended
- Workplace competencies achieved
- Copies of qualifications
- Curriculum Vitae

- Reflective log
- Multi-Source Feedback or feedback from appraisal/1-1
- Individual and department QA or audit
- Creation of and evidence of adherence to departmental/national SOPs and guidelines
- Description of team working (TOE, stress-echo, cath lab etc)
- Team meetings minutes
- Evidence/description of team leading
- Evidence of teaching and training (PTP/STP, medical training)
- Evidence of external teaching or student/lecture feedback

Scientific Practice

There are three subsections within scientific domain; scientific practice, technical practice and quality. Within the scientific domain, assessors are looking for evidence of investigative experience utilising appropriate qualitative and quantitative methodology. For example, in echocardiography this may relate to:

- How the applicant or applicant's department has adopted national guidelines/minimum datasets as local SOP's
- Local audit strategies and how the applicant can demonstrate that the team set and meet standards using audit
- If a training officer for STP's, evidence of how the STP research was overseen
- Any research the applicant has been directly involved with
- Anonymised example of an echo report demonstrating evidence-based practice adhering to latest evidence/guidelines

- Demonstration of involvement in service development and service improvement programmes

Clinical Practice

There are two subsections in the Clinical Practice domain; Clinical Practice and Investigating and Reporting. Here, it is important to evidence patient-centred care, including consent and confidentiality considerations, as well as demonstrating competence in the clinical role held. It is also necessary to demonstrate knowledge of the appropriate tests/procedures undertaken relevant to the clinical context. Examples of evidence for these standards include:

- Description of the department/hospital chaperone policy
- Attendance of consent courses
- Certificate of TTE accreditation from national society (BSE/EACVI/ASE)
- Examples of SOPs created or evidence of evidence-based practice (EBP)
- Anonymised example of an echo report demonstrating EBP through adhering to latest evidence/guidelines
- Description of how patients are triaged/prioritised within the department
- Evidence of department Quality Assurance (QA) and audit programmes
- Description and evidence of developing physiologist led services
- Comprehensive description of the patient cohorts seen within the department, e.g.: valve clinic; cardiomyopathy clinic; pulmonary hypertension clinic; stroke clinic etc

Research, Development and Innovation

At first glance, this domain may be the most daunting to many members of the current cardiac physiology workforce. This section seeks evidence of critical appraisal of current literature and

evidence-based practice, along with evidence of evaluation of clinical practice. It is worth bearing in mind that evidence is not limited to research but could, for example, be the development of a new way of working, such as scientist-led valve clinics or evidence-based service improvement programmes. Demonstrating that critical evaluation was performed, and the appropriate audit cycle was used to validate the implementation and continual improvement of the new service (by the applicant) would be an important component of the evidence. Examples of evidence for these standards include:

- Demonstration of EBP through creation of SOPs or evidence of critically appraising recently published research (journal club etc.)
- Description of individual and departmental QA and audit processes, with emphasis on learning outcomes
- Evidence of undertaking and disseminating research, whether individually or as part of a writing group
- Novel service development or innovation
- MSc, PhD or other research award
- Peer reviewed publications
- Presentations/posters at scientific meetings
- Peer reviewer of articles

Clinical Leadership

This domain of the GSP assesses the applicants' ability to lead within services and includes: appropriate delegation of duties; supporting and respecting your team and colleagues; taking appropriate action to remedy deficiencies in team performance; and maintaining oversight when delegating duties. This will require clear delineation of roles and responsibilities and regular

assessment of team performance to ensure that patients are protected from risk or harm. Evidence for this domain would include:

- Teaching
- Mentorship
- Creating SOPs
- QA and audit
- Personal and employer references
- Output from multi-source feedback
- CV
- Evidence of performing team appraisal/1-1

Gaps in your portfolio

Echocardiography has evolved to such an extent that this sub-speciality of cardiology is now rightly considered a science in its own right. It is therefore appropriate that all non-medical health care professionals currently practising echocardiography acknowledge becoming a registered Clinical Scientist is likely, at some point, to become a professional necessity. However, many echocardiographers currently practising in the UK may feel they do not possess the relevant skills, experience or competencies to successfully achieve equivalence immediately. The biggest perceived hurdle for many, and probably the most commonly asked question to those who have achieved STP equivalence, is what level of research is required for achieving equivalence. For staff who have previously undertaken an MSc in a relevant area, it is likely they already possess the necessary academic components of the domains covered. However, applicants that do not hold post-graduate qualifications often find their initial review of the research domain somewhat daunting; this may also extend to the Scientific Practice domain, albeit to a lesser extent. A key point to note when gathering evidence for the Research, Development and Innovation domain is that it is not restricted to pure

research but extends to development and innovation of services and departmental practice. This would include the development of new services, such as physiologist-led clinics. The relevant evidence would comprise demonstration of a well written business plan, with a critical appraisal of the most recent guidelines and the appropriate assessment of the new service using an audit cycle.

Publication

An excellent way to demonstrate your research, development or innovation processes are appropriately validated and benchmarked is to have it published in a relevant peer-reviewed journal. There are several types of submission a peer reviewed journal, such as Echo Research and Practice, will accept. These include articles on original research, echo education, case reports and review articles.

Detailed instructions for authors are available via the journal's web page. It is important to review these carefully and familiarise yourself with the process of submission. When determining where to publish any article, take note of the aims and scope of the journal as this will provide an indication of the type of publication the journal will be most likely to consider. Ensure you stick rigidly to the word count and referencing structure as this will ensure you adhere to the appropriate framework.

Portfolio Outcomes

There are three potential outcomes from the submission of the portfolio:

1. Progress to interview
2. Further information/evidence or training required
3. Reject application

In the event of outcome 2 or 3, feedback will be provided.

Interview

On a successful submission of the portfolio, the application will progress to the third stage, which is an interview. The purpose of the interview is to assess the applicant's competence in the workplace and ensure they meet the standards set out in good scientific practice and are comparable in knowledge, skill and competence to someone who has successfully completed the STP.

The interview panel is comprised of three assessors, the chair (lay person), at least one professional from the specialist field of the applicant, and at least one registered clinical scientist. The interview is normally conducted by video-conferencing and usually lasts between 30 and 60 minutes. You will be asked a number of questions from across the five domains. It is important to focus on the question being asked, don't forget to state the obvious and ask for the question to be repeated if you are unsure. While any interview is daunting, it is important to realise that the assessors will have reviewed your portfolio and consider it to be at the appropriate level. The assessors can recommend one of three outcomes:

1. Outcome 1: Applicant has demonstrated full equivalence and should be awarded the Certificate of Equivalence (STP).
2. Outcome 2: Applicant may be able to demonstrate equivalence, but further evidence is required.
3. Outcome 3: Applicant has not demonstrated equivalence.

Stage Four: Ratification and certification

All interview outcomes are ratified by the AHCS' Education and Training Committee before formal release. Confirmed outcomes are communicated to the applicant by email. If outcome 1 is awarded, the successful applicant can then apply to join the Clinical Scientist register held by HCPC. Once on

the register, registrants need to maintain a record of CPD to remain within their scope-of-practice. The HCPC review a percentage of all the members of the register on an annual basis. If outcome 2 is given, then specific feedback as to the gaps in knowledge are provided and there is then an opportunity to resubmit once the gaps have been filled.

Conclusion

Echocardiography has advanced considerably over the last few decades. To reflect the level of knowledge and degree of responsibility needed to practice echocardiography, the educational training programme for echocardiography is now taught at post-graduate level in all countries with developed health services. However, statutory regulation for those practising echocardiography is not currently mandatory within the UK, despite the level of responsibility and influence on patient care that echocardiographers hold. Statutory regulation of any medical or health care workforce is a crucial element in the patient protection system, particularly for professions in patient facing roles. By stipulating codes of conduct and expected practice, regulatory bodies maintain patient safety through oversight of registered individuals; to fall below the standards of expected practice risks removal from the register and the prevention to practice.

The advent of physiologist-led services has seen the development of senior physiologist roles to include responsibilities of devolved care from senior doctors. While the expansion of senior physiologist roles offers exciting opportunities for the future of the cardiac physiology workforce, the greater responsibility held by individuals in these roles must be recognised. Therefore, to ensure the safety of patients and to guarantee the future development of the workforce, statutory regulation is a necessary process for all non-medical professionals performing echocardiography.

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Declaration of interest

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the review.

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Table 1: recommended structure for AHCS Equivalence Portfolio	
Sections	Examples of evidence
Under-graduate study and pre-qualification training	Education and Training Skills acquired
Post-graduate study, training and responsibilities	Professional qualifications Further academic study Previous posts held
Current role	Clinical responsibilities Teaching and Education Management Course/conferences attended Research/Audit Service Development and Improvement