

CARDIAC PHYSIOLOGY WORKFORCE OPTIONS ANALYSIS

Executive Summary

- There is a major shortfall in the cardiac physiology workforce which threatens the ability to meet increasing demand and to delivery of 7 day working.
- Options are outlined in the document as to how this shortage might be overcome, with economic costings that take into account training and the health costs of a shortage of physiology staff.
- While no single option is likely to meet the shortage in a timely manner, recommendations are made that include improved workforce planning, foreign recruitment, increased admissions to the Practitioner Training programme and a need to support departments in delivering postgraduate training.

Introduction

The Strategic Review of Cardiac Physiology Services in England¹ recommended urgent action to address the shortfall in the current cardiac physiology workforce at all levels across the career framework. The Review emphasised that the current workforce is inadequate to meet existing demand, with marked variations in access and significant waiting lists, let alone meet the future challenge of delivering planned NHS changes including the introduction of 7-day services. This document outlines options to solve the workforce shortage in cardiac physiology and the potential costs involved, with the aim of promoting growth of the workforce while simultaneously ensuring continued quality appropriate to meet the complex current and future demands placed on modern cardiology services.

Key Drivers for Change

1) Existing Shortfall in Cardiac Physiology Workforce

There is a projected gap of 663 whole time equivalent (WTE) cardiac physiologists by 2018-9, a figure that includes locum, bank and agency staff.¹ These data are supported by the Healthcare Scientists Training Capacity survey from the Centre for Workforce Intelligence Report² that highlighted 78% of departments offering services in physiological sciences had difficulties recruiting qualified staff and that 8% of qualified staff posts were currently vacant. This shortfall will severely inhibit the ability of cardiac physiology services to meet the demands of 7-day working and makes it unlikely that the Seven Day Services Clinical Standards (February 2016)³

can be met. Clinical Standard 5, as it relates to cardiology, requires echocardiography to be available every day of the week, with urgent tests within 12 hours and non-urgent within 24 hours. In emergency cases, access to echocardiography would clinically be needed even more urgently.

2) Decline in Numbers Entering the Workforce

Despite the development of Modernising Scientific Careers⁴, the numbers entering the cardiac physiology workforce at a level able to deliver echocardiography and advanced cardiac rhythm management is insufficient to meet the current shortage or projected retirement of 20% of the workforce by 2020. The National School of Healthcare Science themed board report for Health Education England (HEE) has stated that only 27 posts will be available for training in cardiac science at Scientist Training Programme (STP) level in 2016.⁵ Compounding this has been a poor uptake in Clinical Scientist training at a departmental level due to a number of factors, including limited awareness. For example, in physiological sciences, 61% of departments offer training at Practitioner Training Programme (PTP) level but only 7% provide STP level training.² The limitation on the number of places that can be offered by HEE within the current accredited programs and the restricted ability to place students in departments for the 50 weeks required means that numbers entering the profession are not matched to those leaving. Moreover, not all who complete an accredited program end up working in an NHS cardiac physiology department, with losses to agencies, overseas employment and other sectors including industry. Workforce planning that matches those entering to those leaving is lacking.

3) Increasing Demand

There is increasing demand on cardiac physiology services, particularly in echocardiography, which has seen a 43% increase in commissioning over the last six years.⁶ Despite this increase, the use of echocardiography is currently 20% lower than in other European countries⁷ and its use is substantially lower than in the USA, where performance of transthoracic echocardiography (TTE) is associated with lower in-patient mortality across a range of common cardiovascular diseases.⁸ It is expected that demand for echocardiography will continue to grow significantly over time due to a number of factors. Firstly, an ageing population results in an increasing prevalence of heart failure and valvular heart disease⁹, the diagnosis of each is heavily reliant on echocardiography. Secondly, there are a number of new indications for echocardiography, such as the monitoring of cardio-toxic effects of new medications, for example Herceptin and other cancer treatment drugs.¹⁰ Thirdly, patients with congenital heart disease are living longer and require regular, lifelong follow-up with echocardiography.¹¹

Fourthly, an echocardiogram is increasingly seen to be an important investigation in the urgent assessment of patients presenting with acute breathlessness, those suspected of having acute cardiac events and in pre-operative risk assessment of patients undergoing non-cardiac surgical procedures.

For cardiac rhythm management, there is an increasing demand for device implantation with an aging population. Pacemaker implantation rates increases exponentially with age after 60 years. There is an increasing reliance on remote monitoring which has further resource implications. The British Cardiovascular Society Out-Of-Hours Cardiovascular Care: Management of Cardiac Emergencies and Hospital In-Patients review, which included the BHRS position statement on out of hours management of bradyarrhythmia emergencies, highlighted the need to provide 7/7 pacemaker implantation which requires appropriate physiologist support.¹²

Much of this increased demand is not funded, especially in echocardiography and device management, where no inpatient work receives payment and much is bundled with out-patient activity. For example, none of the out-patient echocardiography performed during an out-patient visit to cardiology is funded (the hospital is paid for the out-patient attendance and not the echocardiogram) if this is delivered as a one stop service, despite this being better for the patient than re-calling him or her on another day for the scan.

4) Variation in Supply

The current NHS Atlas of Variation (in press) indicates that there is a 39.5-fold difference in rates of echocardiography across the United Kingdom, with a significant widening in the range of variation since the previous report.¹³ This variation is unwarranted and is understood to reflect disparate organizational arrangements and performance. Eliminating this variation will require a significant increase in workforce, particularly in areas where it has previously been difficult to recruit and retain staff.

5) Dependency on Locum, Bank and Agency Staff

NHS Improvement has taken steps to limit payment to agency staff and encourage workers back into substantive roles.¹⁴ Despite this, the evidence is that this cap has not had a significant impact.¹⁵ The shortfall of 663 WTE cardiac physiology staff takes account of the numbers of locum, agency and bank staff that are currently employed to ensure that waiting times for routine echocardiography are kept below 6 weeks. Continued dependence on locum staff exposes NHS organisations to avoidable costs, yet a National Echocardiography Survey performed by Picker on behalf of the British Society of Echocardiography (BSE) data indicate that more than a third of departments have at least 50% staff from locum agencies.¹⁶ While the

workforce shortage remains so critical and pay rates for locum agencies are so attractive, any imposition of 7-day working (particularly if 24/7) risks a whole scale exodus from departments, with the possibility that the same individuals will have to be re-employed at double the cost.

6) Quality Agenda

There is a requirement from the Care Quality Commission to ensure that quality is placed at the centre of healthcare delivery. The NHS England 'Putting Patients First' plan includes a proposal to ensure that 70% of all scientific and diagnostic services are part of accreditation programs and demonstrate robust quality assurance measures.¹⁷ The ability to deliver a high quality service is hampered by a shortfall in the workforce, especially when combined with a dependence on transient locum, bank and agency staff. The ultimate aim for the British Cardiovascular Society (BCS) and Affiliated Societies is to ensure that the cardiac physiology workforce of the future can deliver the highest standards of quality assured services to all our patients in a sustainable and cost-efficient manner.

The following are sources that have already set out recommendations to facilitate change; however, there has been little action and no impact at the front door, within community and hospital services. A national strategy which is left to local implementation is simply not achieving the objectives outlined.

Strategic Review of Cardiac Physiology Services 2015

http://www.google.co.uk/url?url=http://www.bcs.com/documents/SRCPS_Final_Report_12052015_2.pdf&rct=j&frm=1&q=&esrc=s&sa=U&ved=0ahUKEwiwt-7VtPrMAhWJKsAKHVspBG8QFggUMAA&usg=AFQjCNFHpEulzN_JareqsZTTPTOGfEeZfw

Seven day services clinical standards update 2016

<https://www.google.co.uk/url?url=https://www.england.nhs.uk/ourwork/qual-clin-lead/7-day-week/&rct=j&frm=1&q=&esrc=s&sa=U&ved=0ahUKEwjG-4SgtfrMAhVkJMAKHUXPBhwQFggUMAA&usg=AFQjCNEBEGm7Y9mA6aMWMVQcGAb8r4QqCw>

A review of scientific services in the NHS in 2014-2015

<http://www.google.co.uk/url?url=http://www.nhs.uk/news-events/news/review-of-scientific-services-in-the-nhs-published.aspx&rct=j&frm=1&q=&esrc=s&sa=U&ved=0ahUKEwj1t5PItfrMAhXKCMaKHbKqBssQFggUMAA&usg=AFQjCNHPEynmuNw8ptL-VrskTZECGEteCA>

Solutions and Options

The BCS, BSE, Society for Cardiological Science & Technology (SCST) and the British Heart Rhythm Society (BHRS) have been working together to explore a variety of options to ensure that cardiac physiology departments can deliver high quality, sustainable services in the near future.

These collated options have been considered in parallel to the ongoing HEE's sonography options appraisal. They are designed to identify a vision for a national strategy to address the key challenges facing cardiac physiology workforce. These challenges include:

1. The shortage in the cardiac physiology workforce
2. The significant variation in the provision of cardiac physiology services across the UK
3. The limited availability of postgraduate training

An economic analysis has been performed to assess the budget impact of each option proposed so that an informed decision can be taken on the financial implications of inactivity versus implementation of the various options. The economic model assesses both the cost inputs required, including salary, cost of a Master of Science degree, cost of the Practitioner Training Programme and cost of locums to fill gaps in the workforce in addition to the expected cost offset. An analysis of Hospital Episodes Statistics (HES) data and the National Heart Failure Audit⁹ shows higher performing hospitals in NHS England (for percentage of echoes performed compared to lower performing hospitals for the percentage of echoes performed), had on average 38 fewer readmissions per hospital with a primary diagnosis heart failure. The model assumes that the more an option fills the gap (by percentage echoes performed) the more heart failure primary diagnosis hospital readmissions are avoided. The cost offset of these avoidable hospital readmissions is also included in this analysis to give a best estimate on the financial considerations for NHS England to evaluate. The Healthcare Resource Group (HRG) related income for hospital trusts has been excluded from the economic analysis.

These options are presented and costed as mutually exclusive but it may be that no single option will be feasible or affordable. The report ends with a series of recommendations that highlights potential combined approaches.

Option 1: Maintenance of Current State (Local Implementation of National Drivers)

Benefits

- Low initial investment but offset by high locum/agency costs

Risks

- Current failure to deliver an adequate workforce. There is no evidence that local implementation has made any difference to the documented shortages in the cardiac physiology workforce to date. In the NHSIQ Review of Scientific Services, 90.5% of departments do not deliver full 7-day services and 76.2% of respondents stated recruitment shortages as a major barrier to implementing change.¹⁸
- Future workforce planning (Horizon Scanning) that has recently taken place within the ultrasound workforce (Dr Ania Kosicka, Head of Workforce Programmes, formerly CfWI) is outlining plans to meet future numbers required in 2025 but is not able to take into account the existing shortage. Therefore, the inability to meet rising demand will continue.
- Existing provision is heavily dependent on locum and bank staff, with many requiring existing staff to perform waiting list initiatives to meet 6-week waiting targets for out-patient echocardiograms, before introduction of 7-day working. More than a third of departments are reliant on locum agency staff for more than half of their workforce, despite the huge costs involved.
- Locum agencies are draining experienced physiologists from NHS Departments. In echocardiography, with the rates currently offered by locum agencies, any physiologist could leave the NHS to work 37.5hrs and earn £75,000 for doing scans at 40 minute intervals with no other responsibilities. This is double the wage of a band 7 working full time in the NHS and means that the physiologist could earn his or her salary of £36,000 by actually working 14 hrs (7 per day on a Saturday and Sunday only) at the enhanced rate of £48/hr.
- Trusts will gradually and increasingly be forced to employ non-accredited and incompletely trained individuals to get increasing workload completed within the time frame demanded by Seven Day Service Standards. This reduction in high skilled service providers will adversely affect patient care, place increasing burden on existing trained staff, and may exacerbate the trend toward retirement.
- Trusts are employing biomedical science graduates to train in echocardiography and cardiac rhythm management in order to deliver the service requirements. Whilst this

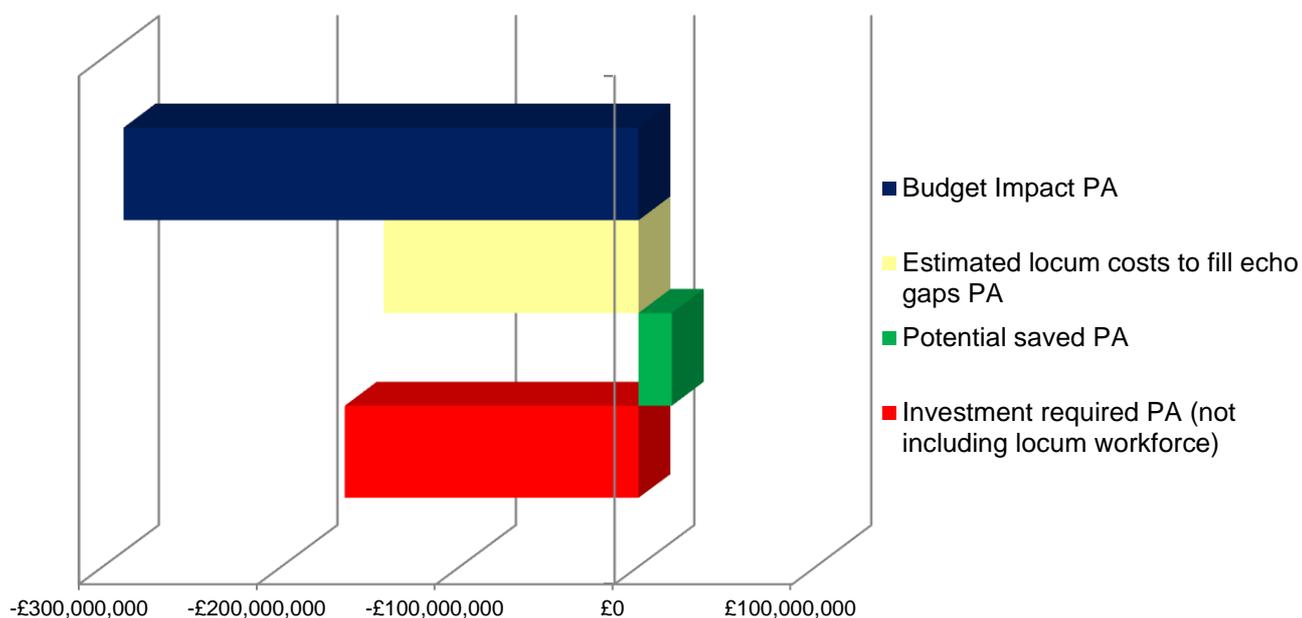
does provide a potentially skilled workforce, this is dependent on Trust finances, these individuals will be essentially supernumerary until they are trained and furthermore will only have specific skills in one field, rather than the more extensive training of an appropriately qualified cardiac physiologist.

- Maintaining the current shortage will risk the training of other disciplines in echocardiography, specifically failure to train future cardiologists, intensivists and emergency physicians who are increasingly dependent on echocardiography skills for completion of training. A major feedback from workforce surveys has been that time dedicated to training is under threat due to demands in delivery.

Economic Analysis

- The budget impact of option 1 is an estimated -£288.4 million per annum over 2016-2020. Although upfront costs are relatively low there is a significant financial implication of not investing to train sufficient numbers of cardiac physiologists to meet the current and future demand.
- In order to maintain the current 27 STP trainee posts per annum, an annual investment of £164 million is required.
- A shortfall of 5 million echocardiograms over the 5-year period (2016-2020) is predicted. As echo performance is related to primary diagnosis heart failure readmissions, an estimated 6,267 readmissions per annum (p.a.) could be avoided by maintaining this option leading to an estimated saving of £18.6 million p.a. If all echocardiograms performed were outside patient admitted episodes in hospital, additional income for NHS England hospital trusts combined with the savings in hospital readmissions leads to an estimated overall saving of £437.6 million p.a..
- Additional costs considered in this analysis include the cost of locum and bank staff, which is an inefficient use of NHS resource. Annual locum costs are estimated to be £142.5 million p.a.

Figure 1. The budget impact of option 1 (no change)



Option 2: Increase the Numbers Entering Scientific Training Programme

This option aims to meet the projected shortfall in workforce by significantly increasing entry to the Scientific Practitioner Training Programme. Physiologist exiting this training programme will be recognised as Clinical Scientists in line with the Modernising Scientific Careers (MSC) recommendations.

Benefits

- The output from MSC of Clinical Scientists is currently recognized as producing high calibre cardiac scientists who can have a positive impact in raising standards for all those departments that are engaged, enhancing the quality of care delivered to our patients.
- The benefits to patients of Clinical Scientists trained through MSC were outlined by HEE to include:⁴
 - Faster and improved access to diagnostic services
 - Leading edge training to deliver the latest advances in technology and research
 - More efficient services with fewer separate appointments
 - Flexible working and new advanced roles with opportunities for cost savings

Risks

- Cost: this requires a significant upfront investment. The expenditure in delivering Clinical Scientists is borne by HEE, as these individuals are funded throughout their training at postgraduate level, although are not able to contribute fully to the workload as they are in training.
- The cost of training for these individuals is provided by central HEE funding. Applications for direct entry to STP have been capped for two years running and only 27 posts have been opened for the September 2016 intake.⁵ In the current financial climate, it is felt unlikely that the number of STP posts will expand to meet the existing workforce shortage despite the popularity of this scheme (5,768 post-graduate applications received in 2016). The number currently entering the programme is too small to make up the workforce gap and the numbers applying through in-service application are also minimal.
- Departments have been slow to offer STP places for training, although there is now increasing demand for trainees (in 2016 there were more expressions of interest from Hospital trusts for trainees (STP) than the number of training placements granted). It is not clear that all Departments will have the capacity or ability to train STPs in the numbers need to fill the workforce gap.
- It is possible to become a Clinical Scientist either as a fully-funded or part-funded (central funding and shared local funding) post-graduate by direct entry. It is also possible however, for cardiac physiologists to become Clinical Scientists through the equivalence route by means of postgraduate education and work-based training. There are very few cardiac physiologists who currently are training in echocardiography and advanced cardiac rhythm management who seek or achieve equivalence. There are a number of reasons for this, not least that not all physiologists at band 7 level wish to do an MSc or pursue a career as a Scientist.

Economic Analysis

- In order to overcome the deficit in the workforce of 663 WTE physiologists, it is proposed to increase the number of STP places to 332 in year one, meaning that each Trust in the UK would need to take on two trainees, likely the maximum each could train. These STP trainees would not be ready to enter service for 3 years and would not be ready to meet the projected shortage in 2018-9.

- With an estimated 332 STP MSc places in year one, 166 places in year two and a further 166 places in year three, returning to the standard 27 places thereafter, this option requires significant upfront costs (an estimated additional £6.2 million p.a. for salaries of trained cardiac physiologists; £13.4 million extra invested into STP training p.a.).
- The budget impact of option 2 is an estimated -£274.4 million per annum over 2016-2020.
- Investing as outlined above into the STP training programme will lead to an additional 749 cardiac physiologists by 2020. This increase in workforce improves patient care which results in an estimated avoidance of 6,571 readmissions (p.a.) which could save NHS England £19 million (p.a.).

Table 1. The budget impact of option 2 versus no change (option 1)

		Number of STP MSc places (April 2016 - April 2020)	Number of CP posts filled (April 2016 - April 2020)	Investment required PA (not including locum workforce)	Potential saved PA	Estimated locum costs to fill echo gaps PA	Budget Impact PA
Option 1	No change	135	15442	£ 164 555 743	£ 18 663 507	£ 142 560 000	-£ 288 452 236
Option 2	Increase in STP places for MSc	718	16191	£ 189 110 361	£ 19 568 763	£ 104 641 875	-£ 274 183 473
Difference		583	749	£ 24 554 618	£ 905 256	-£ 37 918 125	£ 14 268 763

Option 3: Encourage Career Progression and Increase Accredited Specialist Scientific Practice

This option aims to increase the workforce through increased numbers of people going through the Practitioner Training Programme (PTP). Following graduation, they would undertake specialist training and seek relevant accreditation in echocardiography (eg BSE proficiency accreditation) or in heart rhythm management (eg BHRS certification). This is within the programme laid out in MSC and leads to Accredited Specialist Scientific Practice (ASSP).

Benefits

- Lower cost. Students entering the Practitioner Training Programme pay for their own place at University and for their own living cost (direct entry) or seek progression by personal development from positions as Healthcare Science Associates and Assistants. These individuals then enter the workforce and are performing paid work within departments. Accredited voluntary registration is available to deliver accreditation in

echocardiography (BSE) and advanced rhythm management (BHRS) through training in the workplace. This has the advantage of lower cost than STP training, while the potential pool of those who can develop is larger.

- This option retains the structure of MSC, although places greater reliance on support for physiologists progressing from Practitioner Training Programmes and will require an expansion in the number of PTPs. In particular, there has to be support from Trusts and departments for post graduate education and training that can deliver echocardiographers and advanced rhythm management specialists.

Risks

- Current failure to deliver an adequate workforce. Similar to option 1, most departments already try to maintain their own workforce in echocardiography and rhythm management services by training their own PTPs before appointing to higher banding. Without a real increase in numbers entering at PTP level aimed to make up the shortfall, as well as encouragement to progress with postgraduate training, the current shortfall will persist.
- Delay. There will be a delay from encouraging these individuals into PTP courses and then into further training before staff are available to perform echocardiography and advanced cardiac rhythm management. There is no fast-track option in training.
- Failure to deliver the modern, pluripotential workforce of MSC. This approach stays within the letter of MSC but not within the spirit. Just as in option 2, not all band 7 physiologists wish to do an MSc or seek equivalence, there is no guarantee that all PTPs will wish to pursue postgraduate training or follow a path through to being a Clinical Scientist.
- Additional educational requirements. To deliver the number of ASSPs needed, it is likely that not all training could be provided within departments and expansion of external postgraduate education may be needed. For example, courses which have an emphasis on cardiac ultrasound may be needed along the lines of the advanced scientific/accredited practice modules that could be used toward an MSc on a modular basis. Few Higher Education Institutes are currently delivering such programmes.
- Even with career progression, particularly with University-based MSc programs, individuals still need to be trained in the practical skill and to build experience. One limitation that applies to both increasing STP and PTP numbers is that many centres feel they are 'too busy to train.'

Economic Analysis

- There are no additional STP places for option 3 but there is the additional investment required for PTP posts. No additional funding is required for the PTP training, since this is funded by the student but once appointed and training to ASSP level, there will be both salary implications and also income generation.
- An additional 332 PTP posts in year 1, 166 for year 2 and 3 are required as in option 2. An on-line postgraduate course could be developed with course fees of approximately £3,000, resulting in an investment of £398,400 p.a. for those who were selected or wished to train to Clinical Scientist level. This reflects the cost of the NHS part of the training which is set at £3000, while of course PTP undergraduate courses are funded by the students themselves. PTP students are not salaried, as they are university students who apply for paid posts once they have their degree but there is then the cost of an estimated £3.7 million additional investment p.a. for the salaries of the PTPs and other cardiac physiologists while training in advanced practice such as echocardiography.
- The budget impact of option 3 is an estimated £-269.5 million per annum over 2016-2020. £18.8 million less PA compared to no change.
- Investing in the PTP instead of additional places on the STP MSc will lead to an additional 830 cardiac physiologists by 2020. Compared to option 1.
- This increase in workforce improves patient care which results in an estimated avoidance of 6,604 readmissions (p.a.) which could save NHS England £19.6 million (p.a.).

Table 2. The budget impact of option 3 versus no change (option 1)

		Number of STP MSc places (April 2016 - April 2020)	Number of CP posts filled (April 2016 - April 2020)	Investment required PA (not including locum workforce)	Potential saved PA	Estimated locum costs to fill echo gaps PA	Budget Impact PA
Option 1	No change	135	15442	£ 164 555 743	£ 18 663 507	£ 142 560 000	-£ 288 452 236
Option 3	places for MSc, supplement with workforce with PTP	135	16272	£ 188 694 392	£ 19 666 661	£ 100 541 250	-£ 269 568 981
Difference		0	830	£ 24 138 650	£ 1 003 154	-£ 42 018 750	£ 18 883 255

Option 4: Limit Clinical Scientists to 'Lead Roles' and Employ Individuals with Limited Training to Produce 'Target Work'

In this Option there would be a limited number of Clinical Scientists who would work only in lead or supervisory roles. There would be employment of cardiac physiologists (band 5 or lower) who would perform target or simple procedures that would then be reported or checked.

Benefits

- Cost. STPs are paid at band 6 level during training for 3 years from central funds while other individuals could do work at lower bands that then would need to be co-reported.

Risks

- This by-passes the work laid out in Modernising Scientific Careers in bringing a highly skilled, university-educated workforce for the delivery of cardiac physiology services in the future.
- Whether individuals recruited into the lower bands came through the PTP scheme or through apprenticeship schemes (see below), these personnel will still require training in the limited procedures within cardiac rhythm management or echocardiography.
- Echocardiography in particular, is an operator-dependent skill with each scan modified to the patient and diagnosis in question. Much relies on the ability of the operator to change protocols and scanning in response to different findings, then understanding the significance and reporting. Limiting the skills of the operator to collecting images will impair the diagnostic capability of the echocardiogram and will result in a significant risk of re-call or missed diagnoses.
- Similarly, cardiac implantable electronic device (CIED) follow up also requires the physiologist to tailor the programming of the device to the individual patient. This can be complex in patients with ventricular arrhythmias, requiring expert knowledge of pacing and shock algorithms, which can be potentially life-saving.

Economic Analysis

- There is a small increase in the number of STP MSc places for option 4, the additional investment required is an estimated £6.2 million p.a.
- 54 STP posts per year, equivalent to an investment of £3.1 million p.a. in course fees compared to option 1 (no change).

- An estimated £13.2 million additional investment pa. for the salaries of both the additional cardiac physiologists graduating from the STP and band 5 physiologists. An additional 662 band 5 physiologist positions are estimated to be required by 2018.
- The budget impact of option 4 is an estimated £-304 million per annum over 2016-2020. Which is less cost effective than doing nothing as option 4 is estimated to cost approximately £16.2 million p.a. more.
- Somewhat limited investment in additional places on the STP MSc compared to option 1 (no change) will lead to an additional 81 cardiac physiologists by 2020.
- This modest increase in workforce improves patient care which results in an estimated avoidance of 6,300 readmissions (p.a.) which could save NHS England £18.7 million (pa.).

Table 3. The budget impact of option 4 versus no change (option 1)

		Number of STP MSc places (April 2016 - April 2020)	Number of CP posts filled (April 2016 - April 2020)	Investment required PA (not including locum workforce)	Potential saved PA	Estimated locum costs to fill echo gaps PA	Budget Impact PA
Option 1	No change	135	15442	£ 164 555 743	£ 18 663 507	£ 142 560 000	-£ 288 452 236
Option 4	Limit STP to 'lead roles' supplement with band 5 physiologists	270	15523	£ 185 040 937	£ 18 761 405	£ 138 459 375	-£ 304 738 907
Difference		135	81	£ 20 485 195	£ 97 898	-£ 4 100 625	-£ 16 286 671

Apprentice Models

One long-term option that has not been included in option 3 and option 4 and which is difficult to cost, is the prospect of apprentice programmes leading to PTP equivalent physiologists. While this may be an alternative route to increase PTP numbers that is not university-based, this has the same issues in terms of time taken for these individuals to complete the apprenticeship and still require further time and training before staff are available to perform echocardiography and advanced cardiac rhythm management. Moreover, these models are not yet active and it is not known whether they could deliver the scale of increase needed within the workforce.

Option 5: Seek Skilled Operators Trained Abroad

Benefits

- Avoids cost of training
- Immediacy in solution

Risks

- The pool of well-trained physiologists has been mined previously, specifically from the Philippines, Portugal and India in relation to echocardiography. While there may still be a residual workforce to mine, this does not offer a long-term solution to the shortfall.
- Although many recruited to the UK already have proven skill, this is not universal and some do not deliver the expected standard or require significant additional training.
- Ethical and social concern, together with political issues relating to immigration.
- This short-term solution does not offer a solution to the on-going issues in the number of trainees within physiology, let alone provide options for replacing the numbers expected to retire from the profession by 2020.
- Overseas skilled operators may have a preference for working in specific areas of the country, eg London, and it may be difficult to ensure an even distribution or recruitment to those areas where need is greatest. Moreover, there is no guarantee these individuals will stay and form a long-term section of the workforce.

Economic Analysis

- There are no additional costs of training for either STP or PTP posts applied for option 5. The gap in the workforce is filled by skilled cardiac physiologists trained abroad.
- An estimated 260 new cardiac physiologists, are included in this cost analysis for year 1, and an additional 100 posts from year 2 to year 5.
- An estimated £29.2 million additional investment PA for the salaries of the additional cardiac physiologists coming from abroad.
- The budget impact of option 4 is an estimated £232.2 million p.a. over 2016-2020, an estimated £55.1 million p.a. less compared to option 1 (no change).
- This significant increase in workforce from abroad could deliver an estimated avoidance of 6,986 readmissions (p.a.) which could save NHS England £20.8 million (p.a.).
- Additional costs not considered in this analysis include the cost of recruiting and travel to incentivise already trained cardiac physiologists to relocate to England. This is likely to be of great expense to the NHS. With no guarantee the workforce will stay to fill the gap on the workforce beyond their contractual obligations.

Table 4. The budget impact of option 5 versus no change (option 1).

		Number of STP MSc places (April 2016 - April 2020)	Number of CP posts filled (April 2016 - April 2020)	Investment required PA (not including locum workforce)	Potential saved PA	Estimated locum costs to fill echo gaps PA	Budget Impact PA
Option 1	No change	135	15442	£ 164 555 743	£ 18 663 507	£ 142 560 000	-£ 288 452 236
Option 5	Seek skilled cardiac physiologists trained abroad	135	17742	£ 201 207 969	£ 20 805 181	£ 52 852 500	-£ 233 255 288
Difference		0	2300	£ 36 652 226	£ 2 141 674	-£ 89 707 500	£ 55 196 948

Table 5: Overall Budget Impact

		Number of STP MSc places (April 2016 - April 2020)	Number of CP posts filled (April 2016 - April 2020)	Investment required PA (not including locum workforce)	Potential saved PA	Estimated locum costs to fill echo gaps PA	Budget Impact PA
Option 1	No change	135	15442	£ 164,555,743	£ 18,663,507	£ 142,560,000	-£ 288,452,236
Option 2	Increase in STP places for MSc	718	16191	£ 189,110,361	£ 19,568,763	£ 104,641,875	-£ 274,183,473
Option 3	No increase in STP places, supplement with PTP	135	16272	£ 188,694,392	£ 19,666,661	£ 100,541,250	-£ 269,568,981
Option 4	Limit STP to 'lead roles' supplement with band 5 physiologists	270	15523	£ 185,040,937	£ 18,761,405	£ 138,459,375	-£ 304,738,907
Option 5	Seek skilled cardiac physiologists trained abroad	135	17742	£ 201,207,969	£ 20,805,181	£ 52,852,500	-£ 233,255,288

Table 6: Estimated Deficiency in Number of Echocardiograms According to Options.

		Estimated number of lives saved per 100 MI hospital admissions	Estimated gap in number of echos required
Option 1	No change	22	5702400
Option 2	Increase in STP places for MSc	23	4185675
Option 3	No increase in STP places, supplement with PTP	23	4021650
Option 4	Limit STP to 'lead roles' supplement with band 5 physiologists	22	5538375
Option 5	Seek skilled cardiac physiologists trained abroad	25	2114100

See Appendix 2 for Summary Plot

Recommendations to NHS England

It is likely that no single option will be fully successful in the time available and it is our view that a number of these options will be needed to overcome this issue. Combining these options may require further study and costing (see Figure 1 Analysis Results in appended Excel spreadsheet for overall economic analysis of options).

After reviewing the various options the BCS and Affiliated Societies make the following recommendations on the grounds of clinical safety, service delivery (especially 7 day services) and cost effectiveness. These suggestions and the need for a solution are widely supported:

1. **Workforce Planning.** There should be a clear method for calculating the number of cardiac physiologists working in the UK, with clarity on sub-specialisation, such that numbers can be tracked and workforce planning can be carried out without reliance on surveys which have variable response rates and accuracy. This work should be carried out regularly by NHS IC.
2. **National Shortage Occupation List.** Cardiac Practitioners, Cardiac Clinical Scientists, echocardiographers and cardiac rhythm management physiologists should be placed on the National Shortage Occupation list to enhance recruitment from abroad as an immediate response.
3. **International Recruitment.** There should be positive moves to encourage recruitment of trained physiologists from abroad, which provides a cost-effective, short-term solution to the current shortage in physiologists.
4. **Restrict Agency Employment.** The movement of current NHS staff into locum agencies is costing the ability of the NHS to provide 7-day working and meet waiting targets. While the DH is not able to restrict working practices, an active and effective limitation should be placed on the ability of NHS Trusts to pay agency staff.
5. **Option 3 is the next most cost-effective model after recruitment abroad and meets the planned objectives of MSC, while delivering a real improvement in the numbers of trained physiologists by 2020.** The gap in time before these trainees become effective echocardiographers, for example, has to be met in the short-term by foreign recruitment or an increase in STP numbers, who will reach scientist status by 3 years. In order to help bridge the gap, it is recommended there should be an increase in fully-funded and part-funded entry to the STP programme sufficient to deliver at least one STP trainee to each of the 165 Trusts identifiable from the DM01 Diagnostic Data Return. Moreover, departments must be encouraged to take on STPs and investment will be needed as outlined below to deliver an infrastructure for training.

6. Option 3 needs to be supported by the encouragement of post graduate courses that can allow an increase in the numbers applying for accreditation, advanced practice, and skills.
7. There should be encouragement for each Commissioning Group across the UK to invest in trainers within departments to support quality training placements. The aim would be to support PTPs and others into Accredited Specialist Scientific Practice, using existing voluntary accreditation processes, with the support of additional academic programme support. This should extend beyond the public sector and include all private providers, for example private echocardiography services, who recruit from the NHS without training. SCST have recommended that 0.1WTE of an experienced devices or imaging cardiac physiologist should be funded to support each PTP and STP trainee. Tariff should be set for procedures such as echocardiography and CIED follow up to encourage this commissioning.
8. Improved advertising and an engagement exercise led by HEE for NHS departments to become more involved with the STP and PTP process.

References

1. Simpson IA, S..... Strategic Review of Cardiac Physiology Services. 2015.
2. CfWI. Centre for Workforce Intelligence Healthcare Scientists Training Capacity Survey. 2015.
3. IQ N. Seven Day Services Clinical Standards. 2016.
4. DH. An Overview of Modernising Scientific Careers. 2010.
5. Ayers LK, M. National School of Healthcare Science (NSHCS) National Recruitment 2016. Themed Board report for June 2016. 2016.
6. NHEngland. Summary: Waiting times and activity for diagnostic tests. 2016.
7. Cleland JGF, Swedberg K, Follath F, et al. The EuroHeart Failure survey programme—a survey on the quality of care among patients with heart failure in Europe. Part 1: patient characteristics and diagnosis 2003;24:442-63.
8. Papolos A, Narula J, Bavishi C, Chaudhry FA, Sengupta PP. U.S. Hospital Use of Echocardiography Insights From the Nationwide Inpatient Sample. Journal of the American College of Cardiology 2016;67:502-11.
9. NICOR. National Heart Failure Audit. 2015.
10. Plana JC, Galderisi M, Barac A, et al. Expert consensus for multimodality imaging evaluation of adult patients during and after cancer therapy: a report from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. European Heart Journal - Cardiovascular Imaging 2014;15:1063-93.
11. Baumgartner H, Bonhoeffer P, De Groot NMS, et al. ESC Guidelines for the management of grown-up congenital heart disease (new version 2010). The Task Force on the Management of Grown-up Congenital Heart Disease of the European Society of Cardiology (ESC) 2010;31:2915-57.
12. BCS. Report on Out-of-Hours Cardiovascular Care: Management of Cardiac Emergencies and Hospital In-patients. 2016.
13. RightCare.NHS.UK. Atlas of Variation in Diagnostic Services. 2016;MAP 24.
14. NHSImprovement M. Rules for all agency staff working in the NHS. 2015.
15. Dunn P. What has the impact been of recent caps on NHS agency staff spend? 2016.
16. Mossman K. National Echocardiography Survey. 2015.
17. NHS-Commissioning-Board. Everyone Counts. 2013.
18. Gillham S, Smith R. A Review of Scientific Services in the NHS 2014-15. 2015.

TWO APPENDICES:

1. LETTER FROM BCS, BSE, BHRS, SCST

2. SUMMARY PLOT OF ECONOMIC ANALYSIS