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In-depth review of the anaesthetics and intensive care medicine workforce

Final report



February 2015

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Executive summary

The Centre for Workforce Intelligence (CfWI) was commissioned by the Department of Health (DH) and Health Education England (HEE) to conduct an in-depth review of the anaesthetics and intensive care medicine (ICM) workforce in England. The review focused on fully trained anaesthetists and ICM specialists, known as intensivists, who hold a certificate of completion of training ('CCT holders'), and typically are employed as consultants.

The CfWI looked ahead 20 years to 2033, to assess whether under four different scenarios there is likely to be a balance between patient demand and workforce supply. The CfWI's projections – which were formulated with representative stakeholder engagement – show that under each extreme but plausible scenario considered patient demand could outstrip workforce supply.

Therefore, the CfWI has presented a series of suggested measures for commissioners to consider that could help to bring patient demand and workforce supply into balance in the future.

The key benefits of this work are to:

- support longer-term workforce planning on issues relating to this workforce, up to 2033
- support robust decision-making, taking into account the uncertainties of the future
- help raise awareness amongst decision-makers of potential emerging risks facing this workforce as the future unfolds.

Key CfWI modelling results for anaesthetics and ICM (A&ICM) demand and supply

The CfWI was commissioned to determine the supply of CCT holders required to provide the same level of service per capita as today. With this in mind, the CfWI has provided the following projections:

Forecasting the future demand for CCT holders in the A&ICM service

Baseline demand – which is based on population growth and demographic changes alone – is projected to **increase by 25 per cent**. This means CfWI modelling projects the number of anaesthetist and intensivist CCT holders in A&ICM would need to rise from approximately 6,100 to approximately 7,600 full time equivalent (FTE) from 2013 to 2033.

Through our stakeholder consultation, the CfWI has determined that demand is expected to grow in all four plausible scenarios faster than 'baseline' demand. **This means demand is likely to be higher than our baseline demand projection under the political and financial conditions considered through our scenario planning process (see Annex C).**

The 'principal demand projection' – which is the 'expected' or 'most likely' future demand scenario in the eyes of our stakeholders – shows a potential increase of 4.7 per cent annually. This would see the number of anaesthetist and intensivist CCT holders needed rising as high as 11,800 FTE in 2033.

Forecasting the future supply of CCT holders available to the anaesthetics and ICM service

Baseline supply – which is based on current conditions with no changes to key modelling assumptions – is projected to **increase by 31 per cent**. This means CfWI modelling projects the number of anaesthetist and

intensivist CCT holders in A&ICM will rise from approximately 6,100 to approximately 8,000 FTE from 2013 to 2033. The principal supply projection is close to the baseline supply projection.

The range of scenario projections for supply is narrower than the range for demand, as the impact of uncertain variables is smaller.

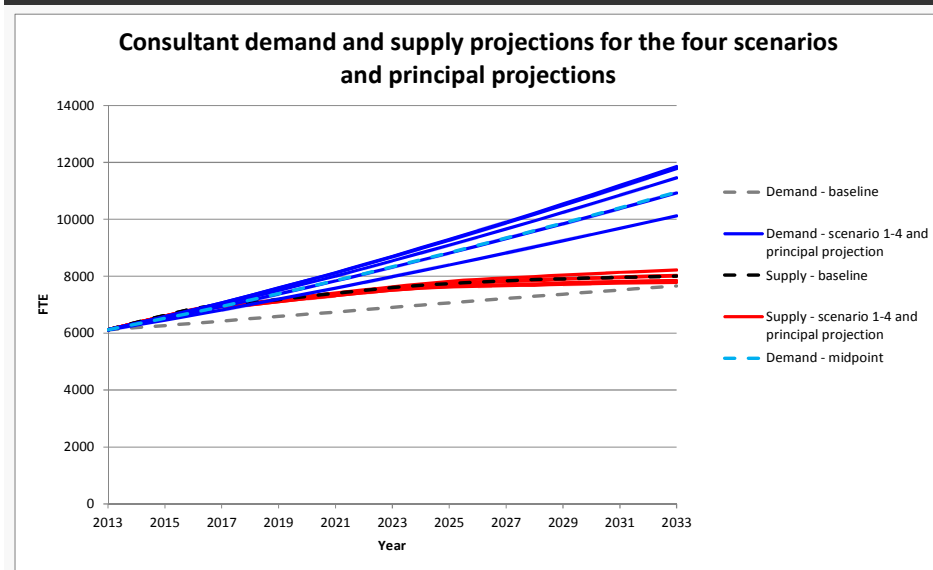
Forecasting the future demand vs. supply for CCT holders in the anaesthetics and ICM service

Figure 1 shows **baseline supply is projected to increase by 31 per cent while baseline demand alone will increase by 25 per cent.**

The projection of baseline demand is also exceeded by the principal supply projection and the potential outcomes of all four plausible future scenarios. This suggests there would be sufficient workforce supply to meet the demand resulting solely from the growing, ageing population. However, it is likely that additional factors will further increase demand. Once these other factors (particularly rising average individual need(s)) are incorporated, we see demand exceed supply. This means in each of the four scenarios there would be a risk of a shortage of anaesthetist and intensivist CCT holders. There could also be an impact on other specialties that rely on service input from anaesthetists.

Figure 1: Demand and supply projections for CCT holders for the anaesthetics and ICM service

Demand scenarios outstrip supply scenarios for the combined A&ICM workforce.



Source: CfWI model of the anaesthetist and ICM workforce for England

Many anaesthetists and intensivists are trained in – and provide service in – both specialties. The proportion of time spent working in each specialty is unclear from the data available. However, our modelling results indicate that there is inherent flexibility in the national workforce available to deliver these services. We recognise that at a local level there may not be the same flexibility.

CfWI proposals and next steps

Based on the findings of this workforce review, the CfWI suggests that the following proposals could be considered to help balance patient demand and workforce supply in the future:

The CfWI suggests that HEE consider continuing to fill the current number of higher specialty trainee (ST3) posts for anaesthetists and intensivists in England to minimise the risk of short-term undersupply.

There is a growing supply of CCT holders but it is possible – as indicated in our ‘principal’ and scenario-specific projections – demand will increase faster than supply. This could result in an undersupply of anaesthetist and intensivist CCT holders in the medium term, and a potential need to increase ST3 posts following a further review in the next two to three years. The contribution to ICM by anaesthetists should be monitored. If the level of service contributed to ICM by anaesthetists decreases, it is likely that ICM will be undersupplied and require an increase in training numbers.

We are also suggesting that HEE may wish to support the flexibility required to meet the needs of the future workforce by training an appropriate mix of specialists with single and dual CCTs, particularly noting that the future ICM service is likely to be delivered mostly by intensivists with dual CCTs. It is important that the proportions **between** specialties are kept as steady as possible. We recognise that it is likely regional requirements for anaesthetists and intensivists will vary; however, it is important that ICM training posts are not provided at the expense of anaesthetics training posts.

The CfWI suggests that a workforce stocktake of anaesthetics and ICM be undertaken in two to three years’ time.

Further workforce reviews could be undertaken in the next two to three years as the ICM specialty grows, due to the complex nature and flexibility of service delivery between the anaesthetics and ICM specialties.

The CfWI proposes that HEE consider looking at working with commissioners and the relevant specialties and professions, and consider ways in which changes to the clinical skill mix might help manage the increasing perioperative role.

Anaesthetists are becoming more involved in the pre- and postoperative care of patients as well as intraoperative care. One option to manage the increasing perioperative role would be to train more physician associates/assistants - anaesthesia (PA(A)s) and advanced critical care practitioners (ACCPs) while there is a plentiful supply of CCT holders, so that they have the opportunity to learn as well as deliver service, with a focus on complex decision-making. These staff groups would then have experience to support doctors if demand increases above projected baseline demand under conditions similar to the modelled scenarios.

There is a case for undertaking further research into the required number and dependency level of intensive care unit (ICU) beds in order to more accurately forecast demand.

The impact of the *Shape of Training* report (Greenaway, 2013) on the training pathways for anaesthetics and ICM is so far unknown. This, along with other inevitable uncertainties in the modelling over the medium term,

Commented [MW1]: We refer to this group further in the report as Physicians’ Assistants (Anaesthesia) with the abbreviation PA(A)s. Can this be updated?

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emphasises the importance of regularly (at least every three years) reviewing the real-time data and matching these against the projections in this report.

Finally, the CfWI would like to thank the many anaesthetists, intensivists, other health professionals, professional bodies, employers, patients and the public who made a contribution to this workforce review.

The CfWI welcomes all responses to this report. Comments can be submitted on our website and the project team can be contacted at: medical@cfwi.org.uk

1. Introduction

1.1 Why this review?

Health Education England (HEE) and the Department of Health (DH) have jointly commissioned the Centre for Workforce Intelligence (CfWI) to conduct an in-depth review of the hospital-based anaesthetics and intensive care medicine (ICM) workforce in England.

Rather than attempt to predict a single future, the CfWI has developed a scenario-based approach for workforce in-depth reviews that recognises the complexity of factors influencing demand and supply and the intrinsic uncertainty of the future.

The key benefits of this work are to:

- support longer-term workforce planning on issues relating to this workforce, up to 2033
- support robust decision-making, taking into account the uncertainties of the future
- help raise awareness among decision-makers of potential emerging risks facing this workforce as the future unfolds.

1.1.1 Objectives

This review:

- identifies key drivers of demand and supply for anaesthetics and ICM (A&ICM), focusing on high-impact, high-uncertainty drivers that may impact in the next 20 years
- models current and forecast demand and supply for A&ICM from 2013 to 2033
- reviews workforce capacity and workload issues
- considers different service delivery models/patient pathways and their workforce implications
- considers the interactions and overlap between A&ICM
- makes suggestions for workforce planning, including training numbers.

1.1.2 Project outcomes

This review:

- aims to reduce the risk of future A&ICM specialist oversupply or undersupply in England
- provides a long-term view of demand and supply factors impacting the A&ICM workforce, to support planning for HEE, all English medical schools and deaneries, and local education and training boards (LETBs).

1.2 Our methodology

To forecast and analyse future patient demand and workforce supply for the anaesthetics and ICM workforces – looking ahead to 2033 – we used our robust workforce planning framework detailed in figure 2. Our scenario-based approach (see Annex C) involves:

- horizon scanning
- scenario generation
- workforce modelling
- policy analysis.

Figure 2: The CfWI workforce planning approach



Source: CfWI

1.2.1 Horizon scanning

Horizon scanning is the exploration of potential challenges, opportunities, and likely future developments. Our horizon scanning vision at the CfWI is to generate high-quality intelligence to inform long-term workforce planning which meet the needs of patients and people who use health and social care services.

Horizon scanning is the first stage of the CfWI's robust workforce planning framework. The output from horizon scanning is used to inform the scenario generation stage, where plausible future scenarios are created to inform strategic planning.

For specific drivers identified in the horizon scanning phase of this work, please see: www.horizonscanning.org.uk/.

1.2.2 Scenario generation

Scenarios are narratives about how the future might evolve; they are generated through facilitated workshops. Scenarios are essential for workforce planning, since it is not possible to predict the long-term future precisely. Workshops can generate a range of plausible futures from which demand and supply projections can be made. Workforce plans and policies can then be assessed against the scenarios' robustness. Following the scenario generation, the narratives are then quantified.

1.2.3 Delphi panel exercise

A Delphi panel exercise involving expert stakeholders is used to quantify key future uncertainties such as changing patient need and changing work patterns of doctors.

Participants who are experts in the field in question are given the scenarios generated in the facilitated workshops. They are then asked to make quantitative judgements about questions based on the scenarios. For example, 'By 2033 how will individual patient need for anaesthetist time change, on average, relative to today?', and they are asked to provide their reasoning behind their decisions as free text.

Answers are compiled and then circulated to the participants, who then have the opportunity to revise their answers based on other participants' rationales. The Delphi process is then repeated, allowing for further revision of their answers. The goal is to reduce the range in answers and get a level of expert consensus which is used to inform the system dynamics modelling.

1.2.4 System dynamics modelling

Central to the CfWI's robust workforce planning framework are workforce models developed using the system dynamics (SD) method that calculate workforce demand and supply. We use SD modelling as it is most appropriate for complex systems, such as for health and social care workforce planning.

The benefits of having a formalised approach to workforce model development include models that are more accurately designed, easier to use, more focused and more efficient. Applying a rigorous formal approach also results in increased stakeholder confidence in the outputs from workforce and data modelling.

The approach is composed of four steps: model scoping, model construction, model documentation and model testing. Each stage is described in detail in a CfWI technical report series,¹ supported by best practice guidance.

1.2.5 System dynamics CfWI modelling definitions

Our modelling produced 'baseline', 'principal' and scenario-specific projections of workforce supply and patient demand for the ICM workforces over 20 years to 2033. These projections, along with other evidence and intelligence, helped us determine whether there is a sufficient supply of CCT holders to provide the same level of service per capita as today, and to understand whether workforce supply is in line with expected demand. It is important to understand the difference between our various projections:

¹ <http://www.cfwi.org.uk/our-work/research-development/cfwi-technical-paper-series>

The **‘baseline demand projection’** represents demand based on population growth and demographic changes such as the ageing of the population.

The **‘principal demand projection’** represents the ‘expected’ or ‘most likely’ future according to our expert Delphi panel. It builds on the ‘baseline’ (defined above) by including the expected change in average individual need plus the impact of changes in productivity.

The **‘baseline supply projection’** represents supply based on current training numbers and workforce behaviour, with no changes to key modelling assumptions.

The **‘principal supply projection’** represents the ‘expected’ or ‘most likely’ future according to our expert Delphi panel. It builds on the ‘baseline’ (defined above) by including expected changes to key variables such as part-time working and the average retirement age.

The **‘scenario projections’** represent demand and supply under a range of four plausible but challenging scenarios as identified in the scenario generation workshop and quantified by our expert Delphi panel.

For more detailed reports on the methodology used by the CfWI, refer to the technical papers series found at: www.cfwl.org.uk/our-work/research-development/cfwl-technical-paper-series.

2. Context

2.1 About the workforce

2.1.1 Anaesthetics, ICM and pain management roles

Anaesthetics is the largest hospital-based medical specialty, with anaesthetists applying their skills across many aspects of patient care. Perioperative anaesthetic care of surgical patients forms the core of an anaesthetist's work, which can range from simple procedures to complex surgery in patients of all ages, including premature babies. In addition, anaesthetists may also be involved in the preoperative preparation of surgical patients, the provision of sedation and anaesthesia in procedures taking place outside the operating theatre, resuscitation and stabilisation of emergency/acute ill patients, pre-hospital emergency care, transport of acutely ill and injured patients, intensive care medicine, obstetric anaesthesia and pain relief in labour, and pain medicine (RCOA, 2013a).

Pain medicine includes postoperative pain relief, acute pain management and management of chronic disease and cancer-related pain (RCOA, 2013a). Anaesthetists can undertake specific training to become a specialist in pain medicine, which usually results in obtaining Fellowship of the Faculty of Pain Medicine of the Royal College of Anaesthetists (FFPMRCA) (RCOA, 2013b).

Consultants grouped under anaesthetics in the published Health and Social Care Information Centre (HSCIC) data (including those working in ICM) account for 16 per cent of the total NHS consultant workforce on a full-time equivalent (FTE) basis in England. The consultant workforce FTE in this broad anaesthetics group has grown substantially during the last decade, up by 54 per cent from 2003 to 2013 (HSCIC, 2014).

ICM focuses on the care of critically ill patients and those requiring high-dependency care in surgical, medical and trauma settings (NHS Medical Careers, 2013a).

Training in ICM was traditionally undertaken as part of a joint CCT programme with another specialty, usually anaesthetics. However, from 2012, the training pathway for ICM changed so that trainees could choose whether to work towards a dual CCT or opt for a single CCT in ICM. The single CCT ICM training pathway takes seven years to complete, so new ICM-only trainees will start gaining their CCTs from 2017 onwards, having started at ST3 in 2012 (FICM, 2012a). A survey of recruits to ICM specialty training posts in 2012 to 2013 showed that 7 per cent of recruits intended to undertake a single CCT in ICM, and 72 per cent of recruits intended to undertake a dual CCT with anaesthetics (FICM 2013a). The remainder of recruits intended to undertake a dual CCT with medicine or emergency medicine.

2.1.2 Training pathways

Several specialties contribute to the provision of anaesthetics and ICM. Our supply forecasts combine the contributions of the following CCT holder categories to the delivery of anaesthetics and ICM services:

- Anaesthetics:
 - anaesthetists (single CCT holders² only)
 - anaesthetists dual with ICM (dual CCT holders only).
- ICM:
 - intensivists (single CCT holders only, of which there are currently few)
 - intensivists dual with anaesthetics (dual CCT holders only)
 - intensivists dual with another specialty (dual CCT holders only excluding anaesthetics). Note that the specialty most commonly linked with ICM for a dual CCT – excluding anaesthetics – is acute medicine. The CfWI is currently working on a separate in-depth review of the acute medical care workforce.
 - anaesthetists (single CCT holders only).

Anaesthetists and intensivists may also undertake additional training in paediatric intensive care medicine (PICM). This is a small group of people but it has been suggested that they may be in demand in the future (RCoA, 2013c).

2.1.3 Multidisciplinary teams

Anaesthetists work in multidisciplinary teams. A consultant anaesthetist leads the team in the preoperative assessment clinic, which includes nurses, operating department practitioners (ODPs) and other trained staff including physician associate (anaesthetists)s. PA(A)s fulfil an additional role that was created, relatively recently, for skill mix and efficiency. PA(A)s must be supervised by an anaesthetist at all times (AAGBI, 2012; RCoA, 2011a). PA(A)s provide services across all aspects of general anaesthesia delivery, providing regional and local anaesthesia in some organisations. PA(A)s can also be used in preoperative assessment, exercise testing, provision of sedation to patients under the care of other specialists, and cardiac arrest teams. PA(A)s typically work at a ratio of one consultant anaesthetist to two PA(A)s (RCoA, 2013d).

In the anaesthetic room, the anaesthetist works with a trained assistant and sometimes a third member of staff to assist with more difficult situations such as emergencies and complex cases such as obese patients or operations where the patient has to be placed in a position that makes giving and supervising an anaesthetic more challenging. These trained assistants would usually be either an operating department practitioner or a suitably trained nurse (AAGBI, 2012).

After operations have been completed, anaesthetists work closely with surgeons while patients recover from surgery and anaesthesia (AAGBI, 2012). Advanced Critical Care Practitioners (ACCPs) also play an important role in intensive care units (ICUs) as part of the team, carrying out a variety of tasks including endotracheal intubation. ACCPs require direct supervision by someone who is medically qualified (DH, 2008).

² Please note the term 'CCT holders' has been used to refer to people on the specialist register.

ICM consultants can be based in critical care units, high dependency units or on wards, working as part of a team. The team may include critical care nurses, physiotherapists, pharmacy staff, microbiology staff, radiographers and technicians (NHS Medical Careers, 2013b).

2.2 Key policy drivers

2.2.1 Mid Staffordshire NHS Foundation Trust Public Inquiry

The Mid Staffordshire NHS Foundation Trust Public Inquiry final report by Sir Robert Francis QC was published in February 2013. This report made recommendations for the NHS in response to major concerns over mortality and standards of care. The major themes of the recommendations were to improve safety and quality of care, embed the patient voice throughout the system, improve leadership and enable staff to raise the alarm when unsafe practice has taken place (Francis, 2013). The findings and recommendations are likely to impact on the entire health system, including the provision of anaesthetics and ICM.

2.2.2 Shape of training review

The *Shape of Training* review (SOT) was published in 2013 under the chairmanship of Sir David Greenaway. It gathered evidence and sought opinions from stakeholders to inform changes to the postgraduate specialty medical education and training arrangements to produce doctors who are adequately trained, able to provide safe and high-quality care, and meet the needs of patients and the service in the future. The review considered education and training, patient needs (present and future) and the balance between specialists and generalists. The review recommended more broad-based postgraduate specialty training, which may require more training time to develop technical skills, knowledge and experience for general specialties such as anaesthetics. This would fall within the timeframe of four to six years after completion of the Foundation programme, with a specific duration for anaesthetics training yet to be decided (Greenaway, 2013). The Government's response to SOT is still awaited and, consequently, this report cannot comment on the implications of any changes that might arise after that response has been published.

2.2.3 Seven-day care

Anaesthetics and ICM have been identified as specialties that should have a seven-day-a-week consultant presence by the Academy of Medical Royal Colleges (AORMC, 2012). In its latest guidance the Royal College of Anaesthetists (RCoA) adds detail to this recommendation by stating that there should always be a consultant anaesthetist present during general and regional anaesthesia; a point also made in previous College guidance. The RCoA also states that emergency anaesthesia should be consultant-led at all times (RCoA, 2013e; RCoA 2011b). The Faculty of Intensive Care Medicine (FICM) also welcomed the Academy report, stating that seven-day consultant presence is the norm in ICM but that improvements in staffing could be made by reconfiguring support services. This would enable community care to be included in the seven-day package of care in order to prevent inappropriate hospital admission and discharge patients back to their community in a timely manner (FICM, 2012b). Anaesthetists already provide a seven-day service in acute care and also provide clinical leadership in out-of-hours perioperative care (RCoA, 2013f).

2.2.4 Future Hospital Commission

The Royal College of Physicians (RCP) established the Future Hospital Commission to review the design and delivery of inpatient hospital care in order to highlight measures that would improve the safety and quality of patient care in response to rising acute admissions, the ageing population, and the increasing frequency of complex co-morbidity. The Commission presented its findings to the RCP in 2013. There were no specific

recommendations for the anaesthetics and ICM workforce but many general principles emerged that will have a broad impact. Some of these recommendations include:

- improvements in patient care, e.g. robust arrangements for the transfer of care
- improvements in medical professionalism, e.g. communication with the patient, communication and collaboration with other staff, and shared decision-making with the patient
- same access to care on all seven days for acutely ill patients
- seven-day services in the community so that only patients with acute needs are in hospital beds
- improvements in continuity of care
- training to develop doctors to deal with the current and future patient demographics, e.g. elderly patients with dementia
- training to place more emphasis on treating a patient holistically rather than giving specialist care to each of their conditions separately without considering the individual's lifestyle, complexity of conditions and patient experience
- the intensity of monitoring and treatment of patients to match the acuity of illness, with patients placed in beds appropriate to their dependency level
- increasing enhanced care bed numbers (level 1) relative to acute medical beds (level 0), with the majority of level 1 beds to be located in acute care hubs where there is close working with intensive care services (RCP, 2013a).

With these shifts in policy towards a more generalist service, the roles of anaesthetists and intensivists are changing and now overlap more with acute services. This enables the provision of a more flexible service suited to the increasing complexity of conditions and the holistic approach to individual patients.

3. Activity, service provision and patient demand

3.1 Guidelines for service provision

3.1.1 Anaesthetics and ICM

The RCoA has published new guidelines for the provision of anaesthetics services, which update the 2009 guidelines (RCoA, 2009) to include developments in clinical practice, service delivery and education. These guidelines cover the range of anaesthetic care, including preoperative, intraoperative and postoperative, in a variety of specific areas such as paediatrics, obstetrics and pain management (RCoA, 2013e).

The RCoA guidelines include references to ICM, although there are additional standards published by the Intensive Care Society (ICS), which give non-prescriptive examples of levels of care (ICS, 2009) and standards for consultant staffing (ICS, 2006). For example, the ICS states that intensive care units (ICUs) should have 24-hour named consultant cover, with the majority of working time spent by the consultant in charge in the ICU and otherwise immediately available (ICS, 2006). There are also additional guidelines for more specific areas of ICM. For example, the Paediatric Intensive Care Society (PICS) has its own standards for the care of critically ill children (PICS, 2010).

There are differences in anaesthetics service delivery depending on the type of hospital and the patient population served. For example, hospitals receiving patients with major injury and trauma must have an appropriate mix of staff available 24 hours a day to provide such emergency services (RCoA, 2013e). Responding to an audit of emergency laparotomy surgery, the Association of Anaesthetists of Great Britain and Ireland (AAGBI) links consultant presence and the provision of essential facilities to patient mortality. There is a reported twelve-fold difference in mortality outcomes between the best and worst hospitals across the UK (AAGBI, 2012).

Hospitals within the ambit of a [specialty] school of anaesthesia/anaesthetics must be able to provide anaesthetics training in elective and emergency general surgery, urology, trauma and orthopaedics, obstetrics and gynaecology, ear, nose and throat, oral surgery, day case surgery and paediatric surgery including neonatal (RCoA, 2013e).

3.1.2 Pain management

New recommendations specifically for the improvement of pain service provision were agreed at the first English Pain Summit by the British Pain Society, the Chronic Pain Policy Coalition, the Faculty of Pain Medicine and the Royal College of General Practitioners. They called for clear standards for pain management to be nationally agreed and implemented, an awareness campaign to promote the prevention, understanding and treatment of pain, nationally agreed commissioning guidance, and improvement in pain data (Chronic Pain Coalition, 2012).

The RCoA has also published guidance for commissioning local pain services, which describes the team of staff needed to deliver pain management services to patients with a variety of conditions (RCoA, 2013g). The RCoA report acknowledges that while pain management was usually delivered in secondary care in the past, it is

Commented [MW3]: Missing reference to the 2009 guidelines.

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now often delivered in primary care and community services, depending on the circumstances such as whether the pain is acute or chronic. However, this transition is in its infancy. Primary care will need to be appropriately resourced in order to provide more of this service. Some treatment will still need to be provided in secondary care, with multidisciplinary teams working across primary and secondary care as appropriate.

Pain management involves a specialist team that always consists of a consultant in pain medicine, who is usually an anaesthetist with subspecialty training in pain medicine, who has obtained Fellowship of the Faculty of Pain Medicine of the Royal College of Anaesthetists (FFPMRCA). There are five specific patient pathways for pain: primary assessment and management, spinal pain, non-inflammatory musculoskeletal pain, neuropathic pain and pelvic pain (RCOA, 2013g).

3.2 Demand for procedures and interventions

3.2.1 Patient demographics

Figures 3 and 4 show historical trends in surgical procedures and interventions. These cannot be used as a direct comparison with anaesthetics and ICM but can be used to provide insight into the general demands on key aspects of these hospital services.

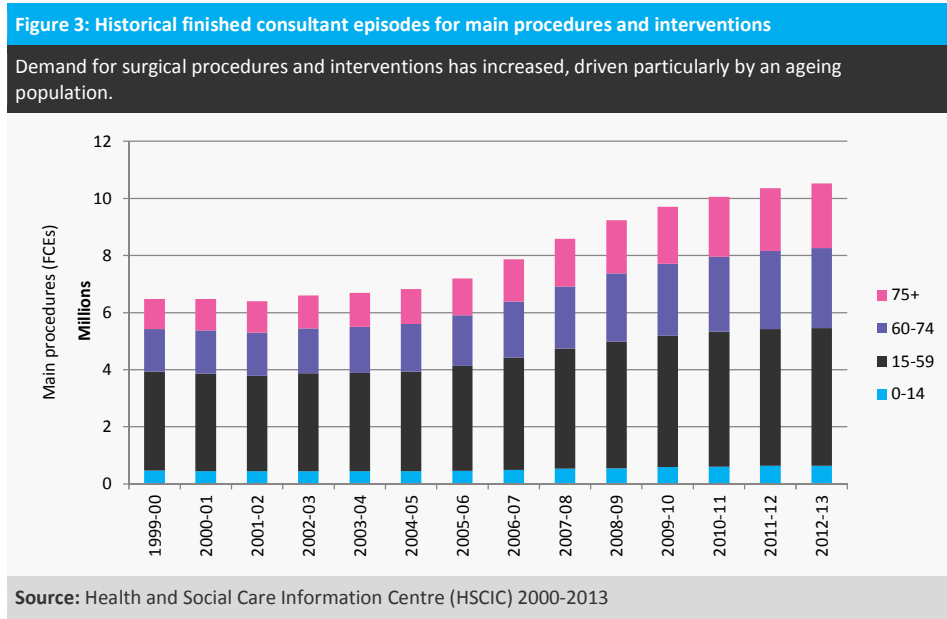


Figure 3 shows that finished consultant episodes (FCEs) for main procedures and interventions have increased overall between 1999-2000 and 2012-13, rising by 63 per cent to approximately 10,600,00 FCEs per annum. This has been driven by increases in demand from all age groups, with demand growing fastest in the 75+ age group.

Table 1 shows the change in FCEs for surgical procedures and interventions in 2012-13 by patient age group.

Table 1: Surgical procedures and interventions by patient age group 2012-13

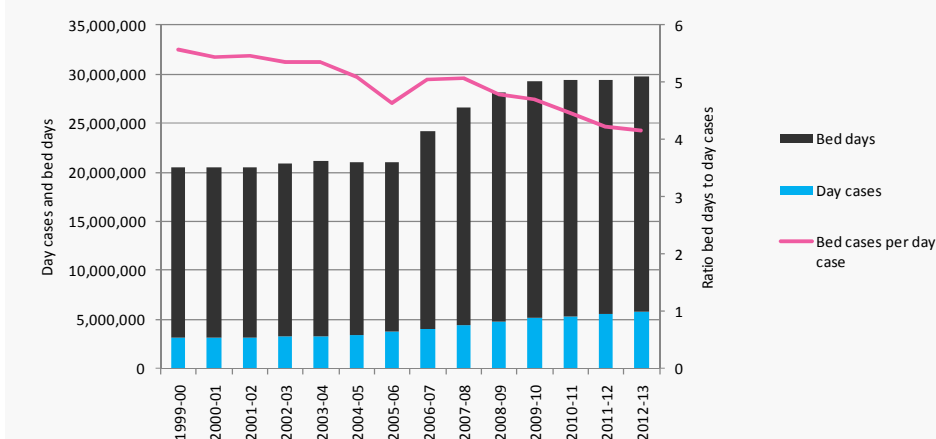
Patient age	Surgical procedures and interventions (FCEs) (approx.)	Change from 1999-2000 to 2012-13
0-14	632,000	37%
15-59	4,900,000	39%
60-74	2,800,000	88%
75+	2,300,000	116%
All ages	10,600,000	63%

Source: Health and Social Care Information Centre (HSCIC) 2000-2013

Figure 4 shows historical trends in bed days and day cases for all surgical procedures and interventions. Day cases represent inpatients who have been admitted for same-day treatment, not requiring an overnight stay. Bed days³ are the sum of all the days that patients in the group occupied hospital beds, excluding day cases.

Figure 4: Historical day cases and bed days

Bed days and day cases have both increased, with the largest proportional growth for day cases.



Source: HSCIC 2000-2013

³ Please note that the counting methodology for bed days changed in 2008-09 to no longer include estimates for cases that continue beyond the end of the financial year. The HSCIC made this change because its old methodology was overestimating bed days.

Figure 4 shows that day cases and bed days for main procedures and interventions both increased overall between 1999-2000 and 2012-13, with much of the increase occurring from 2005-06 during a time of increased funding for the NHS, before levelling off post-2009 in the recession years. Bed days increased by 38 per cent to approximately 24,000,000, while day cases increased by 84 per cent to approximately 5,800,000. Overall, this is an increase in the total bed days and day cases for main procedures and interventions of 45 per cent to approximately 30,000,000. The ratio of bed days to day cases decreased overall by 25 per cent, from approximately six bed days down to four bed days for every day case. The increase in demand therefore occurred despite an apparent shift towards preference for day treatments where appropriate. These trends cannot be used as a direct comparison with A&ICM but can be used to provide insight into the general demands on hospital services; anaesthetists and intensivists are required to serve surgical patients whether they are receiving day treatment or are staying overnight following surgery.

3.2.2 Demand for beds

The UK has one of the smallest proportions of acute hospital beds allocated to intensive care in the developed world (RCoA and FICM, 2011). Combined with the ageing population and increasing patient expectations for more and safer care of better quality, there may be further pressure on these beds (RCoA, 2012). The Lancet adds that changing public expectations and patient involvement in the withdrawal and withholding of treatment may also pose further ethical considerations in balancing demand and supply in critical care (The Lancet, 2010).

There is also a national shortage of paediatric beds in paediatric intensive care units (PICUs), particularly in the winter months, according to the joint briefing from the Intensive Care Society, the Paediatric Intensive Care Society, the Association of Paediatric Anaesthetists of Great Britain and Ireland and the Faculty of Intensive Care Medicine. They propose a range of solutions to recognise regional variations, which may have an impact on intensivist workforce requirement (ICS et al., 2012). Overall, there may be an increase in demand for anaesthetists trained in PICM in the near future (RCoA, 2013c).

The National Confidential Enquiry into Patient Outcome and Death report *Knowing the Risk: A review of the perioperative care of surgical patients* (NCEPOD, 2011) highlighted issues in the care of high-risk surgical patients. The RCoA and FICM responded to this report positively, identifying 'a chronic lack of bed capacity as a major factor hindering provision of crucial early postoperative care' (RCoA, 2011c). They emphasise the need for integrated care for critically ill patients, asserting the importance of a comprehensive preoperative assessment that identifies risks and keeps the patient informed.

This may require the role of the anaesthetist to change to that of a perioperative physician, including the provision of preoperative assessments. Postoperative care is also noted as a crucial area for improvement in capacity, as many life-threatening complications developed at this stage are avoidable (RCoA and FICM, 2011).

The RCoA has published a report outlining a wide range of audit changes, designed to raise standards in anaesthetics. The report includes audits of service delivery, consultant supervision of trainees, and anaesthetics, intensive care and pain training (RCoA, 2012). Improvements that may take place as a result of these audits might be expected to impact on the demand for anaesthetists and intensive care specialists.

3.2.3 Technology

Use of new technology can have an impact on demand for anaesthetists. Telehealth is one factor that has begun to take effect and is likely to expand in the future. For example, the increased availability of information from many sources can help patients to be more informed and take measures to improve and maintain their own health, while greater links between patients and their healthcare staff in the community can help to

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manage and prevent conditions, thus potentially reducing the need for hospital care and surgery. There is an opportunity to take this further in the future if there is a sufficient culture change in healthcare to allow technology to be more widely used (Queen's Nursing Institute, 2012). However, the direct impact of telehealth on theatre workload is yet to be quantified and is difficult to anticipate with any accuracy. It may take some time for prevention of chronic conditions to manifest as a reduction in hospital demand.

Technology change is also having a direct impact on surgery. The use of minimally invasive surgical techniques including laparoscopic surgery has been increasing. There has also been an increase in technology-assisted surgical procedures since the first prototype robot was used clinically in 1993 (Palep, 2009). These techniques generally decrease blood loss during surgery, postoperative morbidity and length of stay (Bristol Robotics Laboratory, 2012). For example, in cardiothoracic surgery, minimally invasive techniques have been growing in popularity because they can reduce pain and surgical trauma, with equivalent safety and durability to traditional techniques (Iribarne et al., 2011). Demand for cardiovascular care and cardiac surgery is increasing due to the ageing population, and minimally invasive surgery is a suitable treatment for many older patients who cannot have more invasive surgery, thereby increasing demand for surgery, which would require anaesthetists (Jahangiri, 2011).

Commented [MW7]: Are we missing a reference here?

Commented [IE8R7]: This is a somewhat generic statement. Its accepted that surgery has changed to minimally invasive surgery but I don't have a specific reference. We can either leave it in and I doubt anyone will pick on it or we just take it out and amend the following sentence to read correctly.

3.3 Quantification of current service demand

Quantification of current service demand for the purposes of the modelling and forecasting in this review is not straightforward. FCEs by main specialty are not a suitable measure of anaesthetics and ICM service provision because the recording method is not consistent; interventions are often coded to other specialties. The proportion of anaesthetics and ICM FCEs recorded is far lower than the proportion of anaesthetists and intensivists in the workforce, demonstrating that FCEs are inconsistently recorded for these specialties.

For this reason, we have not used FCEs to quantify current service demand. Instead, we asked our expert Delphi panel to acquire an evidence base from expert stakeholders.

3.4 Current level of unmet need

When forecasting demand, the CfWI was commissioned to estimate the workforce needed in future to maintain current levels of care per patient. The CfWI recognises there is always likely to be some unmet need. **Our expert anaesthetics panel, consisting of 28 participants, told us that around 15 per cent of need is unmet today. Our ICM panel, consisting of 14 participants, told us around 25 per cent of need is unmet today. These estimates are comparable with those we have obtained for other medical and surgical specialties.**

Please see Annex D for the full list of questions posed to the Delphi panels.

4. Future patient demand

4.1 Demand modelling assumptions

When forecasting demand, the CfWI is estimating the workforce needed in the future to maintain current levels of anaesthetics and intensive care medicine per capita in England.

Factors impacting the future 'baseline' demand were:

- population growth and the rising proportion of older people (based on the Office for National Statistics (ONS) 2012 projections)
- the proportionally greater reliance of the elderly on anaesthetics and ICM services (based on HSCIC HES 2013a data).

Additional factors impacting our future scenario demand projections include:

- scenario-specific changes to the average person's individual need for anaesthetics and ICM services
- scenario-specific changes to the efficiency and productivity of the service.

Scenario-specific changes are not included in the baseline forecasts. The baseline forecasts assume these factors remain as they currently are.

Baseline demand for anaesthetics services is forecast to increase by 25 per cent by 2033 and by 26 per cent for ICM when considered solely on demographic changes.

The results of our Delphi panel exercise showed an expected average individual need to rise in all four scenarios for both anaesthetics and ICM. Additionally, the Delphi panel exercise found demand for anaesthetist levels would need to increase by an additional 35 per cent to accommodate perioperative work.

As it is not clear how much perioperative work is already being done by anaesthetists (and, therefore, already factored into our demand calculations), nor which grade of doctor is undertaking the work, we cannot accurately assess the future impact of this variable.

See Annex D for the full list of questions posed to the Delphi panel and tables showing the figures for both specialties.

4.2 Baseline and principal demand projections

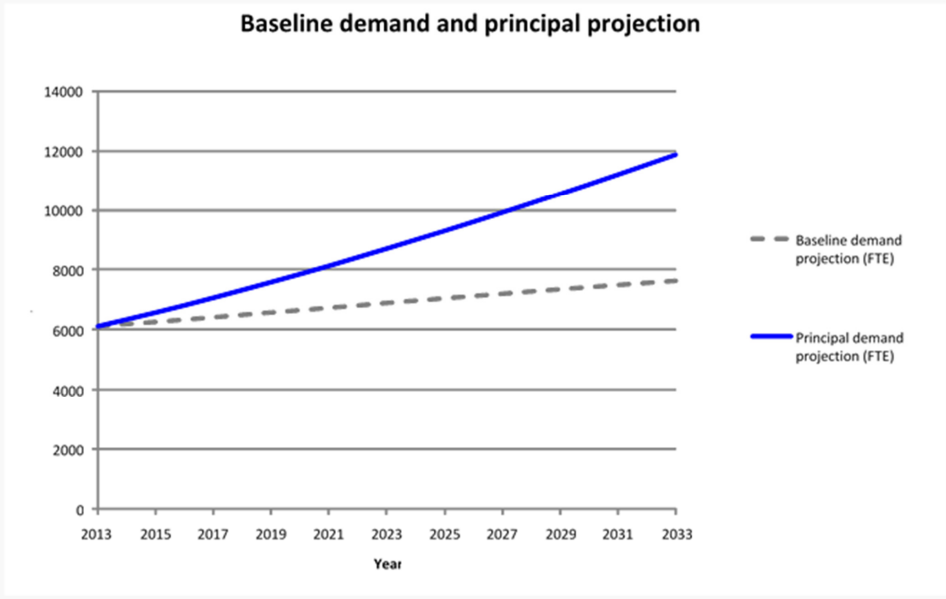
Figure 5 shows the baseline and principal projections for anaesthetics and ICM. The baseline is based on the ageing and growing population alone, while the principal projection is derived from the Delphi process and is the projection deemed most likely to occur according to the experts on the Delphi panel.

Commented [MW9]: There is no reference to this in the report references.

Commented [IE10R9]: These are the 2012 projections but the reference is the ONS 2013 one.

Figure 5: Baseline and principal projections of demand for CCT holders in anaesthetics and ICM

Baseline demand is projected to increase over the next 20 years, with the principal projection increasing on average by 4.7 per cent annually.



Source: CfWI

Baseline demand is projected to increase by 25 per cent by 2033, with the principal projection increasing on average by 4.7 per cent annually due to rising individual patient need.

5. Current workforce supply

5.1 Trends in postgraduate training

Anaesthetics is a popular medical specialty and there are generally more applications than places available, although this varies across regions. The competition ratio (CR) for anaesthetics in 2012-13 was 1.9, and the fill rate has been around 99 per cent over the last three years 2010/11 – 2012/13.

Table 2 shows the offers accepted by trainees for anaesthetics and ICM specialty training level 3 (ST3) posts. There were 321 accepted offers by trainees for anaesthetics specialty training level 3 (ST3) posts in 2012-13 with a likelihood of accepted offers being slightly higher for 2013-14; at the time of writing there were 321 accepted posts with some recruitment still to take place.

There were 49 accepted offers by trainees for ICM specialty training level 3 (ST3) posts in 2012-13 which rose to 74 in 2013-14, a 51 per cent increase. The fill rate was 72 per cent in 2012-13 rising to 89 per cent in 2013-14.

The RCoA estimates approximately 80 per cent of new ICM training posts result in a reduction in anaesthetics training posts. Therefore **the number of anaesthetics trainees in our supply modelling is reduced to account for growth in ICM training**, which is assumed to increase each year to 2016.

Table 2: Offers accepted to anaesthetics and ICM higher specialty training (ST3), 2012-13, England

	Offers accepted	
	Anaesthetics	ICM
2012-13	321	49
2013-14	321*	74

Source: RCoA (2014d), FICM (2014)

* Provisional figure as a full year's data is not yet available.

The RCoA recommended 352 individuals to be awarded a CCT in anaesthetics in 2012 followed by 395 in 2013, including joint CCTs of anaesthetics with another specialty (RCoA, 2014a).

For the new single CCT in ICM, 68 posts were advertised in 2012, of which 49 were filled. The fill rate improved in 2013, with 74 of 83 available posts filled (RCoA, 2014b). Joint CCTs in ICM with another specialty were awarded to 99 individuals in 2012 in the UK, of which approximately 82.5 per cent were joint with anaesthetics based on an average over several years, which equates to approximately 82 posts for 2012 (FICM, 2013b). No data for England alone was available to the CfWI at the time of publication.

Table 3 shows the recruitment figures for single ICM CCT higher specialty training in the UK in 2012 when the single CCT first became available, and for single and dual ICM CCT higher specialty training in the UK in 2013 when the dual CCT option first became available. A breakdown by country was not available to the CfWI at the time of publication. The CfWI did not have access to historical recruitment figures for anaesthetist higher specialty training at the time of publication.

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Commented [IE12R11]: Done

Table 3 shows that appointments to ICM training have increased since the dual option became available.

Table 3: Recruitment numbers to ICM higher specialty training (ST3), 2012-13, England

	Appointments	Total posts available	Fill rate
2012-13 (single)	49	68	72%
2013-14 (single and dual)	74	83	89%

Source: FICM (2013b)

Please note that equivalent figures for anaesthetics are not available for that time period.

Before the 2012 training intake, trainees wishing to become intensive care specialists had to obtain a joint CCT in ICM along with another ‘parent’ specialty, namely acute medicine, anaesthesia, emergency medicine, renal medicine or respiratory medicine. Since 2012, trainees have had the choice of obtaining a dual CCT in ICM and another specialty, or training to obtain a single CCT in ICM (FICM, 2012b). Entry into the previous joint CCT training pathway ceased in 2013, with the curriculum approved by the General Medical Council (GMC) to continue until all existing joint CCT trainees have completed their training. New trainees who would prefer to train in two specialties may opt for the new dual CCT, but the joint CCT route is no longer available (GMC, 2011).

This change in training is likely to drive changes in workforce supply, as junior doctors interested in ICM consider their career plans and choose a route to CCT accordingly. It is not yet clear whether employers will prefer to employ single or dual CCT holders in the future, so trainees currently have to choose with considerable uncertainty about their future prospects. Training length is also impacted, as the single ICM CCT would take seven years to complete, while for example, a dual CCT including anaesthetics and ICM would take eight and a half years to complete (RCoA, 2012).

There is also a small but notable overlap in training to work in PICM. Trainees in anaesthetics, surgery and paediatrics are eligible to undertake training in this area, although currently only those whose parent specialty is paediatrics can receive recognition in PICM (RCoA, 2010b).

5.2 Anaesthetics and ICM current workforce supply

It is unclear how many consultants currently work in anaesthetics and ICM. Table 4 shows the variety of data available from different sources that record doctors trained in anaesthetics alone, ICM alone, anaesthetics and ICM (AICM), and ICM with another specialty (OICM). In addition to this data, there are over 1000 doctors on the specialty register who are not working in the NHS in England. The final row of Table 4 shows the headcount (HC) assumptions used in the CfWI workforce model.

Table 4: Anaesthetics and ICM supply – headcount

Count of doctors working in anaesthetics/ICM (according to the data sources below)	Anaesthetics	ICM	AICM	OICM	Total
GMC doctors on the specialist register with a postcode in England (data request April 2014)	7093	7	499	131	7730
HSCIC – HC of occupation codes (2012)	5711	332	-	-	6043 (2012) 6250 (2013)
FICM – HC of service provision (2011/12) (50% response rate)	-	42	723	29	794
RCoA (consultants, 2010 census)	5639	-	-	-	5639
HC used in CfWI model	5833	6	411	100	6350

See Annex B for the rationale behind the numbers used in our model.

5.3 Workforce trends

It is difficult to provide an accurate current workforce figure for anaesthetics and ICM. ICM has only had a separate CCT since 2012 and so the ICM service was delivered by anaesthetists or doctors who had a joint CCT in ICM and another specialty (usually anaesthetics), or relevant clinical experience. HSCIC records of the ICM ('intensivist') workforce were therefore dependent on staff coding choices made locally. The very small numbers of intensivists counted by the HSCIC historically (see Figures 5 and 8) indicate it is likely most intensivists were not coded as ICM.

The FICM has additional information about doctors contributing to ICM service. Its 2011-12 census of FICM fellows supports a view that far more ICM service is delivered than HSCIC figures would suggest (FICM, 2013b). The FICM estimates that 794 consultants were working in ICM in 2011-12, more than double the HSCIC figure for the same year. The FICM found that while only approximately 5 per cent of the ICM workforce worked solely in ICM, over 91 per cent delivered both anaesthetics and ICM services in 2011-12.

The figures and graphs that follow in this section must be viewed in the context of the above discussion and not treated as absolute. These figures are included to highlight the difficulty in assessing the size and nature of this workforce when considering the official HSCIC data.

5.3.1 Consultants coded under anaesthetics

Figure 6 suggests there has been rapid growth in the supply of consultants coded under anaesthetics in the NHS. On an FTE basis this workforce increased by 51 per cent from 3665 in 2002 to 5551 in 2012. This rate of increase is similar to the 54 per cent growth in the total FTE of NHS consultants during the same period (HSCIC, 2013b). The RCoA 2010 census counted a higher headcount than the HSCIC figures for the same year: 5366

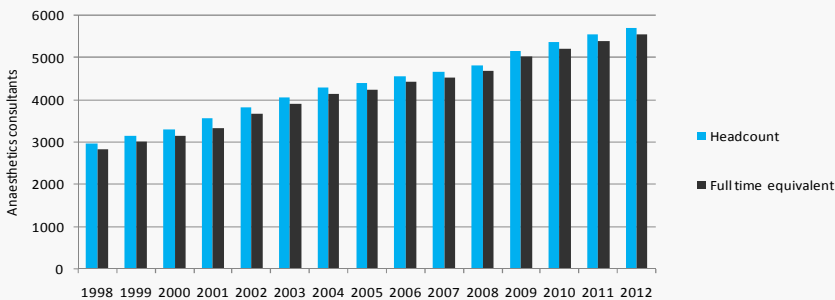
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were recorded by the HSCIC versus 5639 counted by the RCoA (RCoA, 2010a). This may indicate that the historical trends shown in Figure 6 do not include all anaesthetists.

Figure 6: Historical supply of NHS consultants coded under anaesthetics

The supply of consultants coded under anaesthetics has grown rapidly since 1998.



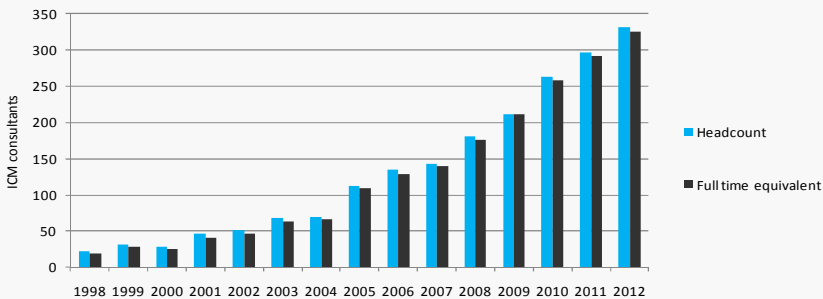
Source: HSCIC 2013b (data for 2013 not available at date of publication)

5.3.2 Consultants coded under ICM

Figure 7 suggests that there has been significant growth in the supply of consultants coded under ICM in the NHS. On an FTE basis this workforce increased by 595 per cent from 47 to 325 from 2002 to 2012. However, the FICM reports (FICM, 2013b) more than double the HSCIC figure for 2012 (794 versus 332 HC) so it is likely that most intensivists are not included in these HSCIC figures. The rapid growth in the HSCIC figures from a very small starting point may indicate that there have been changes in the way intensivists are recorded. Again this makes it difficult to provide an accurate current workforce figure for ICM.

Figure 7: Historical supply of NHS consultants coded under ICM

The supply of consultants coded under ICM has grown rapidly since 1998.



Source: HSCIC 2013a (data for 2013 not available at date of publication)

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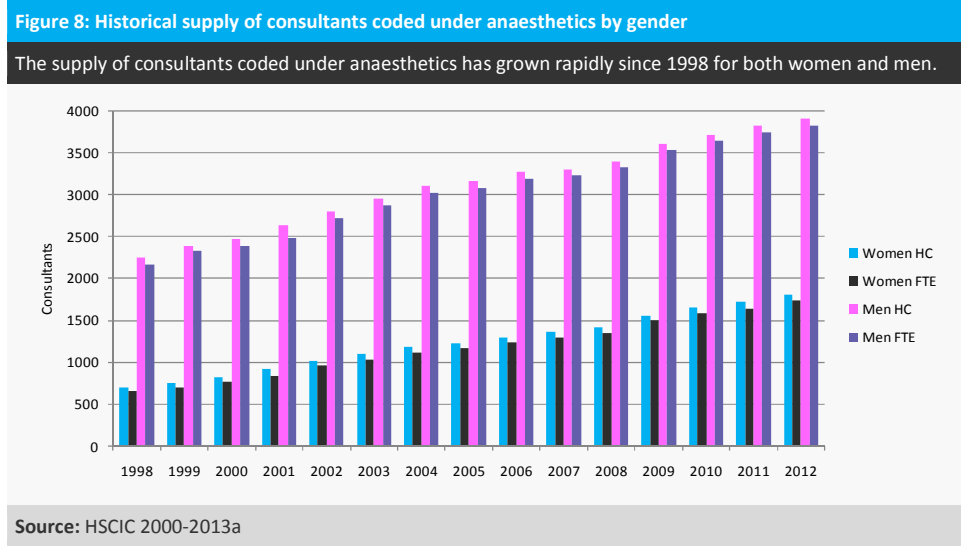
In reality, ICM is mostly delivered by consultants who also work in anaesthetics, with variations in rotas reflecting the flexible nature of this service as a whole. The FICM 2010 survey reported that approximately 36 per cent of consultants working in ICM cover an ICU for a week at a time, another 36 per cent undertake blocks of days and the rest of the work is delivered as single days spent on ICU duty (FICM, 2013b).

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Commented [IE22R21]: The 2010 survey was provided in the 2013 data submission. There is a later reference that was also in the same data submission.

5.3.3 Women in the anaesthetics workforce

With the same caveats as for Figure 6, Figure 8 shows that the proportion of women in the workforce has grown; on a FTE basis the proportion of women increased from 26 per cent (956 FTE) of the workforce in 2002 to 31 per cent (1734 FTE) in 2012. The RCoA 2010 census suggested that women make up 30 per cent of the consultant anaesthetist workforce (RCoA, 2010a), which is similar to the HSCIC proportion of 30 per cent for the same year. The similarity between the two datasets suggests that the gender trends shown in Figure 8 are probably realistic.



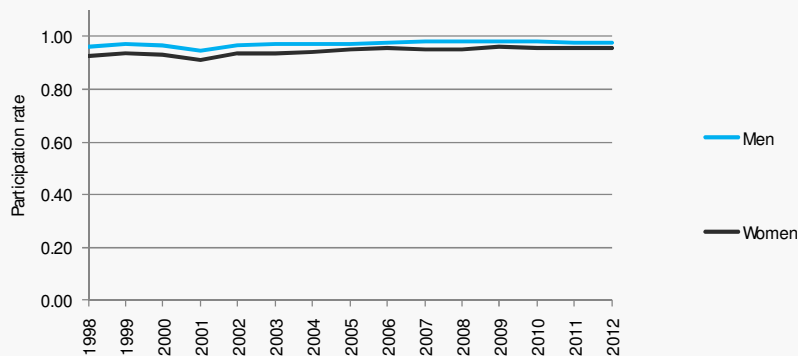
With the same caveats as for Figure 6, Figure 9 suggests that the participation rates for both men and women consultants coded as anaesthetists (i.e. the extent to which consultants work full time) remained broadly constant between 1998 and 2012. The HSCIC figures suggest that women and men have similar participation rates; that is, the extent to which they work part time is similar, 0.96 for women and 0.98 for men in 2010 as it still was in 2012 (HSCIC, 2000-2013a). However, the RCoA 2010 survey (RCoA, 2010a) appears to contradict this evidence: the RCoA recorded working patterns rather than FTE and found that 27 per cent of full-time (working 10 PAs or more) and 62 per cent of part-time (working less than 10 PAs) anaesthetics consultants were women. This suggests a gender difference in working patterns and that the HSCIC figures may not show the full story for working patterns by gender. The contradictory data makes it difficult to draw robust conclusions.

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Figure 9: Historical participation rate by gender – NHS consultants coded under anaesthetics

The participation rates for women and men have remained broadly constant.



Source: HSCIC 2013a

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5.3.4 Women in the ICM workforce

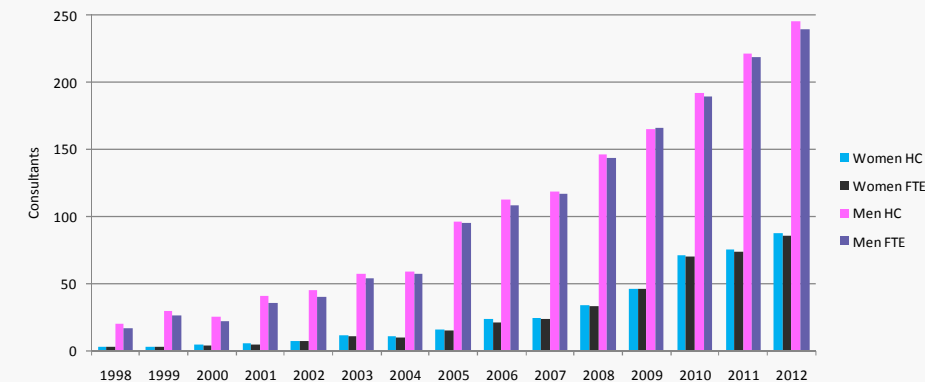
With the same caveats as for Figure 7, Figure 10 shows that within the workforce coded as ICM consultants the proportion of women has grown: on an FTE basis the number of women had increased to 86 (26 per cent of the workforce) in 2012, while the number of men had increased to 239 (74 per cent of the workforce) in 2012. The FICM 2011-12 survey found only approximately 17 per cent of ICM consultants (headcount) were women, which is lower than the survey findings for anaesthetics. However, with much of the ICM service not captured in the workforce data, there could be many women delivering anaesthetics and ICM alongside caring responsibilities (FICM, 2013b).

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Figure 10: Historical supply of consultants coded under ICM by gender

The supply of ICM consultants has grown rapidly since 1998.



Source: HSCIC 2013^a

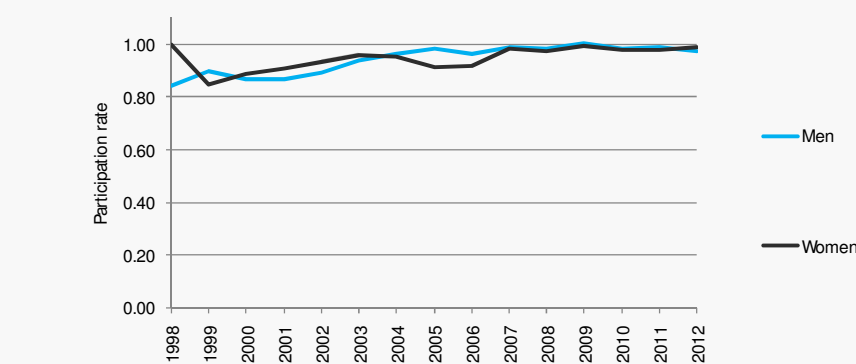
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With the same caveats as for Figure 6, Figure 11 suggests that women and men now have very similar participation rates according to the HSCIC data. The 2012 participation rates were 0.99 for women and 0.98 for men. However, these figures are again likely to be impacted by the coding of staff providing ICM services under anaesthetics rather than ICM. Therefore they may in reality only reflect working patterns for as little as the 5 per cent of the intensivist workforce who work solely in ICM.

Figure 11: Historical participation rate by gender – NHS consultants coded under ICM

The participation rates for men and women coded under ICM have fluctuated but are now very similar.



Source: HSCIC 2013^a

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6. Future workforce supply

6.1 Supply modelling assumptions

Several specialties contribute to the provision of anaesthetics and ICM service based on the CfWI's estimates. The proportion of time specialists spend delivering anaesthetics and ICM services is outlined in Table 5. It is important to highlight that the 2.6 per cent of anaesthetists' contribution to ICM service is a minimum but is likely to be higher, for example up to 25 per cent (RCoA, 2014c). The CfWI's supply projections display a range of flexibility dependent upon the proportion of time doctors spend providing service in each specialty.

Table 5: Modelling assumptions for provision of service

Specialty	Contribution to anaesthetics service	Contribution to ICM service
Anaesthetists ⁴	97.4% (maximum)	2.6% (minimum)
Intensivists	0%	100%
Anaesthetists dual with ICM ⁵	50%	50%
Intensivists dual with another specialty ⁶	0%	50%

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Commented [IE34R33]: Done

Source: CfWI calculations based on RCoA census (RCoA, 2010a) and FICM survey (FICM, 2013b).

6.2 Baseline supply projections

Figure 12 shows our combined supply projection for specialists involved in the provision of anaesthetics and ICM services. **The total supply (headcount) is projected to increase by 36 per cent from 6400 in 2013 to approximately 8600 in 2033. The anaesthetics headcount (for holders of the single CCT) is projected to grow in the short term, reducing over the 2020s, but increasing overall across the period.** This is due to the assumption that some ICM posts will be created at the expense of anaesthetics training posts.

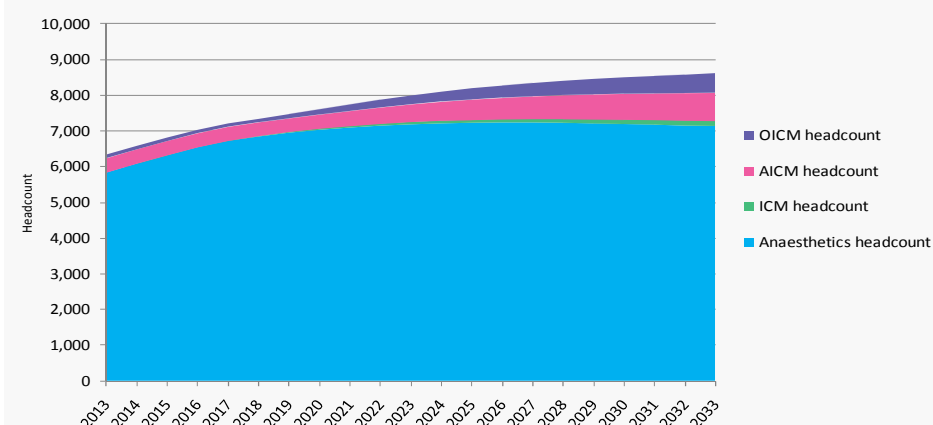
⁴ The minimum contribution to ICM service based on RCoA census data

⁵ Indicative, using average number of **PAe-planned activities (PAs)** from FICM survey (50 per cent response rate)

⁶ Indicative, using average number of PAs from FICM survey (50 per cent response rate)

Figure 12: Projected total CCT holder workforce supply – combined anaesthetics and ICM headcount

Overall, the total headcount supply is projected to grow by 36 per cent by 2033.



Source: CfWI model of the anaesthetics and ICM CCT holder workforce in England

Table 6 shows the change in the supply by type of CCT holder from 2013 to 2033, as represented by Figure 12. The supply for each CCT holder category is projected to grow from 2013 to 2033.

Table 6: Projected supply by CCT/CESR type – headcount

CCT	Headcount (2013)	Projected headcount (2033)	Change in headcount from 2013 to 2033
Anaesthetics	5833	7129	22%
ICM	6	157	2624%
Anaesthetics dual with ICM	411	784	91%
ICM dual with another specialty	100	536	436%
Total	6350	8606	36%

Source: CfWI

Figure 13 shows the combined anaesthetics FTE supply with variation in contribution to the ICM service. This baseline graph is for comparison purposes only. Overall, the total FTE supply potentially available to anaesthetics is projected to increase. The striped sections of the graph explore variations in the FTE of anaesthetists' time that could be spent on ICM service rather than anaesthetics service. 'AICM 0 to 100 % ICM'

refers to doctors with dual CCTs who may spend all, part or none of their time delivering ICM service depending on local contracts and arrangements. The blue striped areas demonstrate degrees of reduction in anaesthetist supply if employers use them to deliver ICM services. The current proportion of anaesthetists' time used to deliver ICM services in England is not known.

Taking all of these factors into account, Figure 13 shows that the FTE from the anaesthetics single CCT is projected to grow more in the short term, reducing after 2026, but increasing overall by 2033.

Figure 13: Projected anaesthetics workforce supply – FTE with different contributions to ICM service
The FTE supply for anaesthetics is projected to grow, even with up to 25 per cent of anaesthetists' time spent delivering ICM services.

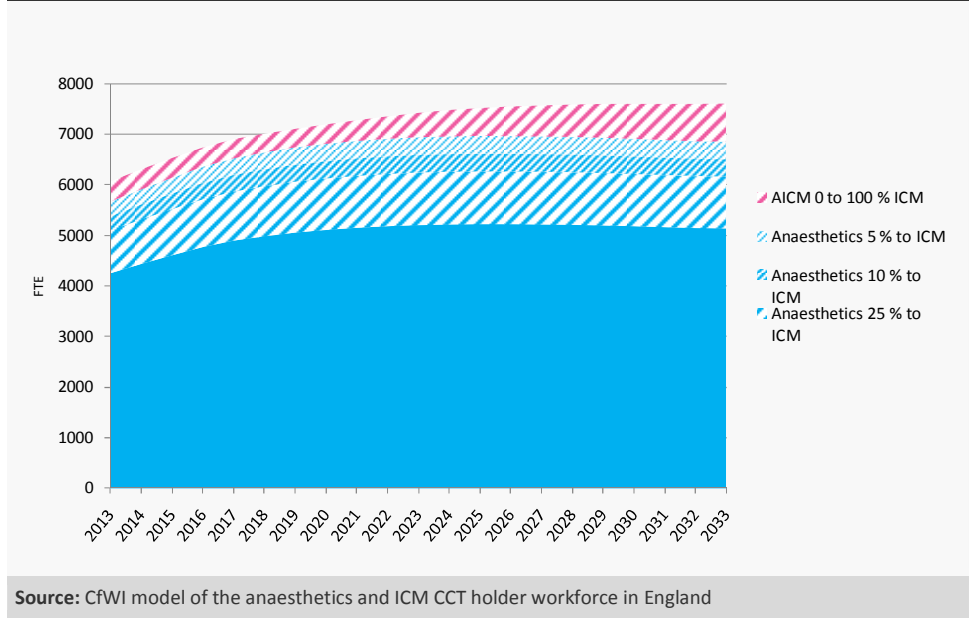


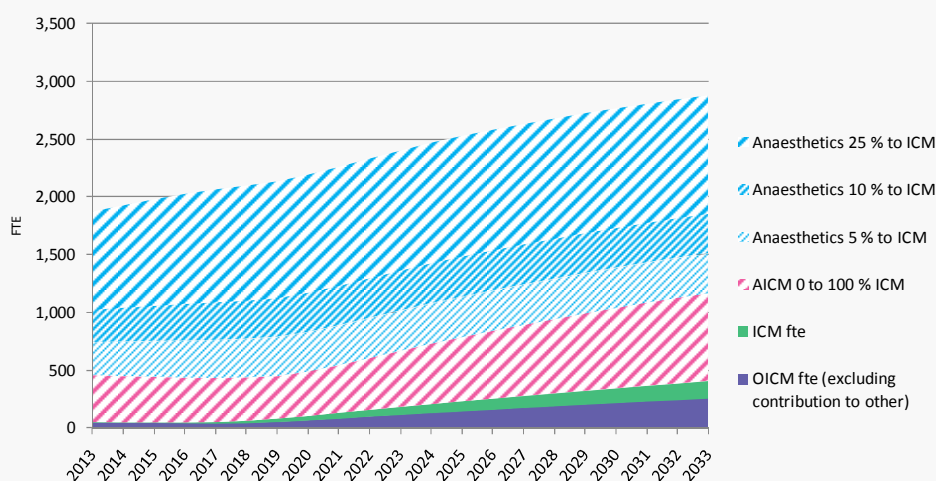
Figure 14 shows the combined ICM supply by FTE with variations in contributions of anaesthetists to ICM. This baseline graph is for comparison purposes only. Overall, the total FTE supply potentially available to ICM is projected to increase.

The striped sections of the graph explore the FTE of anaesthetists' time that could be spent on ICM service rather than anaesthetics service. **This shows that the majority of ICM service in the future could be provided by intensivists with a dual CCT. The single CCT intensivist workforce is projected to grow but will remain relatively small.**

The striped sections on both Figures 13 and 14 represent the same workforce and therefore the totals from the two graphs **should not** be added together as this would double count the workforce that is flexible between the two specialties. This indicates the inherent flexibility in the national workforce available to deliver these services. We recognise that at a local level there may not be the same flexibility.

Figure 14: Projected ICM supply – FTE with different contributions of anaesthetists to ICM service

Overall, the total supply of CCT holders available for ICM service is projected to grow. The majority of the workforce available will possess joint CCTs, mostly ICM and anaesthetics.



Source: CfWI model of the anaesthetist and ICM workforce for England

7. Demand and supply projections

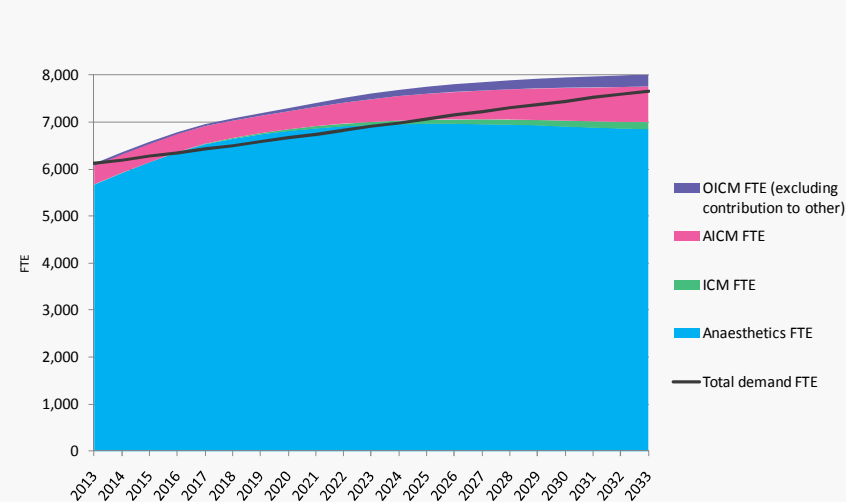
7.1 Baseline demand and supply

Our modelling produced a range of projections for patient demand and workforce supply. The range includes 'baseline', 'principal' and scenario-specific projections. The top and bottom of the range demonstrate the upper and lower limits. Comparing these ranges helps us to understand patient demand and workforce supply for the anaesthetics and ICM workforces over the next 20 years to 2033. Full definitions of terms used can be found in section 1.2.5.

Figure 15 shows the combined baseline supply of all specialties involved in the provision of A&ICM services compared with the baseline demand projection, which is based solely on the growing, ageing population. Note that in the baseline projection, the average person's individual need for A&ICM services is assumed not to change, as are workforce efficiency/productivity.

Figure 15: Projected anaesthetics and ICM total service baseline supply and baseline demand - FTE

Total baseline supply is projected to exceed baseline demand.



Source: CfWI model of the anaesthetist and ICM workforce for England

CfWI modelling found that baseline total demand for CCT holders is projected to increase by 25 per cent from approximately 6100 to approximately 7600 FTE from 2013 to 2033.

Meanwhile, baseline total supply is projected to increase by 31 per cent from approximately 6100 to approximately 8000 FTE from 2013 to 2033.

Therefore, baseline combined anaesthetist and intensivist workforce supply is projected to outstrip baseline demand by 2033. However, our baseline projections assume that with the exception of demographic factors, nothing else changes, so in the next section we consider demand and supply in each of our four challenging but plausible futures.

Table 7 shows the change in the total service supply by type of CCT holder from 2013 to 2033, as represented by Figure 15. The supply for each CCT holder category is projected to grow from 2013 to 2033.

Table 7: Projected total anaesthetics and ICM supply by CCT/CESR type – FTE

CCT	FTE (2013)	Projected FTE (2033)	Change in FTE from 2013 to 2033
Anaesthetics	5665	6844	21%
ICM	5	152	2675%
Anaesthetics dual with ICM	404	758	88%
ICM dual with another specialty	47	257	442%
Total	6122	8011	31%

Source: CfWI anaesthetics and ICM demand and supply model

7.2 Challenging but plausible futures

The CfWI conducted a scenario generation workshop with 21 participants. Four scenarios were developed by stakeholders to represent a range of challenging but plausible futures for anaesthetics and ICM. The different scenarios help to bound the key future uncertainties (such as average individual need and workforce behaviours). Table 8 outlines these scenarios.

The stories that detail each scenario can be viewed in Annex C. For more detailed reports on the scenario generation methodology used by the CfWI, refer to the technical papers series found available at: www.cfwi.org.uk/our-work/research-development/cfwi-technical-paper-series.

Table 8: Four scenarios representing a range of challenging but plausible futures for anaesthetics and ICM

		Cluster A	
		Less political involvement	More political involvement
Cluster D	Increase in GDP spent on health	Scenario 1	Scenario 2
	Decrease in GDP spent on health	Scenario 3	Scenario 4

Source: CfWI scenario generation workshop.

The resulting scenarios and their corresponding story titles are:

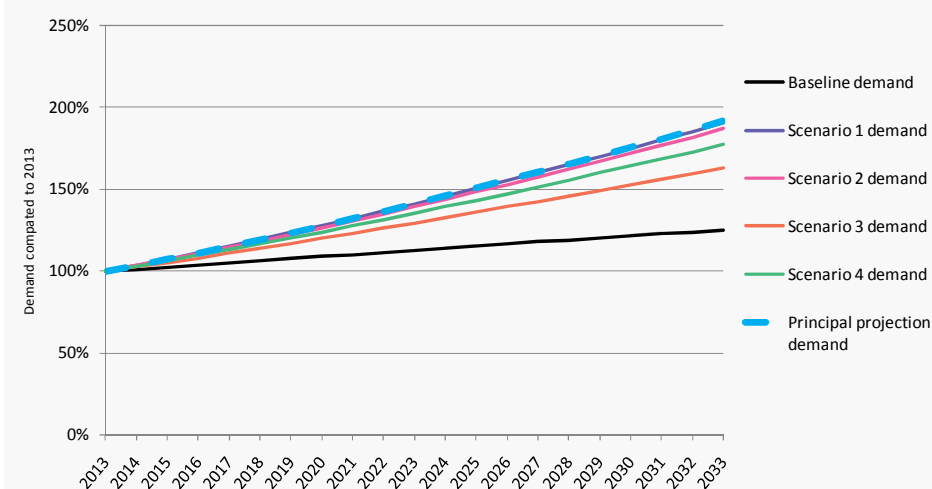
- scenario 1: ‘laissez-faire cash-rich’
- scenario 2: ‘cash-rich centralisation’
- scenario 3: ‘cash-poor fragmentation’
- scenario 4: ‘cash-poor centralisation’.

7.2.1 Demand for anaesthetics service

Figure 16 shows the projected patient demand for anaesthetics for each of the four scenarios compared to the baseline and principal projections. Of the four scenarios for anaesthetics, demand is projected to increase the most in scenario 1 and the least in scenario 3. The principal projection is in line with scenario 1, indicating that the Delphi panel expects a high level of demand in the future.

Figure 16: Change in patient demand for anaesthetics service from 2013

Demand is projected to increase in all scenarios, the most in scenario 1 and the least in scenario 3.



Source: CfWI model of the anaesthetist and ICM workforce for England

The Delphi panel members for this CfWI in-depth review gave rationales for their answers. Scenario 1 (laissez-faire, cash-rich) is projected to increase demand the most because a cash-rich scenario would allow more demand for anaesthetics to be funded than a cash-poor scenario, while a laissez-faire political scenario would lose the economy of scale of centralised control. The Delphi panel believed that duplicated decision-making and the loss of economies of scale would outweigh the disadvantages of centralised control such as bureaucracy.

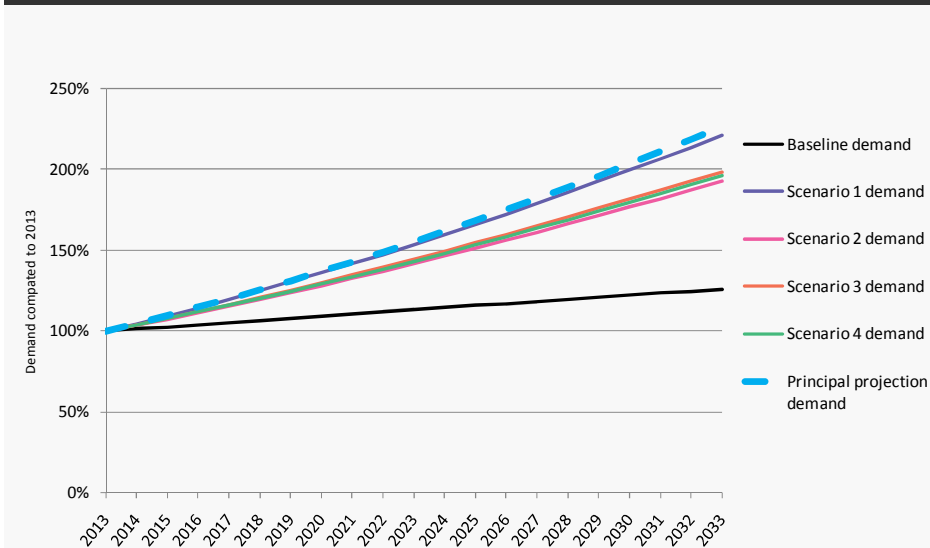
Scenario 3 (cash-poor, fragmentation) is projected to increase demand the least out of the four scenarios for anaesthetics. The Delphi panel believed that a loss of funding would outweigh increased costs due to a loss of economies of scale in a fragmentation scenario. The service would have greater patient need in this scenario but the money would not be available to pay for it, therefore employer demand would be low and the service delivered would be relatively poor compared with other scenarios.

7.2.2 Demand for ICM service

Figure 17 shows the projected demand for ICM for each of the four scenarios compared to the baseline. Of the four scenarios for ICM, demand is projected to increase the most in scenario 1 and the least in scenario 2. The principal projection is for greater demand than scenario 1, indicating that the Delphi panel believes a high demand level is likely in the future.

Figure 17: Change in demand for ICM service from 2013

Demand is projected to increase in all scenarios, the most in scenario 1 and the least in scenario 2.



Source: CfWI model of the anaesthetist and ICM workforce for England

Again, Delphi panel members gave rationales for their answers. Scenario 1 (laissez-faire, cash-rich) is projected to increase demand the most because – according to our Delphi panel – a cash-rich scenario would allow more demand for ICM to be funded than a cash-poor scenario, while a laissez-faire political scenario would lose the economy of scale of centralised control. The Delphi panel believes that repetition of decision-making and the loss of economy of scale would outweigh the disadvantages of centralised control such as bureaucracy, as with anaesthetics.

Scenario 2 (cash-poor, centralisation) is projected to increase demand the least out of the four scenarios for ICM. The Delphi panel believes that the loss of funding combined with the economy of scale of a centralised system would create the least employer demand for ICM.

The stories that detail each scenario can be viewed in Annex C. For more detailed reports on the scenario generation methodology used by the CfWI, refer to the technical papers series found at: www.cfwi.org.uk/our-work/research-development/cfwi-technical-paper-series.

7.3 Demand and supply scenarios for anaesthetics and ICM

Figure 18 shows demand and supply projections for the four scenarios, baseline and principal projections for anaesthetics and ICM in total.

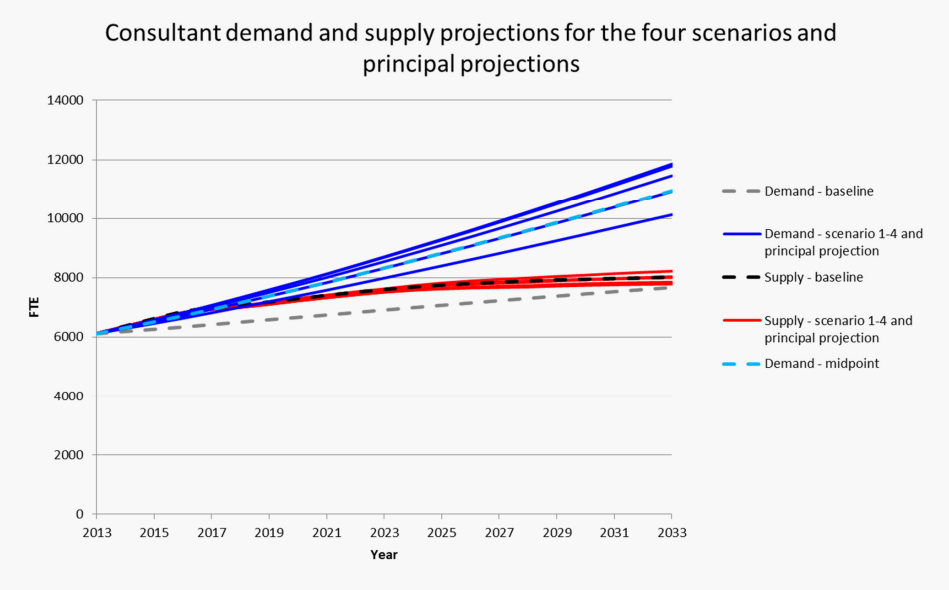
The projection for baseline demand is outstripped by the baseline supply, principal supply and all four scenarios for supply.

This would suggest that there is enough workforce supply to meet demand if demand increases only in line with the ageing and growing population. Other factors – such as rising average individual patient need – have been considered in the remaining demand projections, where demand is seen outstripping all supply scenarios.

It is therefore not inconceivable that this could have an impact on critically ill patients in ICUs, or there could be knock-on effects on other specialties that need to provide support and cover to ICUs, and surgical procedures could be delayed.

Figure 18: Demand vs. supply projections for CCT holders for the anaesthetics and ICM service

Demand scenarios outstrip most supply scenarios for the total workforce.



Source: CfWI model of the anaesthetist and ICM workforce for England

8. Proposals and next steps

8.1 Proposals and next steps

Based on the findings of this workforce review, the CfWI makes the following proposals to help balance workforce supply and patient demand in the future.

The CfWI proposes that HEE consider continuing to fill the current number of higher specialty trainee (ST3) posts for anaesthetists and intensivists in England to minimise the risk of short-term undersupply.

There is a growing supply of consultants but it is possible that the principal and scenario-specific demand projections will increase above principal and scenario-specific supply projections, in addition to the growing and ageing patient population. This could result in an undersupply of anaesthetist and intensivist CCT holders in the medium term and a potential need to increase ST3 posts following a further review in the next two to three years. The contribution of service to ICM by anaesthetists should be monitored. If the level of service contributed to ICM by anaesthetists decreases, then ICM will be undersupplied and require an increase in training numbers.

We are suggesting that HEE may wish to support the flexibility required to meet the needs of the future workforce by training an appropriate mix of specialists with single and dual CCTs, particularly noting that the future ICM service is likely to be delivered mostly by intensivists with dual CCTs. It is important that the proportions **between** specialties are kept as steady as possible. We recognise that it is likely that regional requirements for anaesthetists and intensivists will vary; however, it is important that ICM training posts are not provided at the expense of anaesthetics training posts.

The CfWI proposes that a workforce stocktake of anaesthetics and ICM be undertaken in two to three years' time.

Further workforce reviews should be undertaken in the next two to three years as the ICM specialty grows due to the complex nature and flexibility of service delivery between the anaesthetics and ICM specialties.

The CfWI proposes that HEE consider looking at working with commissioners and the relevant specialties and professions, and consider ways in which changes to the clinical skill mix may help manage the increasing perioperative role.

Anaesthetists are becoming more involved in the pre- and postoperative care of patients as well as intraoperative care. One option to manage the increasing perioperative role would be to train more physician associates/assistants (anaesthesia) (PA(A)s) and advanced critical care practitioners (ACCPs) while there is a plentiful supply of CCT holders, so that they have the opportunity to learn as well as deliver service, with a focus on complex decision-making. These staff groups would then have experience to support doctors if demand increases above projected baseline demand under conditions similar to the modelled scenarios.

There is a case for undertaking further research into the required number and dependency level of ICU beds in order to more accurately forecast demand.

The impact of *Shape of Training* (Greenaway, 2013) on the training pathways for anaesthetics and ICM is unknown. This, along with other inevitable uncertainties in the modelling over the medium term, emphasises the importance of regularly (at least every three years) reviewing the real-time data and matching these

against the projections in this report. This will ensure any divergences are identified so that projections can be modified accordingly with commensurate adjustments to the conclusions and recommendations on training numbers.

Annex A: Acknowledgements and Delphi participants

The CfWI sought input from a wide range of health professionals as part of the scoping, consultation and field visits for this in-depth review. These stakeholders involved in both specialties spoke to us individually, or participated in the summer 2013 horizon scanning focus groups, the September 2013 scenario generation workshop, or our February 2014 Delphi panel exercise. We would like to thank them for their contributions.

We would also like to thank our commissioners, Cris Scotter (DH) and John Stock (HEE) as well as colleagues from the Royal College of Anaesthetists and the Faculty of Intensive Care Medicine, for their advice and support throughout the project.

Table A1: Delphi participant categories

Category	No. of anaesthetics Delphi participants	No. of ICM Delphi participants
CfWI advisor	1	1
Deanery	2	-
Devolved administration (Scotland, Wales, Northern Ireland)	2	1
Doctor (clinician)	3	4
Doctor (junior/trainee)	3	2
Employer (grass roots)	-	1
Employer (umbrella organisation)	1	-
Health Education England	2	-
Local education and training board (LETB)	2	-
NHS Commissioning Board	-	1
Patient	1	1
Prof body for spec. under review	11	7
Regulator (e.g. GMC)	1	-
Related profession (e.g. nurse, allied health professional, technician)	1	3
Union (e.g. British Medical Association)	2	-
Workforce planner	1	-

Annex B: Data sources and modelling assumptions

Supply modelling assumptions

Table B1 shows the assumptions used to project future baseline workforce supply for anaesthetics and ICM services over the period to 2033. The CfWI system dynamics model uses a stock and flow approach, adding to the workforce each year the number of trainees who are estimated to become new CCT holders minus those expected to leave due to workforce attrition or retirement. Estimates of gender mix and future participation rates are used to convert headcount estimates to full-time equivalent (FTE) projections.

Assumptions for the four supply scenarios and principal projection were estimated by a Delphi panel, as shown in Annex D.

Table B1: Supply modelling assumptions

Model element/variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption
Annual number of anaesthetics trainees starting higher specialty training	L	<p>Health Education England (HEE), fill rates for 2011–12</p> <p>HEE medical trainee stocktake, October 2013</p> <p>Faculty of Intensive Care Medicine (FICM) data submission, 2013</p> <p>Higher Education Funding Council for England (HEFCE) medical student data, 2011</p>	N/A	<p>Anaesthetics trainee numbers are calculated by dividing the number of National Training Numbers (NTN) currently in use by the average length of training, to give 383 NTNs per year.</p> <p>The RCoA estimates approximately 80 per cent of new ICM training posts are taken from anaesthetics posts. Therefore the number of anaesthetics trainees is reduced to account for growth in ICM training, which is assumed to increase each year to 2016.</p> <p>The 2017 and onward figures are based on the average of 2012 to 2016 data.</p>

⁷ VH= very high; H=high; M=medium; L=low

Model element/ variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption																																			
		Communication with the Royal College of Anaesthetists (RCoA)		<table><tr><th>Year</th><th>Trainees starting ST3</th></tr><tr><td>2012</td><td>321</td></tr><tr><td>2013</td><td>324</td></tr><tr><td>2014</td><td>306</td></tr><tr><td>2015</td><td>301</td></tr><tr><td>2016</td><td>294</td></tr><tr><td>2017 and onwards</td><td>303</td></tr></table> <p>The gender ratio of future anaesthetics trainees is based on the gender ratio of all medical students from the HEFCE dataset (54 per cent women).</p>	Year	Trainees starting ST3	2012	321	2013	324	2014	306	2015	301	2016	294	2017 and onwards	303																					
Year	Trainees starting ST3																																						
2012	321																																						
2013	324																																						
2014	306																																						
2015	301																																						
2016	294																																						
2017 and onwards	303																																						
Annual number, and gender, of ICM trainees starting higher specialty training	M	FICM data submission, number of trainees, 2013	N/A	<p>Actual (a) number of posts and trainees for 2012 and 2013. Estimates (e) of the number of posts for 2014 to 2016. Assumed constant fill rate from 2013.</p> <p>For 2017 onwards, the average of 2012 to 2016 figures with a 100 per cent fill rate assumed.</p> <table><tr><th>Year</th><th>Posts</th><th>Fill rate</th><th>Trainees</th><th>Solo ICM trainees</th></tr><tr><td>2012 (a)</td><td>68</td><td>72.1%</td><td>49</td><td>5</td></tr><tr><td>2013 (a)</td><td>83</td><td>89.2%</td><td>74</td><td>7</td></tr><tr><td>2014 (e)</td><td>108</td><td>89.2%</td><td>96</td><td>10</td></tr><tr><td>2015 (e)</td><td>115</td><td>89.2%</td><td>103</td><td>10</td></tr><tr><td>2016 (e)</td><td>124</td><td>89.2%</td><td>111</td><td>11</td></tr><tr><td>2017 and onwards</td><td>100</td><td>100%</td><td>100</td><td>10</td></tr></table> <p>The model uses the gender ratio of the ICM trainee membership database, 68 per cent men and 32 per cent women.</p>	Year	Posts	Fill rate	Trainees	Solo ICM trainees	2012 (a)	68	72.1%	49	5	2013 (a)	83	89.2%	74	7	2014 (e)	108	89.2%	96	10	2015 (e)	115	89.2%	103	10	2016 (e)	124	89.2%	111	11	2017 and onwards	100	100%	100	10
Year	Posts	Fill rate	Trainees	Solo ICM trainees																																			
2012 (a)	68	72.1%	49	5																																			
2013 (a)	83	89.2%	74	7																																			
2014 (e)	108	89.2%	96	10																																			
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2016 (e)	124	89.2%	111	11																																			
2017 and onwards	100	100%	100	10																																			

Model element/variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption																					
Age profile of current and future trainees	H	Health and Social Care Information Centre (HSCIC) medical census, 2012 HEE stocktake, October 2013	N/A	The age profile of trainees entering ST3 is calculated by ageing the foundation trainees’ age profile by two or three years for core anaesthetics training or ACCS training respectively. This profile is used as a proxy across specialty and gender.																					
Annual number, and gender, of dual specialty trainees starting higher specialty training	M	FICM data submission, trainee recruitment survey, 2013 FICM data submission, current joint trainee data, 2013	N/A	The model uses the approximate current split of trainees choosing to dual train with anaesthetics, or another specialty, in order to identify the training path for future ICM trainees. The split of ICM trainees is assumed to be: 10 per cent solo ICM training 50 per cent dual with anaesthetics 40 per cent dual with other specialty <table><tr><th>Year</th><th>Anaesthetics and ICM dual trainees</th><th>Other and ICM dual trainees</th></tr><tr><td>2012</td><td>25</td><td>20</td></tr><tr><td>2013</td><td>37</td><td>30</td></tr><tr><td>2014</td><td>48</td><td>39</td></tr><tr><td>2015</td><td>51</td><td>41</td></tr><tr><td>2016</td><td>55</td><td>44</td></tr><tr><td>2017 and onwards</td><td>50</td><td>40</td></tr></table> The model uses the gender ratio of the ICM trainee membership database, 68 per cent men and 32 per cent women.	Year	Anaesthetics and ICM dual trainees	Other and ICM dual trainees	2012	25	20	2013	37	30	2014	48	39	2015	51	41	2016	55	44	2017 and onwards	50	40
Year	Anaesthetics and ICM dual trainees	Other and ICM dual trainees																							
2012	25	20																							
2013	37	30																							
2014	48	39																							
2015	51	41																							
2016	55	44																							
2017 and onwards	50	40																							
Length of training	M	HEE Stocktake, October 2013 FICM data submission, 2013	N/A	Six and a half years for anaesthetics: The RCoA data shows 8.7 years is the average length of training from CT1/ACCS1 to CCT, taking into account full time (FT) and less than full time (LTFT) trainees. This also accounts for																					

Model element/ variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption
		RCoA data, 2013		<p>maternity and out of programme (OOP). Using the HEE stocktake, the calculated weighted average length of core anaesthetics and ACCS training is 2.2 years. Therefore average length of training from ST3 to CCT is $8.7 - 2.2 =$ six and a half years.</p> <p>Eight years for dual AICM: Assumed to be the average length of training, plus 18 months.</p> <p>Five years for ICM: The FICM data shows seven years is the indicative length of training from CT1 to CCT. Using the HEE stocktake, 0 per cent of HST ICM trainees are LTFT, so no adjustment made for LTFT trainees. Subtracting two years for core training will result in an average length of training to be five years from ST3 to CCT.</p> <p>Six and a half years for OICM: The FICM data shows eight and a half years is the indicative length of dual training from CT1 to CCT. Subtracting two years for core training will result in six and a half years training from ST3 to CCT.</p>
Current number, and gender, of trainees in higher specialty training	VH	<p>HEE Stocktake, October 2013</p> <p>HEFCE medical student data, 2011</p> <p>FICM data submission, 2013</p>	N/A	<p>The HEE stocktake shows 2,485 anaesthetics NTN in use. The model uses the gender ratio of all medical students from the HEFCE dataset.</p> <p>The FICM data submission shows 123 trainees currently in training for the single and dual CCT programmes. The model uses the gender ratio of the ICM trainee membership database, 68 per cent men and 32 per cent women.</p>

Model element/ variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption												
Percentage of leavers from higher specialty training (attrition)	H	RCoA, Workforce planning data, 2013	The assumptions have been verified with the RCoA and FICM.	Anaesthetics net attrition rate calculated as 6.4 per cent during period ST3-7 as a proportion of FT and LTFT students. Anaesthetics attrition rates are used as a proxy for ICM, and dual trainees.												
Percentage of leavers following successful completion of higher specialty training	N	No specific data available to the CfWI	The CfWI estimate used due to lack of evidence.	1 per cent (assumed)												
Current number of trained specialists in the workforce	H	General Medical Council (GMC), register data, 2014 HSCIC medical workforce statistics, September 2013	N/A	<p>The model uses the total number of anaesthetics and ICM consultants working in the NHS (6,250 in 2013), plus 100 to represent CCT holders in other medical specialities who work in ICM. The 100 is an approximation based on GMC registration data.</p> <p>The 6,350 consultants are divided into four categories of qualification, as shown in the table below. The ratio of doctors in the four categories is based on the number of doctors on the GMC specialist register for anaesthetics only, ICM only, anaesthetics and ICM, or ICM and another medical specialist register.</p> <table><tr><th>Specialty</th><th>Headcount</th></tr><tr><td>Anaesthetics</td><td>5834</td></tr><tr><td>ICM</td><td>6</td></tr><tr><td>AICM</td><td>410</td></tr><tr><td>OICM</td><td>100</td></tr><tr><td>Total</td><td>6350</td></tr></table>	Specialty	Headcount	Anaesthetics	5834	ICM	6	AICM	410	OICM	100	Total	6350
Specialty	Headcount															
Anaesthetics	5834															
ICM	6															
AICM	410															
OICM	100															
Total	6350															

Model element/ variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption
Current age profile of trained specialists in the workforce	H	HSCIC medical workforce statistics, September 2012 GMC, register data, 2014	N/A	The age profile uses HSCIC 2012 data as a proxy for 2013 because the 2013 data is not yet available. Data is used in one-year age bands for men and women. This is used for the anaesthetist, solo intensivist, and other CCT and ICM qualified specialists. The dual anaesthetist and ICM CCT holder data uses an age profile from the GMC.
Annual number of specialists entering the system from overseas	L	No specific data available to the CfWI	A CfWI estimate used. See workforce attrition rate for details.	The net workforce attrition rate accounts for specialists joining from overseas by continuing the trend of the previous five years.
Annual number of specialists entering the system via an equivalent qualification (CESR)	H	GMC statistics for the UK, 2011-12 GMC, register data, 2014 Communication with the FICM	N/A	Seven anaesthetics CESRs awarded per year. This is the average of CESRs awarded for anaesthetics in 2011 and 2012, scaled down to represent England only. The FICM has suggested one CESR per year for ICM.
Age profile of annual number of specialists entering the system via a CESR	M	No specific data available to the CfWI	A CfWI estimate used.	Assume the same age profile as the consultant workforce.
Annual number of specialists returning having previously left	L	No specific data available to the CfWI	A CfWI estimate used. See workforce attrition rate for details.	The net workforce attrition rate accounts for specialists returning to the workforce by continuing the trend of the previous five years.

Model element/ variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption
Attrition rate for trained specialist workforce	M	HSCIC medical census, 1998 to 2012	N/A	<p>Historical data is used to build a picture of the likelihood of a consultant leaving the workforce due to retirement, by age and gender. For example, 19 per cent of men anaesthetists aged 59 leave the workforce. 20 per cent of women anaesthetists aged 59 leave, and 49 per cent of those aged 64 leave.</p> <p>The non-retirement net attrition rate is calculated from year-on-year total headcount, an estimate of the number of newly qualified joiners to the workforce by year, and an estimate of the number of retirements each year.</p> <p>The historical values vary widely between years. It is calculated that on average 1.1 per cent of men anaesthetists below the age of 51 leave each year and 0.7 per cent of women anaesthetists below the age of 58 leave each year. This is based on the average attrition rate per year for the age group from 2003 to 2011.</p> <p>Anaesthetics attrition data is used as a proxy for the ICM workforce because the low number of ICM doctors does not allow an accurate measure of their attrition.</p>
Annual number of specialists entering the system as an academic	H	HEE stocktake, October 2013	N/A	<p>Two CCT holders join the anaesthetics workforce per year.</p> <p>One CCT holder joins the ICM workforce per year.</p>
Age profile of annual number of specialists entering the	L	No specific data available to the CfWI	A CfWI estimate used.	Aged 40 (assumed) for all specialties.

Model element/variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption															
system as an academic.																			
Ratio of time spent delivering service in each specialty	L	FICM data submission, 2013 RCoA Census, 2010	N/A	<p>The RCoA census indicated 1,462 anaesthetics consultants (in England) worked at least one session in ICU (of 5,639 anaesthetists recorded in the census).</p> <p>This is 25.9 per cent of the workforce. Assuming one PA is 10 per cent of an anaesthetist's time, then the minimum time spent in ICU by anaesthetics CCT holders will be (25.9 per cent x 10 per cent =) 2.6 per cent. This value may be much higher as the RCoA has indicated consultants are likely to work more than one PA and the figure may range from 2.6 to approximately 25 per cent. No data is available to confirm this for England.</p> <p>It is assumed that single ICM CCT holders provide 100 per cent service contribution to ICM.</p> <p>The FICM census among fellows indicated a 50 per cent service contribution to ICM and 50 per cent to anaesthetics/other.</p> <table><tr><th></th><th>Anaesthetics service</th><th>ICM service</th></tr><tr><td>Anaesthetics CCT</td><td>97.4% to 75%</td><td>2.6% to 25%</td></tr><tr><td>Anaesthetics and ICM CCT</td><td>50%</td><td>50%</td></tr><tr><td>ICM CCT</td><td>0%</td><td>100%</td></tr><tr><td>Other and ICM CCT</td><td>0%</td><td>50%</td></tr></table> <p>It is assumed these ratios do not vary by gender.</p>		Anaesthetics service	ICM service	Anaesthetics CCT	97.4% to 75%	2.6% to 25%	Anaesthetics and ICM CCT	50%	50%	ICM CCT	0%	100%	Other and ICM CCT	0%	50%
	Anaesthetics service	ICM service																	
Anaesthetics CCT	97.4% to 75%	2.6% to 25%																	
Anaesthetics and ICM CCT	50%	50%																	
ICM CCT	0%	100%																	
Other and ICM CCT	0%	50%																	

Model element/ variable	Data confidence rating ⁷	Source of data/assumption	Validation	Data/assumption															
Participation rate of the trained specialist workforce by gender and age	H	HSCIC medical census, 2012	N/A	<p>2012 HSCIC FTE and HC data have been used to calculate the participation rate for anaesthetists, coded as occupation code 091 in the HSCIC census, in one-year age bands.</p> <p>The average of 2010 to 2012 participation rates are calculated from HSCIC FTE and HC data for intensivists, coded as 034 and 095, in one-year age bands.</p> <p>For dual anaesthetics and ICM CCT holders, the average of the anaesthetics and ICM participation rates is used.</p> <p>For dual Other and ICM CCT holders, the average of the ICM and acute participation rate is used. We use acute since historically, this is the second most popular parent specialty after anaesthetics for the joint CCT.</p> <p>The table below indicates the average participation rates used in the model:</p> <table><tr><th></th><th>Men</th><th>Women</th></tr><tr><td>Anaesthetics CCT</td><td>97.8%</td><td>95.8%</td></tr><tr><td>Anaesthetics and ICM CCT</td><td>97.5%</td><td>95.0%</td></tr><tr><td>ICM CCT</td><td>97.8%</td><td>95.5%</td></tr><tr><td>Other and ICM CCT</td><td>95.3%</td><td>91.8%</td></tr></table>		Men	Women	Anaesthetics CCT	97.8%	95.8%	Anaesthetics and ICM CCT	97.5%	95.0%	ICM CCT	97.8%	95.5%	Other and ICM CCT	95.3%	91.8%
	Men	Women																	
Anaesthetics CCT	97.8%	95.8%																	
Anaesthetics and ICM CCT	97.5%	95.0%																	
ICM CCT	97.8%	95.5%																	
Other and ICM CCT	95.3%	91.8%																	

Source: CfWI anaesthetics and intensive care medicine system dynamics model for England

Demand modelling assumptions

The following tables show the assumptions used to forecast future baseline demand for anaesthetics and ICM services due to demographic changes. Baseline demand accounts for both the increased size of the population and also the changing age and gender balance (particularly a higher proportion of older people) to 2033.

In order to obtain the baseline forecasts, the CfWI calculated increasing demand for specialty care due to population growth using ONS projections of England's population, and weightings for specialty services requirement by age and gender. The baseline growth of the population in England uses the 2012-based principal population projection for England that assumes:

- a long-term average completed family size of 1.9 children per woman
- life expectancy at birth in 2037 of 84.3 years for men and 87.5 years for women, with constant rates of mortality improvement assumed thereafter
- long-term annual net migration to the UK of +143,500 per year.

The relative demand from people in a particular age band and gender is calculated for the whole population, and totalled for each future year to give an estimate of the overall future specialty service demand by year.

The baseline weightings for specialty service use were calculated for both inpatient and outpatient attendances. Inpatient attendances are based on finished consultant episodes (FCEs) from Hospital Episode Statistics (HES) data, weighted by age. Outpatient attendances are based on FCEs from HES data, weighted by age and gender.

Note that assumptions for the four demand scenarios and principal projection were estimated by a Delphi panel, as shown in Annex D.

Table B2: Demand assumptions for anaesthetics

Demand for anaesthetics services	Demographic multiplier for 2033	Variable	Source of data	Notes/assumptions
Demand baseline	1.25	Future population projections	Office for National Statistics, Table A3-4, principal projection - England population single year of age, 2012-based.	
		FCE outpatient data	NHS Health and Social Care Information Centre, Hospital Episode Statistics for England. Main specialty by age group for all outpatient attendances: All, 2012-13.	Anaesthetics FCEs are low so all surgical and anaesthetics FCEs are used, assuming all FCEs classed as surgical will require anaesthetics services.
		FCE inpatient data	NHS Health and Social Care Information Centre, Hospital Episode Statistics for England. Main specialty by age group for all inpatient attendances (admitted patient care): All, 2012-13.	Anaesthetics FCEs are low so all surgical and anaesthetics FCEs are used, assuming all FCEs classed as surgical will require anaesthetics services. Assume same across genders.

Table B3: Demand assumptions for ICM

Demand for ICM services	Demographic multiplier for 2033	Variable	Source of data	Notes/assumptions
Demand baseline	1.26	Future population projections	Office for National Statistics, Table A3-4, principal projection – England population single year of age, 2012-based.	
		FCE outpatient data	NHS Health and Social Care Information Centre, Hospital Episode Statistics for England. Main specialty by age group for all outpatient attendances: All, 2012-13.	Anaesthetics FCEs (including surgical FCEs, see above) are used as a proxy to represent the patient demographic.
		FCE inpatient data	NHS Health and Social Care Information Centre, Hospital Episode Statistics for England. Main specialty by age group for all inpatient attendances (admitted patient care): All, 2012-13.	Critical care medicine FCEs used, by age. Assume same across genders.

For more detailed reports on the scenario generation methodology used by the CfWI, refer to the technical papers series found at: <http://www.cfwi.org.uk/our-work/research-development/cfwi-technical-paper-series>.

Annex C: Scenario generation

In this Annex we set out in more detail the four challenging but plausible scenarios that were created by participants at our anaesthetics and intensive care medicine scenario generation workshop held in September 2013. These driving forces and scenarios were developed via a tried-and-tested process by a range of expert stakeholders to identify a range of high-impact, high-uncertainty clusters for modelling purposes.

They do not represent the views of any single organisation such as the CfWI, the DH, HEE, or any professional body, nor can they be attributed to individual workshop participants.

The four challenging but plausible scenarios developed for the next 20 years (2013 to 2033) were:

- **Scenario 1 ‘Laissez-faire, cash rich’** (A1D1): **Less** political involvement in how the NHS Outcomes Framework is delivered, coupled with **more** cash for the NHS
- **Scenario 2 ‘Cash-rich centralisation** (A2D1): **More** political involvement in how the NHS Outcomes Framework is delivered, coupled with **more** funding for the NHS
- **Scenario 3 ‘Cash-poor fragmentation** (A1D2): **Less** political involvement in how the NHS Outcomes Framework is delivered, coupled with **less** cash for the NHS
- **Scenario 4 ‘Cash-poor centralisation’** (A2D2): **More** political involvement in how the NHS Outcomes Framework is delivered, coupled with **less** cash for the NHS.

Table C1: High-impact, high-uncertainty clusters from our scenario generation process

		Cluster A	
		Less political involvement	More political involvement
Cluster D	Increase in GDP spent on health	Scenario 1	Scenario 2
	Decrease in GDP spent on health	Scenario 3	Scenario 4

Source: CfWI scenario generation workshop, September 2013

Scenario 1: ‘Laissez-faire, cash rich’

SCENARIO 1	A1D1: Less political involvement in how the NHS Outcomes Framework is delivered, coupled with more cash for the NHS
GROUP MEMBERS	Dr Anna Batchelor, Dr Mark Bellamy, Dr Jane Eddleston, Professor Tim Evans, Dr Carl Waldmann. Scribe: Felicity Howdle
2013	There have been several recent changes in the healthcare system that could impact the workforce. ICM is now a standalone specialty, giving trainees the choice of a single certificate of completion of training (CCT) in ICM or a dual CCT with ICM and another specialty. The single CCT ICM

training programme is currently in its second year of intake and has so far not recruited its full complement. Trainees hedge their bets (as they do not know the future prospects with a single CCT), with anaesthesia remaining the preferred partner speciality. Emergency medicine and other medical specialities also attract significant numbers.

There is also a new commissioning system for the NHS informed by 75 clinical reference groups (CRGs). The purpose of these is to set national standards for the service so there is equity of access and outcomes. There is recognition that some types of emergency work have poor outcomes, particularly for emergency general surgery patients, which could be improved with better perioperative standards. There is also an opportunity to develop new roles in the workforce if politicians remove bureaucratic constraints and set up appropriate infrastructure to allow these roles to emerge.

There is increasing demand for ICM beds due to increasing complexity, acuity and population size. The workforce is also ageing, which affects the supply of intensivists available to deliver care.

Demand for ICM services increases due to a shift towards 24-7 service delivery and the introduction of the first service specification for adult critical care. Clinical commissioning groups (CCGs) endorse specialist services, reducing the investment in general services. This has a negative effect on smaller district general hospitals that do not have specialist services.

Poor handling of pensions and renegotiation of contracts prompts a significant proportion of the over-50 workforce to reduce its working hours or retire early.

Random healthcare events such as a flu epidemic increase demand for critical care but subsequently attract a cash injection and an opportunity to improve services.

Full implementation of service specifications occurs from 2017, leading to plurality and duplication of services. Private providers offer contracts that are different from the NHS. Most of the first tranche of single ICM CCT trainees complete their CCTs in 2019, but there is a shortfall of consultants due to delays in training and insufficient trainees choosing the single CCT programme. Existing consultants are pushed by employers into delivery of core business, which has a knock-on effect on anaesthesia as consultants are pulled back into ICM to cover the shortfall.

2023

By 2020 there is a big expansion of services based on the service specification. The Government provides a fixed financial envelope for these services because they can see exactly what they are buying thanks

to the plurality of services in place. There is less investment in general services, which causes difficulty recruiting consultants into these posts. There is less professional autonomy as terms and conditions become more locally negotiated and new pension changes come in, impacting on the quality of care provided.

2033 By 2033 there is plurality of services, with the NHS and private providers offering very similar services with different standards between specialist services (which are commissioned to a higher specification) and district general hospitals. Services are therefore tiered. A mixed workforce provides 24-7 care, with different shift patterns compared to 2013. The model of care at the bedside changes the nurse-patient ratio. The treatment of existing consultants and the preference of employers for single ICM or dual CCTs impacts the training choices made by trainees. The effect of this is moderated by methods such as telemedicine, which helps treat patients closer to home whenever appropriate.

Scenario 2: ‘Cash-poor fragmentation’

SCENARIO 2 A1D2: **Less** political involvement in how the NHS Outcomes Framework is delivered, coupled with **less** cash for the NHS

GROUP MEMBERS Professor Julian Bion, Richard Bryant, Dr Carolyn Evans, Mr Bob Greatorex, Dr Nigel Penfold. Scribe: Peter Wood

2013 From 2013 decreased central funding for health results in disinvestment in infrastructure and ultimately has an impact on ICM and anaesthetics training. In response to demand, ICM training numbers increase but anaesthetics posts remain unchanged. The reconfiguration agenda develops as a way to save money, to improve outcomes by volume, and to address rotas, the working time directive and expectations of seven-day services. The objective of care closer to home leads to challenges with hospital doctors’ contracts and – especially – with GP contracts. Intense negotiations between the British Medical Association (BMA) and the Government commence. A mismatch between GP contracts and training numbers arises. Meanwhile, variable commissioning from clinical commissioning groups (CCGs) leads to provider autonomy. This fragmentation leads to variable standards of healthcare delivery.

Due to increasing demand for some kinds of surgery, demand for anaesthetists rises, as does the need for ICM. In both areas, growing pressure on staff is exacerbated by the ‘more for less’ agenda. Tensions arise in and between professions, leading to fractures in professional relationships. Anaesthetics and ICM practitioners retire, leave to work abroad or choose to join a variety of other fields. The workforce gap begins to be filled by less highly skilled anaesthetists and intensivists

from the EEA, physicians’ assistants – anaesthesia (PAAs) and advanced critical care practitioners (ACCPs).

By now, patient access worsens. There is growing health inequality between rich and poor and also between rural and urban populations. More and more people are given personal budgets, while co-funding top-up arrangements are introduced to ease the drop in central funding.

2023

By 2023, the outcome of GP contract negotiations and the extent of provider autonomy are dependent on the outcome of recent general elections. Healthcare is rationed, increasing the burden on the welfare state. Health inequalities between rich and poor and between rural and urban populations worsen.

Later in the decade a number of factors start to mitigate the downward cascade of the healthcare system. Economic recovery and a change in government result in more money for healthcare, which facilitates technological research and pharmacological development. Better public education increases awareness of how to stay healthy, of constrained healthcare resources and of end-of-life choices, all of which help to slow the disintegration of the NHS.

2033

Towards 2033, a healthcare crisis or pandemic occurs. Mitigating strategies are not established and the NHS is not able to cope. The healthcare system as we know it disintegrates.

Scenario 3: 'Cash-rich centralisation'

SCENARIO	A2D1: More political involvement in how the NHS Outcomes Framework is delivered, coupled with more cash for the NHS
GROUP MEMBERS	Carole Boulanger, Dr Liam Brennan, Irene Dalton, Dr Debbie Nolan, Daniel Waeland. Scribe: Ian Edwards
2013	<p>From 2013, following the recent Health and Social Care Act, there is no change in the health sector for two years until the next general election in 2015. The election delivers a change of government. The new government begins a consultation period, and by 2017 legislation is enacted to make changes in the health sector. These changes allocate an additional 3 per cent of GDP to health budgets, centralise services and introduce new commissioning standards. There is an increase in spending on public health education to reduce obesity and substance abuse. Strategies to manage public expectations about the futility of some care and the management of death are also implemented. As part of the centralisation agenda, terms and conditions of service are brought back under a central umbrella.</p> <p>In 2020, the result of the general election does not alter the direction of change in the health sector. There is cross-party agreement that the changes will deliver the best outcomes for patients. The extra cash available funds training and research as well as investment in teams and 24-7 services. However, the spending increase does not cover the cost of more physicians, with non-clinical roles prioritised to enable 24-7 services. There is a rise in the number of training posts but only in targeted areas, specifically intensive care medicine, critical care services and perioperative medicine. Robust infrastructure is implemented to enable electronic patient records. Out-of-hours services are supported by increasing use of telemedicine.</p>
2023	In 2023 patient spending power leads to more demand for local services and creates a divide between the specialist services provided in centralised urban sites and generalist services in rural locations.
2033	By 2033 the increased health spending has boosted quality of care, leading to falling co-morbidity and mortality rates. The health of the whole population improves and cost savings are made as a large proportion of the population stays healthier and of working age for longer.

Scenario 4: ‘Cash-poor centralisation’

SCENARIO	A2D2: More political involvement in how the NHS Outcomes Framework is delivered, coupled with less cash for the NHS
GROUP MEMBERS	Air Commodore Alison Amos, Fiona Cameron, Dr Mike McAlindon, Dr Katy Nicholson, Professor David Sowden, Dr Paul Spargo. Scribe: Jack Lawrence
2013	<p>Soon after 2013, the Government centralises control of the NHS including its terms and conditions of employment. Due to the financial difficulties facing the country, the Government decides to reduce the NHS budget by 3 per cent of GDP. The medical profession is challenged to do more for less and commissioning standards lower.</p> <p>Investment in new and innovative technology and infrastructure reduces and there is little in the way of research and development. Investment in training and education also declines. The continued pressure to work harder and achieve more for less in a time of healthcare rationing causes the workforce to feel alienated and excluded. The constraints on healthcare are felt most keenly by patients. Provision reduces and patients lose choice due to a lack of alternative providers. To manage increasing demand, further rationing is required, increasing the burden on social care and the welfare state.</p> <p>Further attempts to reduce costs lead the Government to negotiate changes to the central terms and conditions of service of the healthcare workforce. Attempts to reduce wages cause a schism in the relationship between the professional bodies and the Government. The financial burden on patients increases as they are expected to contribute, directly or indirectly, to their healthcare. Health inequalities worsen.</p>
2023	<p>Through the 2020s a hole in the workforce appears as professionals migrate abroad. There are moves to employ non-medical practitioners to fill the gap. Changes to training are implemented to produce generalists capable of delivering services. However, there are fewer workforce opportunities in a system with less money and fewer services on offer.</p> <p>Due to the lack of money and fewer career opportunities, it becomes harder to attract and retain professionals. There is a decline in medical student numbers and an increase in the number of doctors emigrating to work abroad. Early retirement becomes a more attractive option. In an attempt to counter this, the Government introduces an increase in the statutory retirement age.</p> <p>By 2025, health outcomes are so much worse that a significant review of healthcare policy is unavoidable. The situation is unsustainable and</p>

system pressures force a complete reversal of the prevailing policy. The attempt to reverse the decline of the NHS is a slow process.

Funding levels lift, allowing for new technology, training and research and job expansion for physicians. However, reduced medical school output during the previous decade drives a need to look internationally for new doctors; home-grown doctors are not qualifying at a fast enough rate.

2033

By 2033 attempts are made to increase the domestic intake to medical training, but there are still difficulties convincing prospective medics that anaesthetics and intensive care medicine in Britain is a promising career path. Similarly, it remains difficult to entice those who left to return.

From patients' point of view, the scope of available treatment increases. People need to contribute less financially and start to experience improving patient care. Both the workforce and patients begin to feel happier, but progression of the anaesthetics and ICM professions remains an ongoing challenge.

Annex D: Delphi panel results

A Delphi expert panel was used to quantify key assumptions for the future workforce in each of the four scenarios and a principal projection. The questions related to either supply or demand and are shown below. The tables below show the average (median) values obtained from the Delphi panel exercise.

Delphi questions – anaesthetist workforce supply assumptions

- What do you think the average participation rate of anaesthetics CCT holders will be in 2033?
- What do you think would be the average retirement age for anaesthetics CCT holders by 2033?

Table D1: Delphi supply assumptions for anaesthetist care in 2033

Supply of anaesthetist care in 2033	Average participation rate of anaesthetists aged 54 and below	Average participation rate of anaesthetists aged 55 and above	Average retirement age for anaesthetists
Supply baseline*	0.96 (women)* 0.99 (men)*	0.93 (women)* 0.93 (men)*	62 (women)* 62 (men)*
Scenario 1	0.92 (women) 0.96 (men)	0.90 (women) 0.90 (men)	62 (women) 65 (men)
Scenario 2	0.90 (women) 0.95 (men)	0.90 (women) 0.90 (men)	62 (women) 64 (men)
Scenario 3	0.92 (women) 0.97 (men)	0.90 (women) 0.90 (men)	64 (women) 65 (men)
Scenario 4	0.90 (women) 0.95 (men)	0.90 (women) 0.90 (men)	61 (women) 64 (men)
Principal projection	0.93 (women) 0.97 (men)	0.90 (women) 0.90 (men)	62 (women) 64 (men)
Source: Delphi panel exercise (median estimate)			
* Supply baseline estimates are based on actual HSCIC workforce average for 2013			

Delphi questions – ICM workforce supply assumptions

- What do you think the average participation rate of trained intensivists (CCT holders) will be in 2033?
- What do you think will be the average retirement age of trained intensivists (CCT holders) by 2033, by gender?

Table D2: Delphi supply assumptions for ICM care in 2033

Supply of intensivist care in 2033	Average participation rate of intensivists aged 54 and below	Average participation rate of intensivists aged 55 and above	Average retirement age for intensivists
Supply baseline*	0.96 (women)* 0.99 (men)*	0.93 (women)* 0.93 (men)*	62 (women)* 62 (men)*
Scenario 1	0.75 (women) 0.95 (men)	0.75 (women) 0.80 (men)	62 (women) 63 (men)
Scenario 2	0.70 (women) 0.95 (men)	0.75 (women) 0.80 (men)	60 (women) 62 (men)
Scenario 3	0.80 (women) 0.95 (men)	0.80 (women) 0.85 (men)	62 (women) 63 (men)
Scenario 4	0.75 (women) 0.93 (men)	0.75 (women) 0.75 (men)	60 (women) 60 (men)
Principal projection	0.80 (women) 0.95 (men)	0.75 (women) 0.85 (men)	62 (women) 63 (men)
Source: Delphi panel exercise (median estimate)			
* Supply baseline estimates are based on actual HSCIC workforce average for 2013			

Delphi questions – Anaesthetics patient demand assumptions

- What percentage of today's need is met by today's anaesthetics provision?
- By 2033 will individual patient need for anaesthetist time change, on average, relative to today?
- By 2033, as a result of workforce efficiency and productivity, will more or less anaesthetist time be needed to meet the same amount of patient need, relative to today?
- By 2033, how much trained anaesthetist time will be commissioned, relative to today?
- By 2033, as a result of perioperative work becoming a core part of the anaesthetist's role, how much extra anaesthetist time will be needed undertaking perioperative work to meet the same amount of patient need, relative to today?

The Delphi panel answers have been converted into a multiplier that indicates how much greater the demand will be in the future compared to current demand. Table D3 below shows the questions that were used to indicate future demand.

For our **baseline demand** we only used the demographic multiplier (projected demand based on population growth and ageing population). For the four **demand scenarios** we also use the median Delphi responses on changes to average patient need and to productivity and efficiency. The formula used to project scenario patient demand in 2033 is:

Demographic multiplier x patient need multiplier x productivity and efficiency multiplier

So for example for demand scenario 1, we project patient demand for anaesthetist services in 2033 to be around 47 per cent higher than it was in 2013 ($1.25 \times 1.35 \times 1.15 = 1.94$).

Table D3: Delphi demand assumptions for anaesthetic care in 2033

Demand for anaesthetics care in 2033	Multiplier due to population growth and ageing population*	Multiplier due to change in patient need	Multiplier due to change in productivity and efficiency #
Demand baseline	1.25*	–	–
Scenario 1	1.25*	1.35	1.15 #
Scenario 2	1.25*	1.30	1.17 #
Scenario 3	1.25*	1.20	1.10 #
Scenario 4	1.25*	1.20	1.20 #
Principal projection	1.25*	1.30	1.20 #

Source: Delphi panel exercise (median), ONS (2013), HSCIC (2000-2013a)
 * Demographic multiplier (base year of 2013) # Estimates above 1.0 mean *less* productive than in 2013

Delphi questions – ICM patient demand assumptions

- What percentage of today's need is met by today's ICM provision?
- By 2033 how will individual patient need for intensivist time change, on average, relative to today?
- By 2033, as a result of workforce efficiency and productivity, will more or less intensivist time be needed to meet the same amount of patient need, relative to today?
- By 2033, how much trained CCT-trained intensivist time will be commissioned, relative to today?

The Delphi panel answers have been converted into a multiplier that indicates how much greater the demand will be in the future compared to current demand. Table D4 below shows the questions that were used to indicate future demand. We use the same formula to estimate projected demand in 2033 as shown above.

Table D4: Delphi demand assumptions for ICM care in 2033

Demand for intensivist care in 2033	Multiplier due to population growth and ageing population*	Multiplier due to change in patient need	Multiplier due to change in productivity and efficiency #
Demand baseline	1.26*	–	–
Scenario 1	1.26*	1.50	1.20 #
Scenario 2	1.26*	1.25	1.25 #
Scenario 3	1.26*	1.40	1.15 #
Scenario 4	1.26*	1.28	1.25 #
Principal projection	1.26*	1.48	1.25 #

Source: Delphi panel exercise (median), ONS (2013), HSCIC (2000-2013a)

* Demographic multiplier (base year of 2013) # Estimates above 1.0 mean *less* productive than in 2013

Full outputs from the Delphi process for anaesthetics and ICM can be made available on request.

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