

Securing the future workforce supply

Trauma and orthopaedic surgery stocktake



September 2014

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Executive summary

The Centre for Workforce Intelligence (CfWI) was commissioned by Health Education England (HEE) and the Department of Health (DH) to undertake a stocktake of the trauma and orthopaedic surgery (T&O) workforce in England. The focus of this stocktake is on T&O surgeons who have completed their Certificate of Completion of Training ('CCT holders', who are typically employed as consultants).

The CfWI estimated the future level of workforce supply that would enable current levels of T&O surgery per patient to be maintained, and the number of higher specialty training numbers required to ensure that supply is broadly in balance with expected patient demand by the end of the projection period (2028). This report has been provided to Health Education England and will help inform the decisions they make as part of their annual workforce planning process.

Key findings

The T&O consultant workforce has grown strongly over the past decade from 1,265 full-time equivalent staff (FTE) in 2002 to 2,015 FTE in 2012 (HSCIC, 2013); a 59 per cent increase (a compound annual growth rate of 4.75 per cent). T&O consultant surgeons account for 28 per cent of the consultant surgical workforce, and 5 per cent of the total medical consultant workforce.

There were 145 specialty training level 3 (ST3) T&O posts available in 2010-11 which fell to 121 in 2012-13, a 17 per cent decline. T&O is a very popular specialty and there are always many more applications than places available. The competition ratio (CR) for T&O is consistently higher than the average across all surgery ST3 posts and the fill rate has been at or near 100 per cent over the last three years.

There has been an average annual decline of -0.3 per cent in T&O activity per consultant between 2003-04 and 2012-13. This is because, even though there was a 34 per cent increase in activity over the last nine years, the consultant workforce grew at an even faster rate. This figure is broadly consistent with the median Delphi panel estimate of around -0.5 per cent change in productivity per annum to 2028.

The CfWI has produced two workforce supply projections, based on different T&O trainee intake assumptions. The first scenario assumes that future T&O trainee intake is maintained at recent levels (using average ST3 accepted offers over the last three annual recruitment rounds). The second supply scenario assumes that ST3 intake increases to the current maximum possible level. Both projections are discussed in greater detail in the principal projection section.

Under the first supply scenario (based on around 122 trainees per year) the CfWI projects the number of T&O surgeons to grow to around 2,720 (FTE) by 2028, a 36 per cent increase on 2012 levels. Projected headcount levels would increase by 34 per cent to around 2,800 by 2028.

Under the second supply scenario (based on around 173 trainees per year), the CfWI projects the number of T&O surgeons to grow to around 3,120 (FTE) by 2028, a 55 per cent increase on 2012 levels.

By contrast, the Delphi panel expected the level of commissioned service for T&O surgeon time will be just 10 per cent higher by 2028.

The CfWI's assessment is that if the ST3 intake is maintained at recent levels (the first scenario) there is a risk of workforce oversupply until around 2022, followed by a risk of undersupply over the remainder of the projection period to 2028.

However, if there is no intervention or cap on ST3 recruitment, and the ST3 intake reflects the maximum commissions currently possible by recycling all national training numbers (NTNs) (a place is 'recycled' after a trainee has relinquished their NTN on completion of training), the second scenario, **there is a significant risk of oversupply over the entire 15-year projection period.**

Our projection of patient demand for T&O surgery forecasts growth of 50 per cent by 2028, as a result of a growing and ageing population, greater average individual patient need and decreasing surgeon productivity. However, Delphi panellists estimated that level of commissioned services will increase by just 10 per cent by 2028. This shows the stark challenge facing both the commissioners and providers of T&O surgical services as they seeking to navigate between tight healthcare funding and rising patient demand. **There is a significant risk that the supply of T&O surgeons over the projection period will exceed the levels of service that the NHS can afford to commission.** This may pose uncomfortable career choices for some new CCT holders over the projection period.

Funding and affordability pressures are likely to see increased attention on productivity and efficiency measures. Productivity improvements could be achieved through service reconfiguration and wider application of best practices; the specialty is preparing to meet these challenges as described in the *Restoring Your Mobility* report (BOA, 2012a). The British Orthopaedic Association (BOA) is also due to publish its *Getting It Right First Time (GIRFT)* report soon, the research and results of which are expected to have a significant impact on the T&O workforce.

Next steps

The CfWI suggests that HEE consider bringing supply and demand into balance in the medium term by capping ST3 recruitment at 122 trainees per year for the next three annual recruitment rounds (2013-14, 2014-15, and 2015-16 inclusive).

We propose the following three-stage approach.

- Stage 1: A cap of 122 on total ST3 T&O posts in 2013-14, 2014-15 and 2015-16 recruitment rounds inclusive.
- Stage 2: An update to this workforce stocktake before the end of 2016, taking into account the BOA *Getting it Right First Time (GIRFT)* report, to assess whether any change in ST3 recruitment may be required.
- Stage 3: Based on that review, the number of ST3 posts should be revised to a new baseline that balances expected future demand from the 2016-17 recruitment round.

The CfWI proposes that this workforce stocktake be updated before the end of 2016 to make suggestions on the appropriate ST3 trainee levels from 2016-17 onwards.

It is important that a review takes place before the end of 2016, as any changes to alter workforce supply from 2023 must be implemented at the latest by the 2016-17 ST3 recruitment round. We also suggest that this updated review take more of a whole-team approach rather than solely focusing on the consultant workforce.

Following discussions with stakeholders, the CfWI acknowledges that future uncertainties (such as changes to service commissions, future service delivery models, the impact of productivity, and new ways of working) are difficult to estimate. Particular considerations that require further analysis in future are the potential impact of

seven-day services (including its affordability) on the T&O workforce and growth in the amount of activity private centres perform on behalf of the NHS.

Although uncertainty will always be present, it does not mean that necessary and appropriate decisions should be deferred. There are risks to any workforce planning suggestions, and workforce planning should keep pace with any changes to reduce the risk of undersupply or oversupply of this specialty in the future.

Finally, the CfWI would like to thank the trauma and orthopaedic surgeons, other health professionals, professional bodies, employers and patients who made a contribution to this workforce stocktake, and welcome all responses to this report. The project team can be contacted at: medical@cfwi.org.uk.

1. Introduction

1.1 About this stocktake

The Centre for Workforce Intelligence (CfWI) was commissioned by Health Education England (HEE) and the Department of Health (DH) to undertake a stocktake of the trauma and orthopaedic surgery (T&O) workforce in England. The CfWI was asked specifically to:

- assess the key drivers of demand and supply for T&O surgery
- estimate the future number of Certificate of Completion of Training (CCT) holders that would enable current levels of T&O services per patient to be maintained to 2028
- estimate how many T&O trainees need to enter higher specialty training (HST) at specialty training level three (ST3) to ensure workforce supply is broadly in balance with expected demand to 2028.

The CfWI's previous report on the T&O surgery workforce, *Trauma and Orthopaedic Surgery: CfWI medical fact sheet and summary sheet* (CfWI, 2011) suggested a reduction in national training numbers (NTNs) and a further workforce review of this specialty in 2013. This report has been provided to HEE and will help inform the decisions they make as part of their annual workforce planning process.

1.2 Stakeholder engagement

The CfWI approach involved extensive stakeholder engagement with a broad range of professional representatives with specialist perspectives on the T&O surgery workforce, including the BOA and the T&O Specialty Advisory Committee (SAC). This engagement was both to improve the quality and credibility of the CfWI's approach and to improve stakeholders' understanding of the intelligence contained in this review and its potential to support decision-making.

Information provided by these representatives is used throughout the report, and the report includes perspectives and analysis that can be derived from available data.

We would like to thank all stakeholders for their contributions, while also noting that our conclusions and suggestions may not necessarily reflect those of the individuals and organisations consulted. For a full list of the stakeholders involved at each stage of this project, please refer to **Annex A**.

1.3 Previous CfWI recommendations

The CfWI's previous report (CfWI, 2011) suggested a 20 per cent reduction in specialty training numbers:

The CfWI recommends a sustained reduction of 30 NTNs phased over the next three years. This could be done by reducing 10 posts a year over the next three years. This will need to be reflected within CST posts to reduce the risk of mismatches between CT2 graduates and ST3 posts. Not all SHAs will need to reduce numbers (for example East Midlands and East of England), based on weighted capitation alone, NHS London is identified for greater reductions. A further review is recommended for 2013.

This would have seen a reduction in specialty training level three (ST3) posts from 145 to 115 by 2012-13.

2. Current workforce

2.1 The consultant workforce

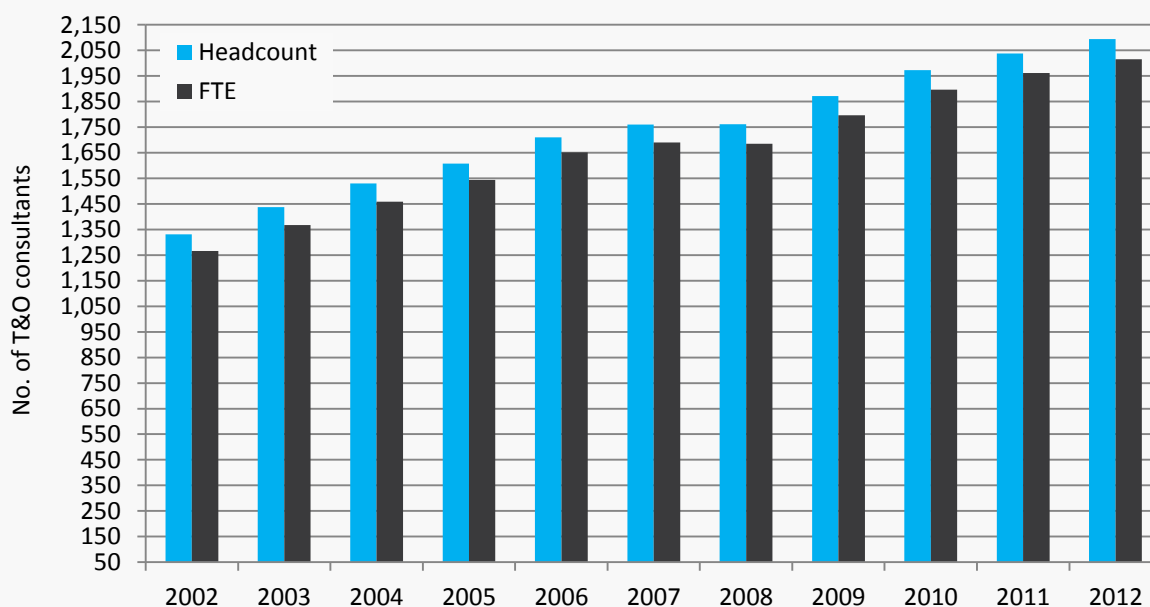
According to the Health and Social Care Information Centre (HSCIC), T&O is one of the largest surgical specialties, making up 28 per cent of the entire surgical consultant workforce and 5 per cent of the total medical consultant workforce (HSCIC, 2013).

As of September 2012 there were 2,094 T&O consultants by headcount (HC) and 2,015 by full-time equivalent (FTE) employed in England. Associate specialist, specialty doctor, and staff grade doctors also provide services. The total number in this group in September 2012 was 641 HC and 626 FTE (HSCIC, 2013).

All stakeholders agree that, for modelling purposes, the only sources of joiners to the CCT workforce are through the specialty training system and the Certificate of Eligibility for Specialist Registration (CESR) route, because the number of joiners from elsewhere is very small and not statistically significant.

Figure 1 shows the historical supply of NHS T&O consultants in England between 2002 and 2012. During this period there was a 59 per cent growth in T&O surgery consultants (FTE basis), a compound annual growth rate of 4.75 per cent).

Figure 1: Historical supply – T&O surgery consultants, England

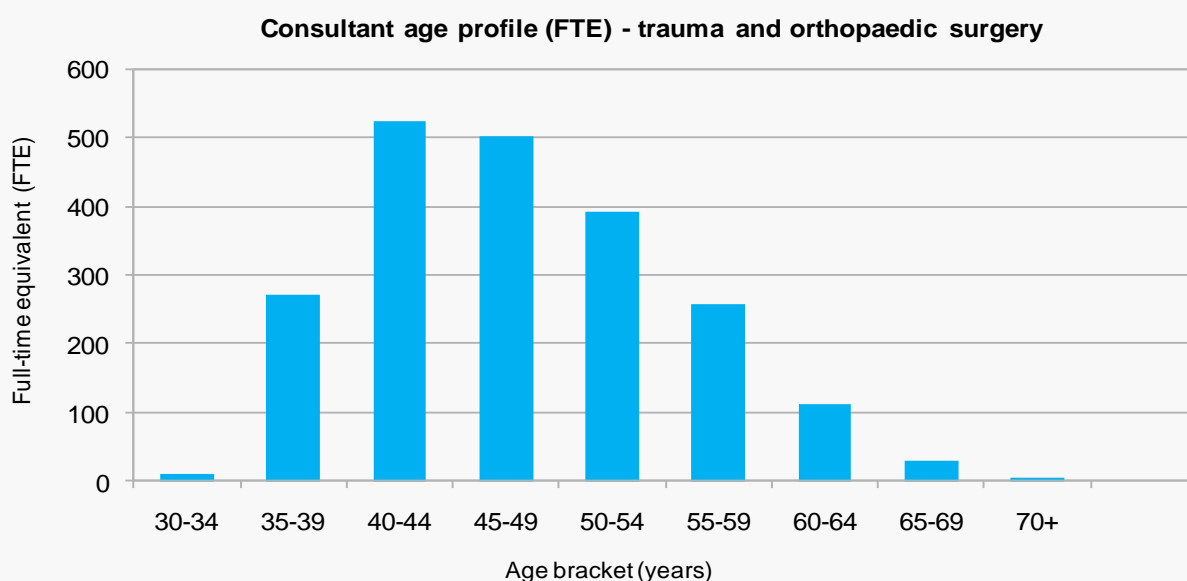


Source: HSCIC, 2013

2.2 Age and gender profile

The age profile (Figure 2) shows a plentiful supply of younger staff with only a small proportion of consultants working beyond typical retirement age. This relatively young age profile reflects the strong growth of the T&O workforce in recent years.

Figure 2: T&O surgery consultant age profile 2012



Source: HSCIC, 2013

T&O is currently the most male-dominated of the surgical specialties, as 95 per cent of CCT holders are currently men, compared with the surgical average of 89 per cent. However, there has been an 83 per cent increase in the number of women studying general surgery between 2007 and 2012, and a 63 per cent increase in the number of women studying T&O surgery (GMC, 2013a).

The CfWI has assumed that the ST3 gender split for 2012 and 2013 is 77 per cent men and 23 per cent women, based on the actual 2013 gender split of ST3 intake (the gender of 2012 ST3 run through joiners is not disclosed). The CfWI projects the T&O CCT workforce will be approximately 11 per cent women in 2028. The average participation rate (that is, the amount worked per week) for men is only marginally higher than for women, and currently stands at 0.91 for women and 0.96 for men.

2.3 Postgraduate training

Progression into T&O ST3 requires trainees to complete core training (CT) in surgery. There are several routes through core training: CT1/2 themed and generic programmes, run-through ST1/2 and academic clinical fellowships (ACF). Core training consists of two years (three years for ACF trainees) with an emphasis on training in surgery in general but with a significant amount of specific training in T&O (GMC, 2013b).

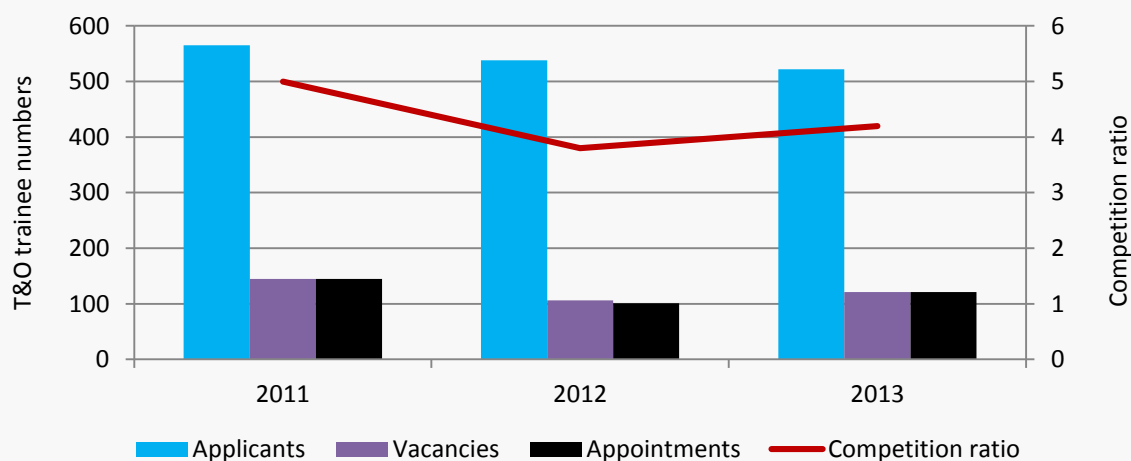
The ST3 to ST6 phase represents four years of training. An important outcome of this phase of training is the successful completion of the intercollegiate examination in T&O (FRCS (T&O)) which trainees are expected to sit early in ST7. The successful completion of the intercollegiate examination is required during the ST7/8 phase of training. A CCT cannot be attained without passing this examination. Further, trainees must maintain their skills in the generality of trauma during ST7/8 so they can provide a general trauma service from day one when appointed as a consultant. After completing ST8 successful candidates will be awarded a CCT.

The Yorkshire and Humber Postgraduate Deanery coordinates national recruitment for T&O ST3 posts. T&O is a very popular specialty (see Figure 3 for recruitment years 2011 to 2013). Historically, there have been 10 applicants for every ST3 vacancy in T&O (BMJ, 2012), resulting in the T&O competition ratio (CR) being consistently higher than the average across all surgery ST3 posts, and the fill rate has been at or almost 100 per cent over the last three years.

The total number of T&O national training numbers¹ (NTNs) is 1,038, but only 971 of these are currently allocated to trainees (HEE, 2014). This is mainly due to the reduction in ST3 recruitment from 145 in the 2010-11 recruitment round to 101 in 2011-12 and 121 in the 2012-13 recruitment rounds. These reductions were likely influenced by the SAC's suggestion to reduce trainee intake and by the CfWI's independent suggestion of a sustained reduction of NTNs in the 2011 report (CfWI, 2011).

The CfWI assumes that, from 2013, the majority of new trainees will take six years to complete their training. However, we allow for the fact some trainees may take up to two years longer (this number is assumed to be 16 per cent). As we move through our forecast period, we assume it will take progressively longer for new trainees to complete training, to the point where by 2028, 40 per cent of new ST3 trainees will take up to four years longer to complete their higher speciality training.

Figure 3: Vacancies, applicants and appointments - T&O ST3 positions in England from 2011 to 2013



Source: Health Education Yorkshire and the Humber, 2013

¹ NTN: A unique identifier issued by a postgraduate dean to an employee where the employee has formally accepted, or commenced, a training activity as a specialist registrar. The allocation of NTNs reflects the numbers of training places nationally, and the allocation of those numbers to each deanery.

2.4 Research strategy and academia

The BOA *Improving Your Mobility* research strategy document (BOA, 2012b) states there is a reduction in the amount of research conducted by the T&O surgical community due to financial constraints. The report states that the funding methods for research have changed and of the small amount (1.5 per cent) of DH funds obtained by surgical research projects, a very small portion has been secured by T&O research applications. It highlights that the growing demand resulting from musculoskeletal disease will only be met with further innovation and good quality research into T&O treatments. The research strategy document suggests that the BOA, DH and various health research councils and charities in orthopaedics and musculoskeletal disease work together to improve the culture, infrastructure and delivery of T&O research.

3. The stocktake process

A CfWI workforce stocktake investigates the current balance of demand and supply for a particular workforce and explores how this is expected to change in the next 15 years. Recognising the complex set of interrelated factors that may influence demand and supply, our stocktake approach consists of horizon scanning, a Delphi panel exercise to quantify key uncertainties, and system dynamics modelling. Detailed results of the horizon scanning and Delphi panel exercises are available at **Annexes A, B, and C**.

3.1 Horizon scanning

Sixteen key stakeholders were asked about potential technological, economic, environmental, political, social and ethical (TEEPSE) challenges, opportunities and likely future developments, and asked to provide supporting evidence if available. These 'drivers' were used as a base to inform the Delphi stage.

Overall, political and social drivers were the most frequently mentioned by our horizon scanning participants, followed by technological and economic drivers. A summary of the key drivers (both trends and uncertainties) that may influence the future T&O workforce can be found at **Annex B**.

3.2 Delphi panel exercise

The Delphi method is a technique which relies on a panel of experts to estimate key future uncertainties, taking into account a combination of many factors, including the drivers gleaned from the horizon scanning stage. The purpose of the Delphi panel exercise is not to predict the future but rather to improve workforce planning by combining the expertise of panellists.

The final (median) judgements of the panel were fed into the CfWI model to inform the demand projection. The median value is used rather than the mean value as it is less likely to be biased by outliers.

A Delphi panel is most effective when it contains a range of people. The T&O panel consisted of representatives with specialist perspectives on the T&O surgery workforce including service commissioners, providers/employers, educators, surgeons, trainee surgeons, anaesthetists, nurses, physiotherapists, HEE, the profession, and the specialty advisory committee – 28 out of 39 (72 per cent) of confirmed participants took part in both Delphi rounds. Surgeons (including BOA, SAC and trainee representatives) contributed the largest proportion of responses.

The panel and questions were approved by HEE. The key questions and responses for the Delphi panel can be found at **Annex C**.

During the Delphi exercise participants give rationales for their estimates. The quantity and quality of responses was very high, demonstrated by the following examples.

In response to the efficiency and productivity question ('As a result of changes in efficiency and productivity, do you think the demand for trauma and orthopaedic surgeon time will change relative to today?') one stakeholder wrote:

As the senior surgeons retire aged 53-65 there is recognition that younger orthopaedic surgeons are less productive and efficient than older surgeons. With time and antibiotic resistance infection around, implants may increase with resultant increasing complications. There is no magic bullet for osteoarthritis and we are seeing increasing OA burden across all ages. This will not reduce but increase. With the change in training, young consultants are less experienced, and this will hamper and reduce efficiency and productivity.

In response to the individual patient need question ('Do you think the average individual patient need for trauma and orthopaedic surgeon time will change, relative to today?') another stakeholder explained:

Patients are increasingly aware of their rights under the NHS Constitution and the multiple benefits, through Patient Reported Outcome Measures (PROMS), of appropriately timed joint replacement surgery. This and a strong desire to sustain healthy lifestyles shapes their mobility outcome expectations accordingly, so the numbers requesting surgery will increase. While on the one hand the number of revisions derived from quality issues should reduce as a consequence of, inter alia, GIRFT, on the other, the increasing prevalence of obesity and other co-morbidities will have an impact on prosthesis life and the rate of revisions. The rate of change from today to 2028 is multifactorial and difficult to quantify: 15 per cent over 15 years is a conservative estimate.

3.3 System dynamics modelling

System dynamics modelling is most appropriate for complex systems such as the health and social care workforce. It represents changes to a system over time by using the analogy of stocks accumulating and depleting over time, and can be extended or revised to address additional issues as they arise. For workforce planning, 'stocks' of people can be segmented by age and gender where data exists.

Due to the complexity of factors influencing demand and supply, and the intrinsic uncertainty of the future, the CfWI used Vensim DSS© to model the flow of T&O HST to forecast future demand and supply. The CfWI has formally tested and validated this model.

Vensim is able to handle the complexity of modelling supply, including the ageing of the workforce, and also offers sophisticated sensitivity and uncertainty analysis, an important feature given the variable quality of data and assumptions available (see below).

3.4 Data sources, assumptions and exclusions

3.4.1 Main data sources

The references section lists all data and information sources used. The main data sources used in this stocktake are:

- Health and Social Care Information Centre, workforce data sets
- Health Education England, HEE stocktake data
- Office for National Statistics, 2012 based national population projections
- Health and Social Care Information Centre, hospital episode statistics (HES)
- Health Education Yorkshire and the Humber, national ST3 intake data.

3.4.2 Assumptions

The workforce model used a series of assumptions when data was not of the required quality or was unavailable. These assumptions were reached by analysing past trends, engaging with the specialty and other professional representatives, and by the collective judgments of our expert Delphi panel. The future supply and future demand sections below lists all assumptions used.

3.4.3 Exclusions

The flows between England, the other three UK countries, non-UK and non-EEA countries have not been explicitly modelled. This is because all stakeholders agree that for modelling purposes the only sources of joiners to the CCT workforce in England are through the specialty training system and the CESR route, because the number of joiners from elsewhere is very small and not statistically significant.

Similarly, the impact of skill mix on demand and supply for T&O services has not been explicitly modelled. However, the CfWI acknowledges that effective planning for this workforce cannot be considered in isolation of other medical/surgical specialties and non-medical workforces that provide essential support services, and a whole-team, multidisciplinary approach may enable more effective workforce planning.

4. Waiting time, activity and efficiency

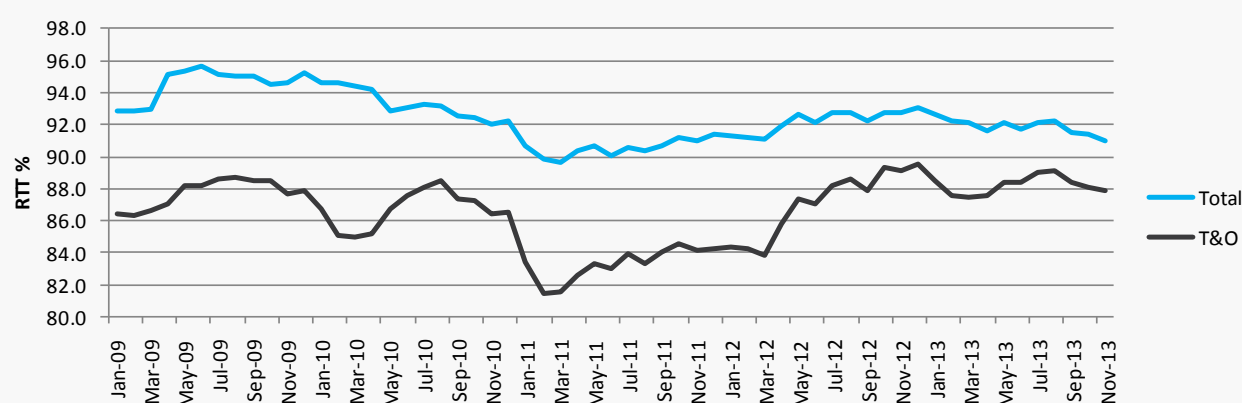
4.1 Referral to treatment waiting time

Referral to treatment (RTT) waiting time data shows the length of time from referral through to elective treatment for T&O patients, and the percentage that were treated within 18 weeks. Figures 4 and 5 show consultant-led monthly RTT for adjusted completed admitted pathways from January 2009 to November 2013 (NHS England, 2014), and compares what percentage of T&O patients were treated within 18 weeks against the overall percentage². The RTT operational standards are that 90 per cent of admitted and 95 per cent of non-admitted patients should start consultant-led treatment within 18 weeks of referral.

- T&O's RTT percentage within 18 weeks has always been lower than the overall, and is one of the lowest performers of the 19 in the group.
- However, T&O's RTT percentage has improved overall since 2009, and the difference between overall and T&O RTT percentage has approximately halved between November 2011 and November 2013.
- Given the expected significant increase in supply of T&O CCT holders in the next five years, further improvements in RTT can be expected.
- There is a slight divergence in the percentage point difference between T&O and total referral to treatment scores around February and March 2012 and 2013, which may be due to falls and other accidents over the winter period. This indicates there may be greater demand over the winter for trauma services, so planned care may be delayed during that time.

There is clear evidence of improvements in T&O referral to treatment waiting times and a narrowing gap between the T&O and overall RTT 'score'. This data shows no signs of crisis in this specialty.

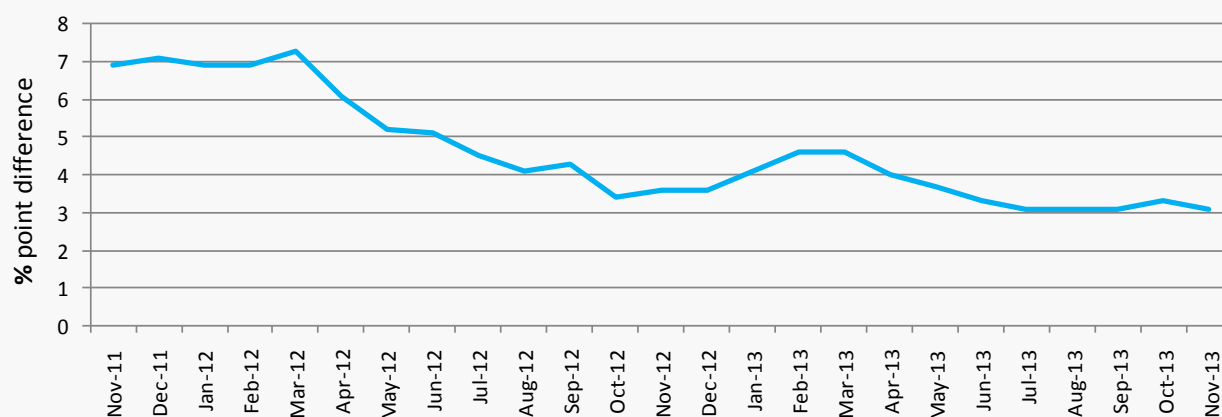
Figure 4: Monthly referral to treatment (RTT) waiting time for adjusted completed admitted pathways*



Source: NHS England, 2014

*The overall RTT percentage is based on general surgery, urology, T&O, ENT, ophthalmology, oral surgery, neurosurgery, plastic surgery, cardiothoracic surgery, general medicine, gastroenterology, cardiology, dermatology, thoracic medicine, neurology, rheumatology, geriatric medicine, gynaecology, and 'other'.

Figure 5: Percentage point difference between T&O and total referral to treatment scores



Source: NHS England, 2014

4.2 Activity

The CfWI analysed the number of T&O consultants against the T&O hospital episodes activity data between 2003-04 and 2012-13 (HSCIC, 2014). Overall T&O activity for inpatients and outpatients was used to measure activity as this report considers T&O as a whole. The CfWI did not use data from the National Joint Registry (NJR) because, by the organisation's own admission, it is not yet possible to tell whether NJR figures reflect increases in activity, increases in compliance, more timely submissions or a combination of these factors (NJR, 2013).

The results, as shown in Table 1, show an average annual decline of -0.3 per cent in T&O activity per consultant FTE between 2003-04 and 2012-13. This is because, even though there was increase in activity, the consultant workforce grew at an even faster rate. This figure is broadly consistent with the median Delphi estimate of around -0.5 per cent change in productivity per annum over the projection period to 2028.

An important caveat to this is that activity per consultant is a purely quantitative measure, and doesn't take account of possible changes to quality or complexity, or to the potential impact on surgeons' activity rates of changes to the size and skill mix of the wider clinical and administrative support team.

Table 1: Hospital Episode Statistics (HES) activity data between 2003-04 and 2012-13

The results show an average annual change of -0.3 per cent in T&O activity per consultant because, even though there was increase in activity, the consultant workforce grew at a faster rate.

HES year	CCT year	In Patients	Out Patients	Total Activity	Consultants FTE	Activity per Consultant
2003/04	2004	911,562	5,248,325	6,159,887	1,459	4,222
2004/05	2005	942,640	5,524,492	6,467,132	1,544	4,189
2005/06	2006	973,718	6,022,351	6,996,069	1,651	4,237
2006/07	2007	1,006,499	5,989,225	6,995,724	1,690	4,139
2007/08	2008	1,090,396	6,206,392	7,296,788	1,685	4,330
2008/09	2009	1,143,092	6,712,880	7,855,972	1,796	4,374
2009/10	2010	1,162,040	7,078,711	8,240,751	1,896	4,346
2010/11	2011	1,188,797	7,186,458	8,375,255	1,961	4,271
2011/12	2012	1,199,539	7,113,285	8,312,824	2,015	4,125
2012/13	2013	1,177,080	7,050,069	8,227,149	2,007	4,099
Compound annual growth rate (CAGR)		2.9%	3.3%	3.3%	3.6%	-0.3%
Average annual change		3.2%	3.8%	3.7%	4.2%	-0.3%

Source: HSCIC, 2014a

4.3 Revisions and cement vs non-cement

Some stakeholders are of the opinion that cemented prosthetics take longer to complete in surgery and therefore decrease productivity. However, the South West London Elective Orthopaedic Centre (SWLEOC) maintains that cemented prosthetics take at most 20 minutes more to complete and is not considered a factor that would significantly decrease productivity, considering their slightly better revision³ rate compared to non-cemented prosthetics (SWLEOC, 2014a).

A report on the cost effectiveness of different types of total hip replacement prosthesis (BMJ, 2013) shows that cementless prostheses are being increasingly used in England and Wales but are the most expensive and have contributed to a doubling of prosthesis costs between 1996 and 2006.

The same report shows that seven-year revision rates were lower for cemented (3.0 per cent) than for hybrid (3.8 per cent) or cementless prostheses (4.6 per cent) and concluded that cemented prostheses were the least costly type for total hip replacement. However, for most patient groups hybrid prostheses were the most cost effective and cementless prostheses did not provide sufficient improvement in health outcomes to justify their additional costs.

When asked to what extent current and anticipated workload was the result of greater numbers of revisionary operations, the SWLEOC stated there had recently been two major product recalls that had formed the

³ * Revision: a second surgery in which the existing implant or components are taken out and replaced.

significant portion of revisionary operations since 2006, and that many of these revisions would be completed within 18 months. Subsequently they did not consider revision rates would be as high in the future as a result of product recalls. However, discussions with other stakeholders reveal some in the profession think revisions for any number of reasons will continue to be a demand consideration going into the future.

The CfWI believes more analysis is required on patient experience, surgery time, revision rates and overall costs before an informed decision can be made, and expect the *GIRFT* report will significantly contribute to this knowledge.

4.4 Case study: South West London Elective Orthopaedic Centre

The South West London Elective Orthopaedic Centre (SWLEOC) is a Centre of Clinical Excellence with an excellent track record, short length of stay and a low 0.2 per cent infection rate for five years running. The SWLEOC monitors performance on a monthly basis covering key indicators of patient care, finance and government targets. The SWLEOC currently operates on the largest number of hip and knee replacement patients within the NHS and its average length of stay for hip and knee replacement is a good performer nationally, with excellent patient satisfaction responses. The SWLEOC also has a research and development programme that informs the global orthopaedic clinical community (SWLEOC, 2014b).

The CfWI visited the SWLEOC to better understand how its gains in efficiency and productivity had been achieved, for example via service reconfiguration, and whether these gains might be replicable nationally. According to the SWLEOC, the largest contributing factors for the gains realised to date was more to do with the way in which the facility was organised as opposed to any surgical factors. These organisational factors include:

- patient pathway designed to minimise patient infection ('one way traffic')
- complimentary home taxi service to ensure timely arrival and departure where required
- pre-screening process by phone prior to attendance to ensure that an appointment was needed, and phone call made two days before attendance to ensure that patients would be attending on time
- two-year duration of follow-up checks post-surgery
- treating all American Society of Anaesthesiologists* (ASA) category patients, not just ASA 1 and 2
- intensivist always on site 24/7/365
- nurse-led discharge.

The CfWI acknowledges that the configuration of the SWLEOC is unlike that of a district general hospital (DGH) and is not suggesting national productivity gains could be achieved based on one localised study. However, the SWLEOC can be used as a comparator for emerging elective centres and the way in which the facility is organised could be used as a baseline model for most orthopaedic units. The CfWI further suggests the specialty explore this option to further understand what impact the overall SWLEOC configuration may have on increasing efficiency in the service.

*ASA grades make up a simple scale describing fitness to undergo an anaesthetic. The ASA does not endorse any elaboration of these definitions. However, anaesthetists in the UK often qualify (or interpret) these grades as relating to functional capacity – that is co-morbidity that does not limit a patient's activity (ASA Grade 1 and 2) or that does limit a patient's activity (ASA Grade 3 and 4):

- ASA Grade 1 – 'Normal healthy patient' (without any clinically important co-morbidity and without clinically significant past/present medical history)

- ASA Grade 2 – ‘A patient with mild systemic disease’
- ASA Grade 3 – ‘A patient with severe systemic disease’
- ASA Grade 4 – ‘A patient with severe systemic disease that is a constant threat to life’.

4.5 Productivity and efficiency

One of the biggest challenges with service improvement is attempting to balance the service capacity that is available against that of demand by referrals into the service – with an overall aim of avoiding the need to create a waiting list. **Funding and affordability pressures are likely to see increased attention given to productivity and efficiency measures.**

While there is clear evidence of improvements in T&O referral to treatment (RTT) waiting times, compliance needs further improvement with around 88 per cent of all procedures since July 2012 meeting the government’s 18-week target. A significant challenge is the change in surgical and anaesthetics training and culture, which stakeholders and Delphi panellists consider has a downward impact on productivity. There is a growing trend among new CCT holders to undertake one to two years of additional fellowship to build experience before seeking a consultant post.

While the Delphi panel’s estimate of an average annual -0.5 per cent change in T&O surgery productivity over the projection period is broadly consistent with activity per consultant data, this is well below the average 0.4 per cent growth in NHS productivity over the last 15 years (ONS, 2012). In a climate of flat real funding and growing patient demand, it is doubtful whether the NHS can afford continuing productivity decline in a key medical specialty.

However, there is consensus between stakeholders that the service could be more efficient, and the BOA has already outlined five points to achieve this (BOA, 2012a). The Director of National Programmes at HEE and the National Clinical Director (NCD) for Trauma expect orthopaedic elective services will see configuration changes in the next two years (HEE, 2014b and NCD for Trauma, 2014). Moreover, the results from the BOA’s forthcoming *GIRFT* study are expected to have a further positive impact on the productivity of the T&O workforce by suggesting changes to improve care pathways and patient experience, resulting in reduced waiting times, better patient outcomes and significant savings to the NHS.

Productivity improvements can be achieved through service reconfiguration and application of best practices. Given the work that is being done to address the fall in productivity and improve compliance in T&O, it is also plausible that productivity could improve over the next 15 years, which would result in a considerably lower estimate of demand for CCT holders than the CfWI’s current projection.

5. Future patient demand

Future patient demand for T&O surgery is both complex and uncertain. Simply using current data and projecting historical trends forward would miss the potential impact of future changes.

The CfWI's future demand calculation has three main components:

- current demand (defined by our commission remit, i.e. estimate the future number of CCT holders that would enable **current levels of T&O services per patient to be maintained** to 2028)
- changing population and demographics (population growth and the changing age composition of the population)
- future uncertainties.

5.1 Current demand assumption

The CfWI seeks to assess whether there would be an undersupply or oversupply of T&O CCT holders by 2028 if **current levels of T&O services per patient were to be maintained**. The CfWI will therefore assume current demand is equal to current supply, and this is the basis from which future demand is calculated.

Across the NHS there is always likely to be some unmet need. We are not suggesting there is no unmet need at present. It is important to note workforce demand is the required workforce that the NHS can afford. It is often confused with workforce need, which is the required workforce without any financial constraints.

The Delphi expert panel estimated that the median level of current needs that were met for T&O surgery was 90 per cent, with estimates ranging from 70 to 100 per cent (**Annex C**). This implies that around 10 per cent of current needs are not being met. This is a lower estimate of current unmet need than for most other medical specialties that the CfWI has reviewed to date.

5.2 Changing population and demographics assumptions

Different age groups have different dependencies on medical/surgical services, so the CfWI considers not just overall population growth but change to the population age profile. Older people have a higher impact on the demand for T&O, and England has an ageing population, so if we only considered the total future population size we would incorrectly estimate the future level of demand.

The Office for National Statistics (ONS) forecasts that the English population will grow by about 11 per cent by 2028 (ONS, 2013) but there are large variations by age group, with the 60+ age group forecast to grow by 36 per cent and those aged 20-29 forecast to decline by 4 per cent. Those aged 40-49 years old are forecast to decline by 5 per cent. Therefore each age group will have different impacts on future patient demand.

The prevalence rates by age group for inpatients and outpatients for 2011-12 were determined using HES data (HSCIC, 2012a and HSCIC, 2012b). The CfWI assumed rates remain constant, and factored ONS population forecast by age group from 2013 to 2028, creating a prevalence rate weighted time series forecast of future demand based on population growth by age group.

For T&O, the resulting overall change in demand by 2028 is estimated to be 19 per cent higher with inpatient data, and 15 per cent higher with outpatient data. There are significantly higher numbers of outpatients compared to inpatients. However, inpatients have inherently higher episode intensities, so the CfWI has used an average (17 per cent) as the overall prevalence-weighted population impact on demand by 2028 to avoid underestimating demand. Detailed prevalence rate analysis is available in **Annex D**.

5.3 Assumptions about future uncertainties

As well as the impact of population size and age profile, the CfWI also considered changes in demand caused by future uncertainties. Demand for healthcare is a difficult concept. For T&O the CfWI examined two of its key components:

- **the future average need of patients**
i.e. the average individual patient need for trauma and orthopaedic surgery by 2028
- **the future productivity of the workforce**
i.e. the efficiency and productivity of the trauma and orthopaedic surgeon workforce by 2028.

These demand changes are influenced by the 'TEEPSE' drivers, gathered during horizon scanning, and are most appropriately quantified by a range of experts taking part in a Delphi panel exercise. The panel was asked to consider the potential impact of these drivers on the T&O surgical workforce. The CfWI's Delphi results suggest that by 2028, demand for T&O surgeon time will be:

- 20 per cent higher due to average individual patient need (excluding demographics)
- 7 per cent higher due to declining efficiency and productivity.

The Delphi panel was asked to consider the level of T&O surgical services that the system may decide to commission by 2028, relative to today. It is interesting that the panel felt the level of commissioned service for T&O surgeon time will be just 10 per cent higher by 2028 – considerably lower than the expected increase in patient need.

5.4 British Orthopaedic Association (BOA) demand estimates

The BOA previously advocated a consultant-per-capita ratio target but moved away from this around 2011. Since this time the BOA has assessed demand based on evidence of current capacity gaps and expected trends. The BOA published findings in 2012 that suggested a 15 per cent capacity gap (BOA, 2012a), and further estimates that demand could be rising by as much as 7 to 8 per cent per annum due to factors such as an ageing population and increasing rates of obesity (BOA, 2014a).

The 2012 Briggs report *Getting It Right First Time* (Briggs, 2012), which shares the title with but is a separate document to the BOA's forthcoming *GIRFT* report, highlights key demand drivers that create the need for smarter working:

- pressure on GPs to refer increasing numbers of patients for orthopaedic care
- the expectancy of an ageing population to be active for longer
- increasing surgical sub-specialisations
- advances in new technologies.

The report states that 25 per cent of surgical interventions in the NHS are for the treatment of musculoskeletal disease and this is set to rise over the next 10 years.

5.5 Demand projection

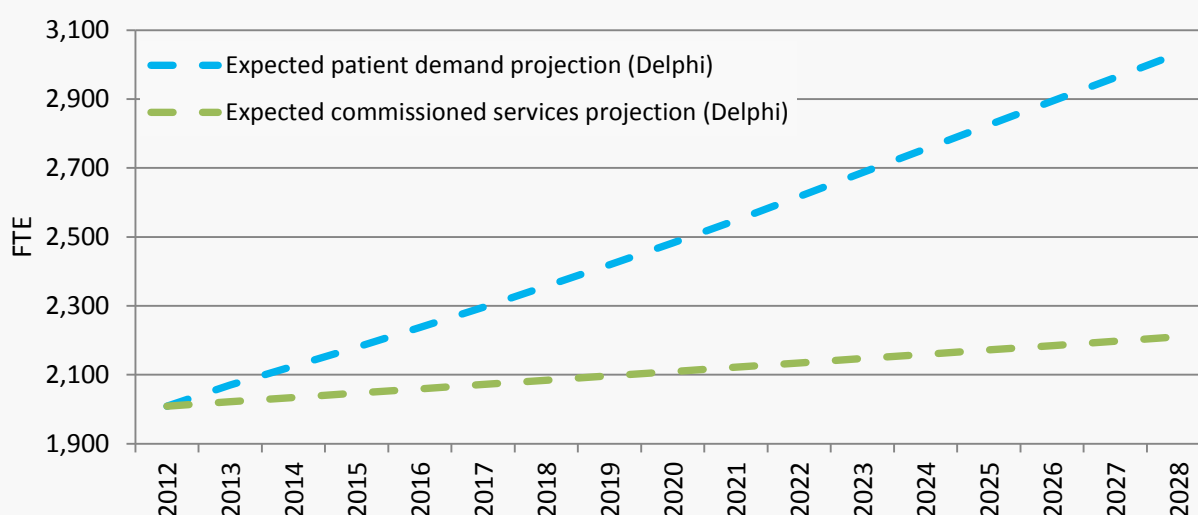
The demand projection is the forecast of future patient demand, and is based on the following modelling assumptions, reached by existing data described above, and engagement with the Delphi panel:

- current demand is taken to equal current supply (defined by our commission remit)
- 17 per cent increase in demand by 2028 due to prevalence-weighted population growth, derived from HES data (HSCIC, 2012a and HSCIC, 2012b)
- 20 per cent increase in average individual patient need by 2028, derived from median Delphi response (Annex C)
- 7 per cent increase in demand by 2028 due to declining workforce efficiency and productivity, derived from median Delphi response (Annex C).

The CfWI multiplies these assumptions together to calculate the forecast future demand ($1.17 \times 1.07 \times 1.20 = 1.50$), i.e. **a 50 per cent growth in expected patient demand for T&O surgical services by 2028.**

Figure 6 shows the CfWI's demand projection for T&O surgery, with demand increasing year on year to meet the total forecast increase of 50 per cent growth by 2028, a compound annual growth rate of 2.6 per cent. This is discussed in greater detail in the principal projection section below.

Figure 6: Demand projection for T&O surgery, England



Source: CfWI system dynamics model of the trauma and orthopaedic surgical workforce for England

The CfWI has also considered the potential level of commissioned services. Delphi panellists estimated that the median level of commissioned services will increase by just 10 per cent by 2028, compared with current levels (Annex C). As Figure 6 shows, this is far below the expected 50 per cent increase in patient demand by 2028.

This shows the stark challenge facing both the commissioners and providers of T&O surgical services as they seeking to navigate between tight healthcare funding and rising patient demand.

Clearly affordability (and efficiency) are key factors which commissioners of healthcare services will need to balance against patient demand over the projection period. **There is a significant risk that the supply of T&O surgeons over the projection period will exceed the levels of service that the NHS can afford to commission.** This may pose uncomfortable career choices for some new CCT holders in the projection period.

6. Future workforce supply

The CfWI's future workforce supply projections are informed by three broad components: trainees and training, the workforce, and future changes to training and the workforce. For modelling purposes the CfWI made the following assumptions about training, derived from analysing past trends, engaging with the specialty, and the Delphi exercise results.

6.1 Training modelling assumptions

- The 971 in-use NTN in 2013 are split evenly across the HST years (ST3-ST8).
- ST3 intake from 2013-14 onwards is held constant at 122 per year (based on recruitment average between 2010-11 and 2012-13 recruitment rounds **OR** all NTN are recycled for new trainee appointments into ST3 every year upon existing trainees gaining a CCT (an average 173 ST3 intake per year) (see Section 6.4).
- Average delays in training are factored in to model the impact of out-of-programme experiences (OOPE) and maternity leave.
- HST takes an initial average of just over six years to complete in 2013 but a proportion of trainees take up to eight years to complete, therefore factoring in people taking slightly longer to gain a CCT on average.
- There is an overall training attrition of 1 per cent per cohort during HST.
- 23 per cent of all trainees from 2014 onwards are women, based on 2013 intake gender split. This has little impact on training delays by 2028.
- The age distribution of trainees is factored into the model.

6.2 Workforce modelling assumptions

- There are no unemployed CCT holders and every new CCT holder is employed within 12 calendar months of gaining a CCT.
- The only joiners to the CCT workforce are through the specialty training system and the CESR route.
- There is zero intake into the CCT workforce from non-UK and non-EEA countries (all stakeholders agree that the number of joiners from elsewhere is very small and not statistically significant).
- The 2028 participation rate is 0.91 for women and 0.95 for men, informed by the Delphi exercise. The actual 2013 participation rate is 0.91 for women and 0.96 for men.
- 5 per cent of the CCT workforce are women in 2012 (HSCIC, 2013), rising to around 11 per cent by 2028. There is little impact on overall workforce participation by 2028.
- The actual CCT holder age profile is factored into the model.
- The workforce attrition profile includes all leavers including retirements. It is distribution based and increases with age, based on the net leavers for each age group of the T&O workforce over the period 2009 to 2012. The net workforce attrition rate over the forecast period varies between 3 and 4 per cent per annum.
- We have not identified re-joiners or those leaving for reasons other than retirement. However, for modelling as a net variable, the existing calculation captures all relevant permutations of leavers and re-joiners.

6.3 Retirement modelling assumptions

The latest BOA retirement intentions survey (BOA, 2014b) projects around 500 retirements in the next five years. This figure is the same as the early retirement profile the CfWI modelled for its sensitivity analysis. The CfWI's standard retirement profile projects 330 consultants retiring in the next five years. A wave of early retirements would have only a modest impact on total workforce supply, as one would only lose a year or two of service from each.

In practice, retirement intention surveys tend to overestimate actual retirement rates. The BOA's sample size was around 30 per cent of the T&O consultant workforce and may not be representative of the whole consultant workforce. The CfWI has for this reason used its standard net leavers methodology, which is calculated using actual NHS retirement rates over the past five years and the age profile of the T&O workforce. This works out at 3 to 4 per cent of the workforce retiring each year on average.

6.4 Workforce supply projections

The CfWI has produced two workforce supply projections, based on different T&O trainee intake assumptions. The first scenario assumes that future T&O trainee intake is maintained at recent levels (using average ST3 accepted offers over the last three annual recruitment rounds). The second supply scenario assumes that ST3 intake increases to the current maximum possible level. Both projections are discussed in greater detail in the principal projection section.

Both projections are based on the assumptions described above and the only difference between them is the number of trainees that enter ST3 each year. These are discussed in greater detail in the principal projection section.

6.4.1 Scenario 1 supply projection

Scenario 1 assumes that ST3 intake from the 2013-14 recruitment round onwards is held constant at 122 trainees per year, which is the most recent system behaviour, including the current three-year recruitment average between 2011 and 2013. This is a reasonable projection as not all NTN's are recycled for new appointments upon trainees gaining a CCT.

Under the first supply scenario, the CfWI projects the number of T&O surgeons to grow to around 2,720 (FTE) by 2028, a 36 per cent increase on 2012 levels. Projected headcount levels would increase by 34 per cent to around 2,800 by 2028.

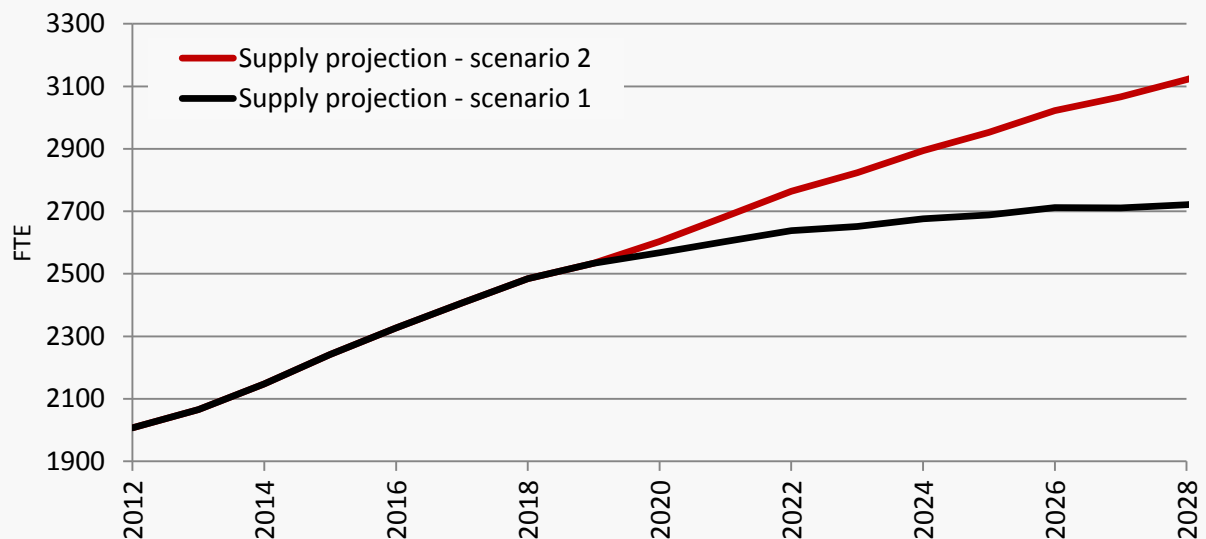
6.4.2 Scenario 2 supply projection

Scenario 2 assumes that all NTN's are recycled for new trainee appointments into ST3 every year upon existing trainees gaining a CCT, an average of 173 per year. This is the forecast supply with the maximum trainee intake currently possible if the existing number of T&O NTN's is not changed.

Under the second supply scenario, the CfWI projects the number of T&O surgeons to grow to around 3,120 (FTE) by 2028, a 55 per cent increase on 2012 levels.

Both these workforce supply projections are shown in Figure 7, and are discussed in greater detail in the principal projection section.

Figure 7: Workforce supply projections for T&O surgery, England



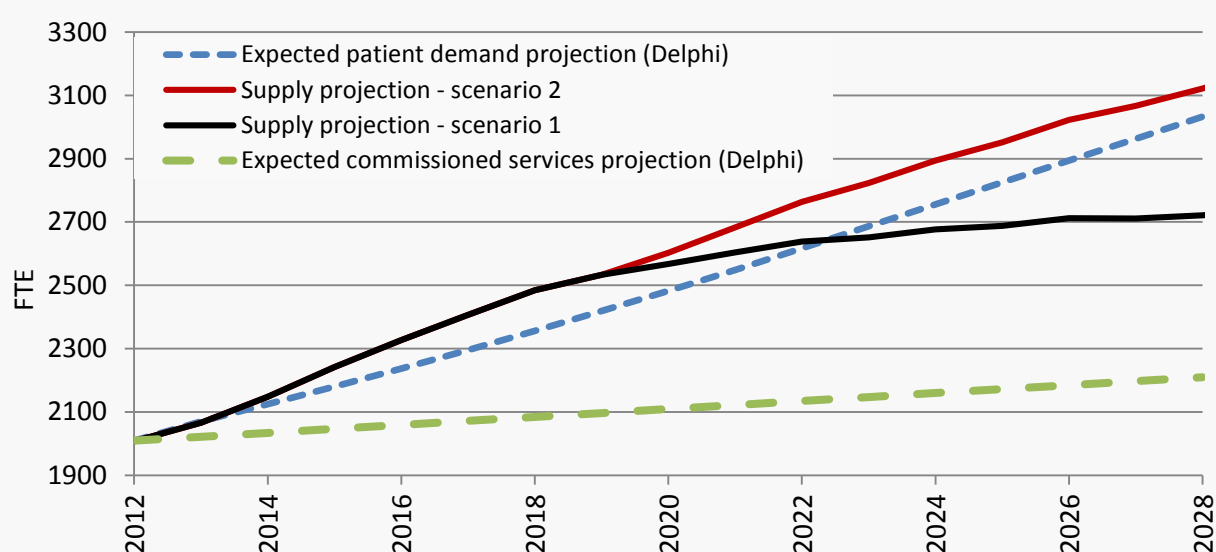
Source: CfWI system dynamics model of the trauma and orthopaedic surgical workforce for England

7. Principal projection and next steps

7.1 Principal projection

The CfWI's principal projection is the combination of the demand projection and the two supply projections described above. Figure 8 shows the principal projection for T&O surgery between 2012 and 2028.

Figure 8: Principal projection for T&O surgery, England



Source: CfWI system dynamics model of the trauma and orthopaedic surgical workforce for England

The CfWI's patient demand projection forecasts demand for T&O surgical services to grow to around 3,030 FTE by 2028, an increase of 50 per cent from 2012, as a product of a growing and ageing population, greater average individual patient need and decreasing productivity. This is the level that would enable current levels of T&O services per patient to be maintained.

Scenario 1 supply projection forecasts the total supply of CCT holders to increase to around 2,720 FTE in 2028, an increase of around 710 FTEs or 36 per cent increase on 2012 levels. As Figure 8 shows, there will be relatively high workforce growth up to 2018, reflecting higher ST3 intake from 2006-07 to 2010-11, and a subsequent slower growth from 2019, reflecting the lower average ST3 intake from 2011-12 onwards.

In this case, based on 122 ST3 trainee posts per annum from the 2014-15 recruitment round onwards, workforce supply exceeds expected demand between 2014 and 2022, but from 2023 demand starts to outstrip supply. By the end of the projection period we anticipate significant undersupply.

Scenario 2 supply projection forecasts the total supply of CCT holders to increase to around 3,120 FTE in 2028, an increase of around 1,110 FTEs and a 55 per cent increase on 2012 levels. In this case, based on ST3

recruitment kept to the maximum commissions currently possible by annually recycling all available NTN at an average of 173, the forecast supply will always be greater than the forecast demand, and it will grow at approximately the same rate as demand throughout the forecast period.

The CfWI's assessment is that if the ST3 intake is maintained at recent levels (the first scenario) there is a risk of workforce oversupply until around 2022, followed by a risk of undersupply over the remainder of the projection period to 2028.

However, if there is no intervention or cap on ST3 recruitment, and the ST3 intake reflects the maximum commissions currently possible by recycling all national training numbers (NTNs) (the second scenario), there is a significant risk of oversupply over the entire 15-year projection period.

7.2 Next steps

The CfWI suggests that HEE consider bringing supply and demand into balance in the medium term by capping ST3 recruitment at 122 trainees per year for the next three annual recruitment rounds.

We propose the following three-stage approach.

- Stage 1: A cap of 122 on total ST3 T&O posts in 2013-14, 2014-15 and 2015-16 recruitment rounds inclusive.
- Stage 2: An update to this workforce stocktake before the end of 2016, taking into account the BOA *GIRFT* report, to assess whether any change in ST3 recruitment may be required.
- Stage 3: Based on that review, the number of ST3 posts should be revised to a new baseline that balances expected future demand from the 2016-17 recruitment round.

The CfWI proposes that this workforce stocktake be updated before the end of 2016 to make suggestions on the appropriate ST3 trainee levels from 2016-17 onwards.

It is important that a review takes place before the end of 2016, as any changes to alter workforce supply from 2023 must be implemented at the latest by the 2016-17 ST3 recruitment round. We also suggest that this updated review take more of a whole-team approach rather than solely focusing on the consultant workforce.

Because of the relatively high growth in supply up to 2018, the proposed capping of training numbers during the forecast period of oversupply until 2022-2023 would not impact negatively on the services ability to deliver if it follows the action points outlined in the BOA's *Restoring Your Mobility* report (BOA, 2012a). This period of adjustment could also be used to develop and initiate additional strategies to enhance productivity gains.

Because of the existing number of NTNs, capacity exists within the training system to increase recruitment numbers above the current three year recruitment average between 2011 and 2013. The CfWI considers that the suggested cap is an optimum number to work towards the broad balancing of supply and demand in the future.

Following discussions with stakeholders, the CfWI acknowledges that future uncertainties (such as changes to service commissions, future service delivery models, the impact of productivity, and new ways of working) are difficult to estimate. Particular considerations that require further analysis in future are the impact of seven-

day services (including the affordability of seven-day services) on the T&O workforce and growth in the amount of activity private centres perform on behalf of the NHS.

A whole-team, multidisciplinary approach may be required to understand the scope, boundaries and overlaps of the various specialties and professions working in this field in order to enhance clinical outcomes and patient safety, as well as to optimise any skill mix initiatives and enable more effective workforce planning. Ideally, effective workforce planning cannot be considered in isolation from other medical/surgical specialties and non-medical workforces that provide essential support services.

However uncertainty will always be present; this does not mean necessary and appropriate decisions should be deferred. There are risks to any workforce planning options, and workforce planning needs to keep pace with any changes to reduce the risk of undersupply or oversupply of this specialty in the future.

8. Conclusion

While patient demand for T&O surgical services is forecast to grow by around 50 per cent over the next 15 years, there is a risk the supply of CCT holders in T&O surgery will exceed demand over the short-to-medium term. If there is no intervention or cap on ST3 recruitment, there is a significant risk of oversupply over the projection period.

Productivity improvements could be achieved through service reconfiguration and application of best practices. The period prior to the next suggested review in 2016 could be used for the development of additional strategies to enhance productivity gains.

The proposed capping of training numbers during the forecast period of oversupply would not impact negatively on the service's ability to deliver if it follows the action points outlined in the BOA's *Restoring your Mobility* report. The BOA's forthcoming *Getting It Right First Time* report is expected to have a significant impact on (and is an important step forward for) the specialty.

The CfWI acknowledges some stakeholders' concerns that there is and will continue to be a lack of resources to deliver T&O services in England. However, RTT waiting time data clearly indicates year-on-year improvements. Nevertheless, RTT compliance needs further improvement. A significant challenge to this is the reported change in surgical and anaesthetics training and culture which many stakeholders believe impedes service efficiency. This may be contributing to the growing trend among new CCT holders to undertake one to two years of additional fellowship to build experience before advancing towards consultant.

There is consensus between stakeholders that the service could be more efficient, and the BOA has already outlined five points to achieve this, described in the *Restoring Your Mobility* report (BOA, 2012a):

- specifying quality
- integrating providers: the musculoskeletal clinical network
- forging Provider partnerships
- implementing 'beyond compliance' surveillance
- changing clinician culture.

Elective services are expected to see configuration changes within the next two years. The CfWI further suggests the specialty explore whether the SWLEOC configuration and processes could be used to increase efficiency in the service.

Moreover, the results from the BOA's forthcoming *GIRFT* study are expected to have a further positive impact on the productivity of the T&O workforce by recommending changes to improve care pathways and patient experience, resulting in reduced waiting times, better patient outcomes and significant savings to the NHS.

Given the positive work that is being done to improve compliance and therefore productivity in T&O, it is also plausible that productivity could improve over the next 15 years, which could result in a lower estimate of demand than presently forecast. Once the effects of the action points in the BOA's *Restoring Your Mobility* and *GIRFT* study become clearer, and as the service gains greater understanding of activity and revisions, a revised estimate of demand can be modelled. One particular consideration that requires further analysis is the impact of seven-day services, including the affordability of seven-day services, on the future T&O workforce.

Annex A: Stakeholder involvement

The CfWI sought input from a wide range of health professionals as part of this project. The following individuals participated in one or more of the following: horizon scanning interviews, the Delphi panel exercise, data provision, or face-to-face consultative meetings. We would like to thank them for their time and contributions.

Name	Representing	Delphi Panel
Naufil Alam	BOA	
Richard Baxandall	HEE/LETB/Employers	•
Natalie Beswetherick	Physiotherapists	•
Pete Blakeman	HEE/LETB/Employers	•
Mr Mark Bowditch	Surgeons (incl BOA, SAC and trainees)	•
Mr Gavin Bowyer	Surgeons (incl BOA, SAC and trainees)	•
Professor Tim Briggs	Surgeons (incl BOA, SAC and trainees)	•
Kate Brown	Commissioners	•
Professor Alison Carr	HEE/LETB/Employers	•
Professor Joe Dias	Surgeons (incl BOA, SAC and trainees)	•
Dr Benjamin Ellis	Surgeons (incl BOA, SAC and trainees)	
Dr Ewen Forrest	Anaesthetists	•
Mr Mark Goodwin	Surgeons (incl BOA, SAC and trainees)	•
Mr Bob Greatorex	CfWI Professional advisors and board members	•
Karen Hertz	Nurses	•
Simon Hodgkinson	HEE/LETB/Employers	•
Julie Honsberger	HEE/LETB/Employers	
Mr Colin Howie	Surgeons (incl BOA, SAC and trainees)	•
Julia Judd	Nurses	•
Miss Nikki Kelsall	Surgeons (incl BOA, SAC and trainees)	•
Gervaise Khan-Davis	HEE/LETB/Employers	•
Mr Mike Kimmons	BOA	•
Dame Donna Kinnair	CfWI Professional advisors and board members	•
Eleni Kollia	HEE/LETB/Employers	
Mr David Large	Surgeons (incl BOA, SAC and trainees)	•
Sarah Marsh	Commissioners	•
Mrs Scarlett McNally	Surgeons (incl BOA, SAC and trainees)	•
Patrick Mitchell	HEE/LETB/Employers	•

Professor Chris Moran	Commissioners	•
Dr Andy Norris	Anaesthetists	•
Rachel O'Connor	Commissioners	•
Mr Jeya Palan	Surgeons (incl BOA, SAC and trainees)	•
Professor Martyn Porter	Surgeons (incl BOA, SAC and trainees)	
Julie Shepherd	Physiotherapists	•
Rob Smith	HEE/LETB/Employers	
Mr Peter Smitham	Surgeons (incl BOA, SAC and trainees)	•
Professor David Sowden	CfWI Professional advisors and board members	
Mr David Stanley	Surgeons (incl BOA, SAC and trainees)	•
John Stock	HEE/LETB/Employers	•
Sheila Stringer	Physiotherapists	•
Steve Thomas	HEE/LETB/Employers	
Mr John Timperley	Surgeons (incl BOA, SAC and trainees)	
Julia Trusler	BOA	
Andrew Wainwright	HEE/LETB/Employers	•
Mr David Wilkinson	HEE/LETB/Employers	•
Jo Wilkinson	HEE/LETB/Employers	

Annex B: Horizon scanning

Overall, political and social drivers were the most frequently mentioned by our horizon scanning participants, followed by technological and economic drivers.

‘Thinking ahead to 2028, what drivers (both trends and uncertainties) may influence (1) the requirements of the future trauma and orthopaedic workforce and (2) workforce numbers and proportions?’

- By ‘driving forces’ we mean things in the profession’s contextual environment, not the internal workings of the profession that are within its direct control.
- By ‘requirements’ we mean roles, skills, demand and need for services.
- By ‘proportions’ we mean the shape of the workforce, proportions of different (sub)-specialties and grades, proportions relative to other disciplines.

Please consider possible technological, economic, environmental, political, social and ethical drivers/influences and please tell us if you are aware of evidence that supports the driving forces you identify.

Horizon scanning feedback: plausible drivers of demand and supply

Technological drivers:

- new surgical techniques and equipment
- new materials
- new predictive technologies
- (in)effectiveness of current and future antibiotics.

Economic drivers:

- cost of healthcare
- availability of funding for healthcare
- cost of advanced medical technologies and pharmaceuticals
- cost effectiveness of new technologies
- cost effectiveness of timely vs. late vs. nil intervention
- level of service provision
- balance of public vs private healthcare provision
- uptake of private health insurance.

Environmental drivers:

- changes in temperature due to climate change, impact on infections and accidents
- increases in storm activity due to climate change.

Political drivers:

- Government targets
- degree of primary, secondary and social care integration
- drive towards 24/7 services
- changes to doctors’ contracts (GPs and hospital doctors)
- consultant-led vs consultant-delivered services
- changing contribution of non-consultant career grade doctors
- skill mix initiatives

- European Working Time Directive
- Regional Trauma Centres
- demand-limiting measures such as surgery restrictions for people with high BMI
- medical generalism vs specialisation.

Social drivers:

- ageing population, co-morbidity, complex conditions, complexity of joint replacements, need for revisions
- obesity and resulting joint replacement complexities
- sports injuries and risk of general trauma, especially knees, ankles, shoulders and elbows
- changing public expectations of T&O services
- uptake of managed patient pathways from conservative management through to surgery
- litigation
- migration of doctors (immigration to and emigration from England)
- geographical spread of T&O surgeons and the 'moth effect' of larger cities
- pension changes, changes to official and actual retirement age, number of surgeons who 'retire and return' to work
- generational attitude change to less-than-full-time working and training.

Ethical drivers:

- life-extending technologies
- prescription of drugs or opiates to avoid surgery
- changes in societal attitudes towards assisted dying and end-of-life care.

Annex C: Delphi panel exercise

The Delphi panel for the T&O stocktake was not only limited to clinicians. The panel consisted of a wide range of professional representatives with specialist perspectives on the T&O surgery workforce, including service commissioners, providers/employers, educators, surgeons, trainee surgeons, anaesthetists, nurses, physiotherapists, HEE, the profession and the specialty advisory committee. The panel and questions were signed off by HEE.

The final median judgements of the panel after two rounds were fed into the CfWI model to inform our projection of expected demand and supply.

Delphi participant overview

Figure C1: Delphi participant overview

	Confirmed participants		Round 1			Round 2			
			Number	% of total responses	% of 'confirmed' participants	Number	% of total responses	% of 'confirmed' participants	% of R1 participants
Anaesthetists	2	5.1%	2	5.7%	100%	2	7.1%	100%	100%
Commissioners	4	10.3%	4	11.4%	100%	2	7.1%	50%	50%
HEE/LETB/Employers	10	25.6%	9	25.7%	90%	8	28.6%	80%	89%
Nurses	2	5.1%	2	5.7%	100%	1	3.6%	50%	50%
Physiotherapists	3	7.7%	3	8.6%	100%	3	10.7%	100%	100%
Professional advisors	2	5.1%	2	5.7%	100%	2	7.1%	100%	100%
Surgeons (incl BOA, SAC & trainees)	16	41.0%	13	37.1%	81%	10	35.7%	63%	77%
	39	100.0%	35	100.0%	90%	28	100.0%	72%	80%

Source: CfWI analysis of Delphi participants

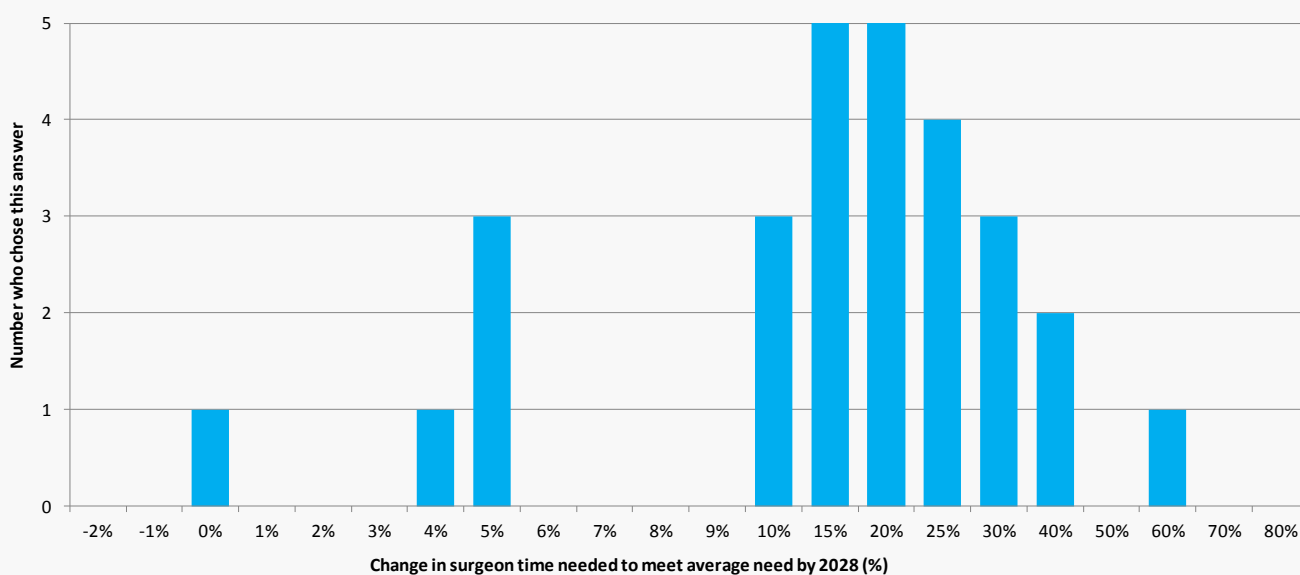
- A wide range of experts contributed: the quantity and quality of contributions was high.
- 28 out of 39 (72 per cent) of confirmed participants took part in both Delphi stages.
- Surgeons (including BOA, SAC and trainee representatives) contributed the largest proportion of responses.
- There was some divergence of answers in round two, but some questions still elicited a wide range of quantitative answers.
- No rationales were required in round two.

Average individual patient need question

Question: Do you think the average individual patient need for trauma and orthopaedic surgeon time will change, relative to today?

By need we mean: 'the requirement of individuals to enable them to achieve, maintain or restore an acceptable level of social independence or quality of life as defined by a particular care agency or authority'.

Figure C2: Average individual patient need



Source: CfWI analysis of Delphi results

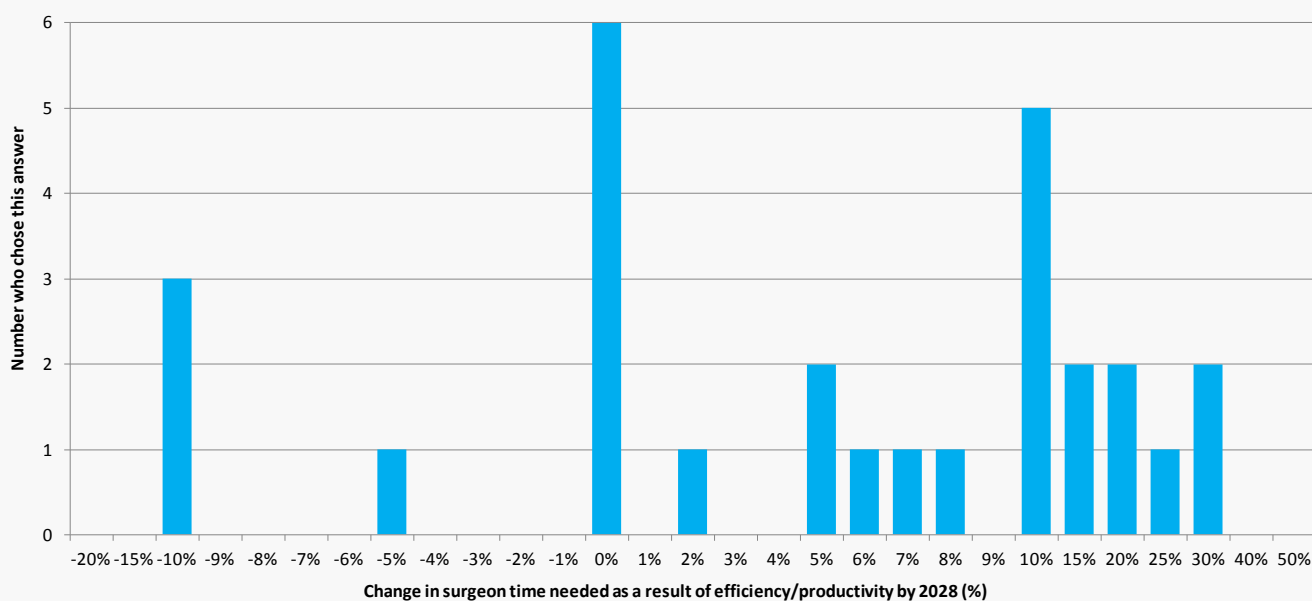
Final judgements of the panel after two Delphi rounds:

- The most common answers were 15 and 20 per cent.
- The answers ranged from 0 to 60 per cent.
- The median value was 20 per cent.
- The average value was 20 per cent.
- The panel was instructed not to consider population growth as it is factored separately into the model. However, some rationales included population, which has the potential of overestimating or double counting the impact of population growth/ageing population.
- There was a convergence of range in round two, with the median value unchanged.

Efficiency and productivity question

Question: As a result of changes in EFFICIENCY AND PRODUCTIVITY, do you think the demand for trauma and orthopaedic surgeon time will change relative to today?

Figure C3: Efficiency and productivity



Source: CfWI analysis of Delphi results

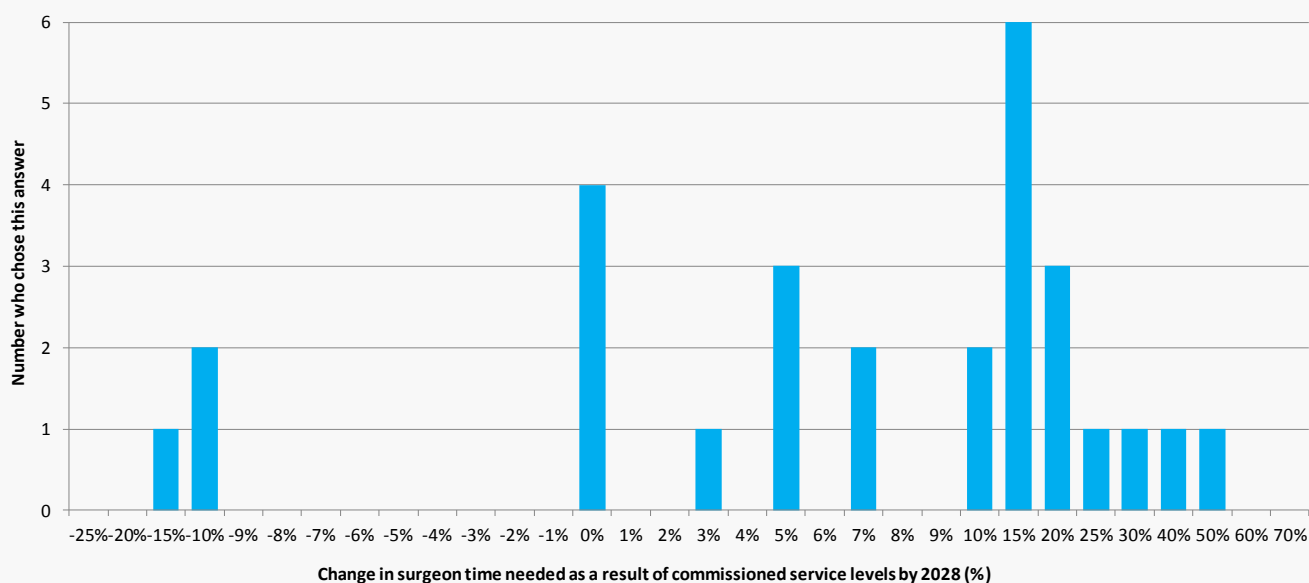
Final judgements of the panel after two Delphi rounds:

- The most common answer was 0 per cent.
- The answers ranged from -10 to +30 per cent.
- The median value was 7 per cent.
- The average value was 7 per cent.
- Some participants' quantitative answers appeared to contradict their rationales. We contacted those people individually and, with their agreement, adjusted their answer to match their intentions.
- There was a convergence of range in round two, with the median value higher.

Commissioned level of service question

Question: Do you think the demand for trauma and orthopaedic surgeon time will change relative to today in order to deliver the COMMISSIONED LEVEL OF SERVICE in 2028?

Figure C4: Commissioned level of service



Source: CfWI analysis of Delphi results

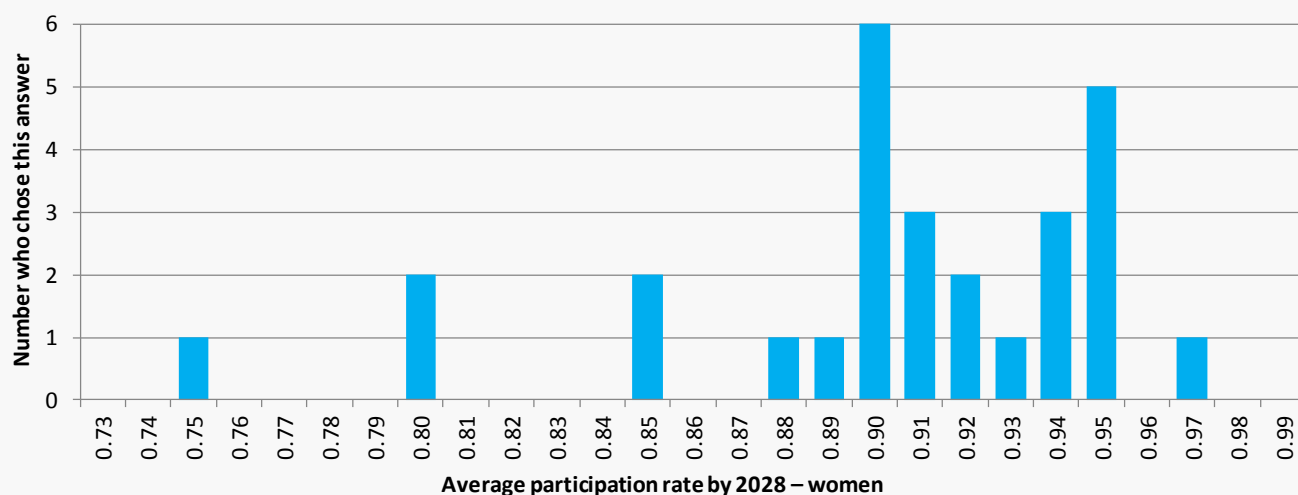
Final judgements of the panel after two Delphi rounds:

- The most common answer was 15 per cent.
- The answers ranged from -15 to +50 per cent.
- The median value was 10 per cent.
- The average value was 11 per cent.
- There was a convergence of range in round two, with the median value unchanged.

Participation rate question – women

Question: What do you think will be the AVERAGE PARTICIPATION RATE (full-time and part-time working) of T&O surgeons (CCT holders) by 2028, by gender?

Figure C5: Participation rate – women



Source: CfWI analysis of Delphi results

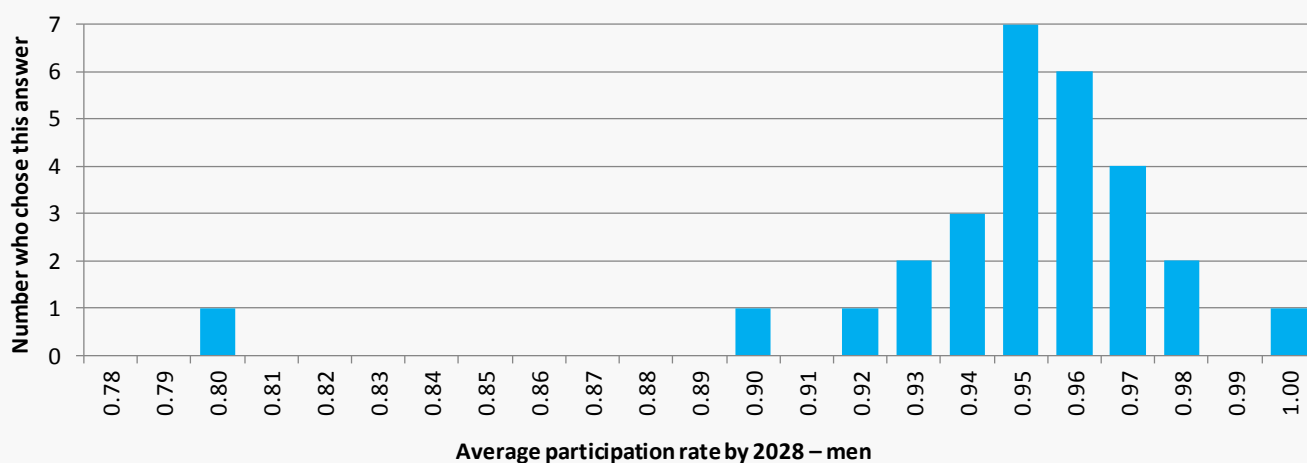
Final judgements of the panel after two Delphi rounds:

- The most common answer was 0.9.
- The answers ranged from 0.75 to 0.97.
- The median value was 0.91.
- The average value was 0.90.
- There was a convergence of range in round two, with the median value higher.

Participation rate question – men

Question: What do you think will be the AVERAGE PARTICIPATION RATE (full-time and part-time working) of T&O surgeons (CCT holders) by 2028, by gender?

Figure C6: Participation rate – men



Source: CfWI analysis of Delphi results

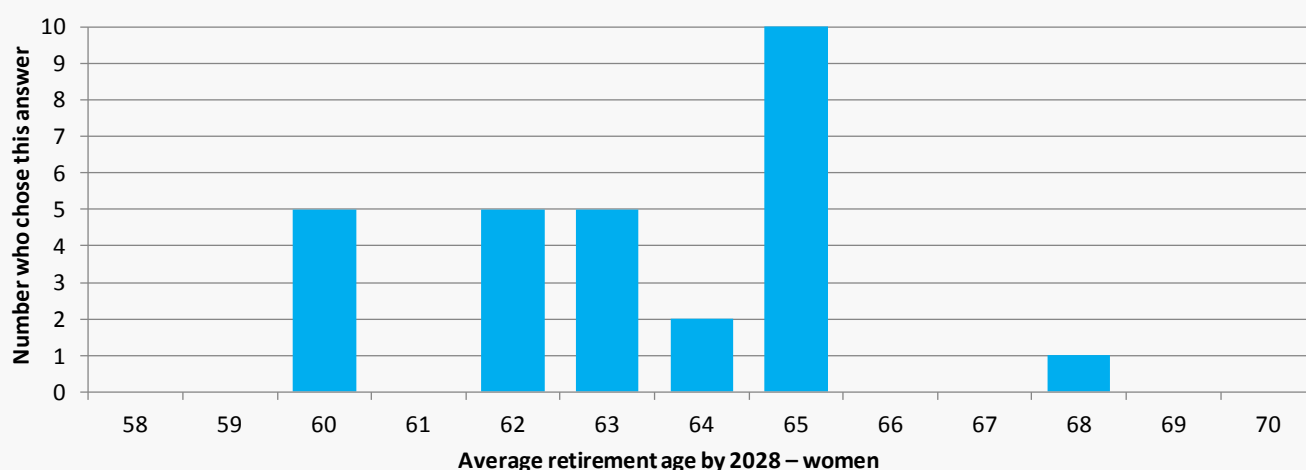
Final judgements of the panel after two Delphi rounds:

- The most common answer was 0.95.
- The answers ranged from 0.8 to 1.0.
- The median value was 0.95.
- The average value was 0.95.
- There was a divergence of range in round two, with the median value unchanged.

Retirement age question – women

Question: What do you think will be the AVERAGE RETIREMENT AGE of trauma and orthopaedic surgeons (CCT holders) by 2028, by gender?

Figure C7: Retirement age – women



Source: CfWI analysis of Delphi results

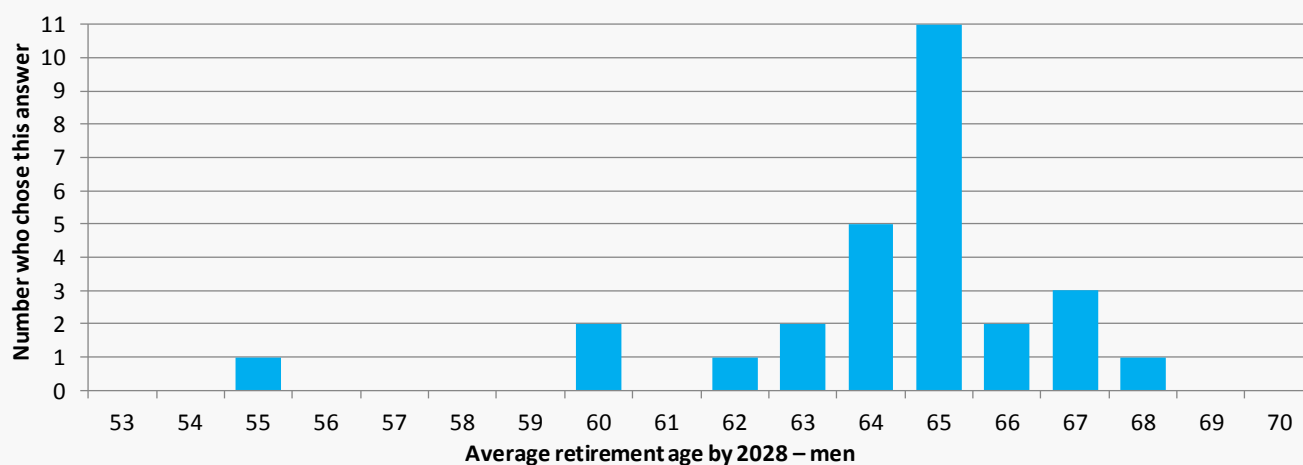
Final judgements of the panel after two Delphi rounds:

- The most common answer was 65.
- The answers ranged from 60 to 68.
- The median value was 63.
- The average value was 63.
- There was a convergence of range in round two, with the median value lower.

Retirement age question – men

Question: What do you think will be the AVERAGE RETIREMENT AGE of trauma and orthopaedic surgeons (CCT holders) by 2028, by gender?

Figure C8: Retirement age – men



Source: CfWI analysis of Delphi results

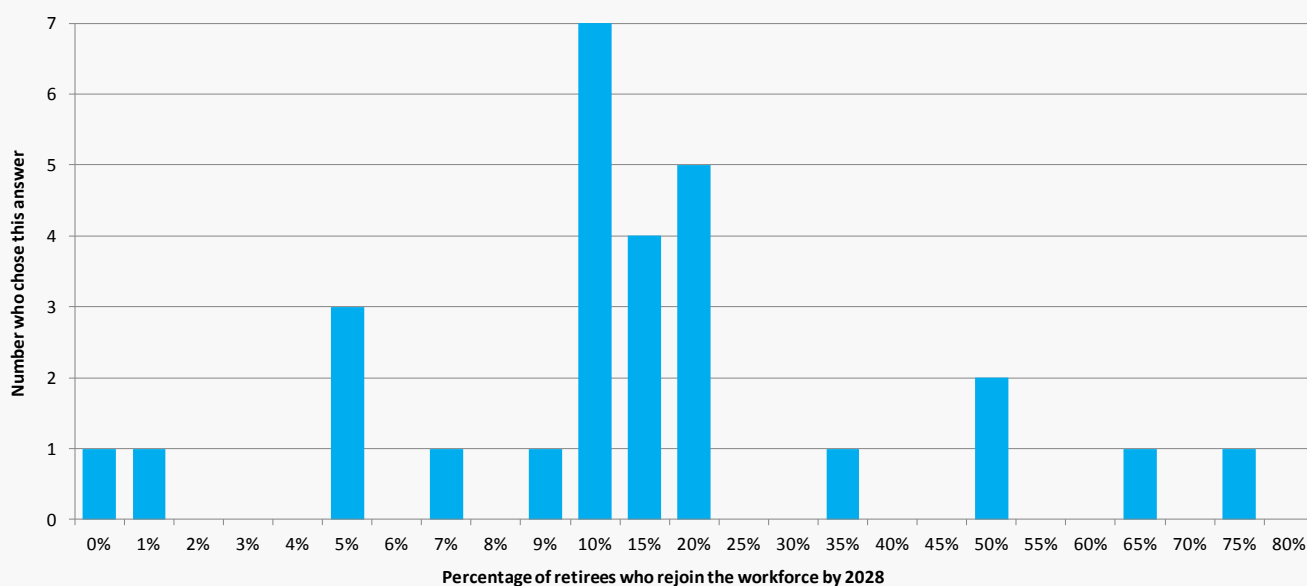
Final judgements of the panel after two Delphi rounds:

- The most common answer was 65.
- The answers ranged from 55 to 68.
- The median value was 65.
- The average value was 64.
- There was a divergence of range in round two, with the median value unchanged.

Retire and return question

Question: What do you think will be the percentage of retirees who will REJOIN the workforce SHORTLY AFTER RETIRING, by 2028?

Figure C9: Retire and return



Source: CfWI analysis of Delphi results

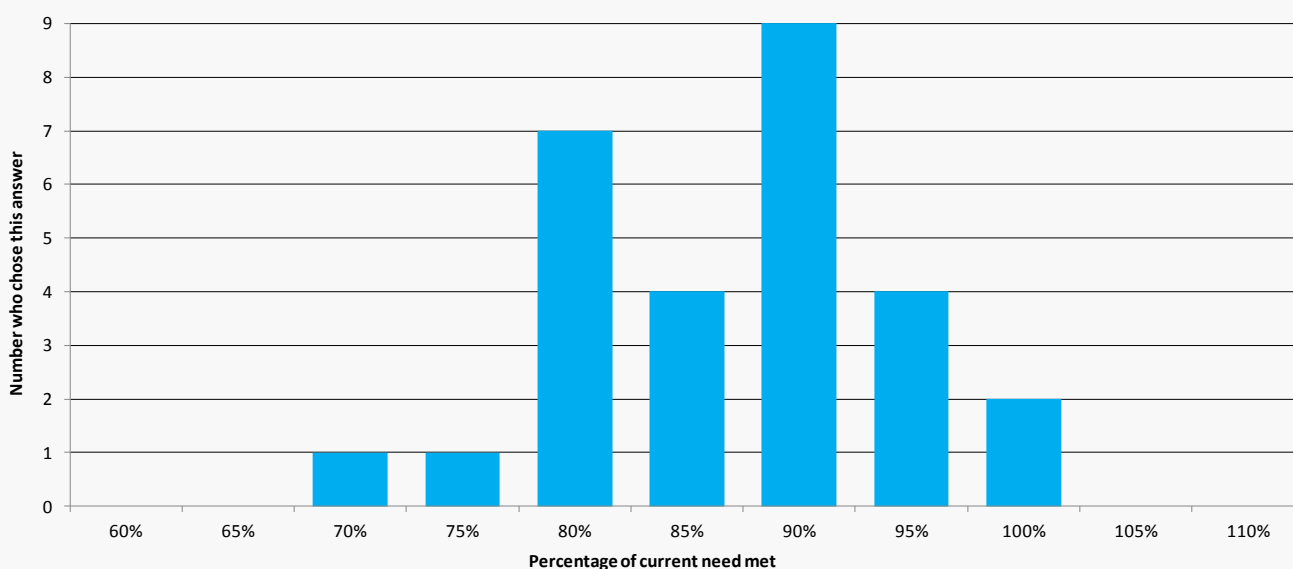
Final judgements of the panel after two Delphi rounds:

- The most common answer was 10 per cent.
- The answers ranged from 0 to 75 per cent.
- The median value was 13 per cent.
- The average value was 19 per cent.
- There was a divergence of range in round two, with the median value higher.

Current need question

Question: What proportion of today's need is met by current T&O surgical services?

Figure C10: Current need



Source: CfWI analysis of Delphi results

Final judgements of the panel after two Delphi rounds:

- The most common answer was 90 per cent.
- The answers ranged from 70 to 100 per cent.
- The median value was 90 per cent.
- The average value was 87 per cent.
- There was a convergence of range in round two, with the median value unchanged.

Annex D: Changing population and demographics

Prevalence rates by age group for inpatients and outpatients for 2012 were calculated using HES data. The CfWI assumed rates remain constant, and factored ONS population forecasts by age group from 2013 to 2028, creating a prevalence rate weighted time series forecast of future demand based on population growth by age group.

For T&O, the resulting overall change in demand by 2028 is estimated to be 19 per cent higher with inpatient data, and 15 per cent higher with outpatient data. There are significantly higher numbers of outpatients compared to inpatients. However, inpatients have inherently higher episode intensities, so the CfWI has used an average (17 per cent) as the overall prevalence-weighted population impact on demand by 2028 to avoid underestimating demand.

Changing population 2012 to 2028, England

There are large variations by age group with the total population forecast to grow by 11 per cent:

- 60+ forecast to grow by 36 per cent
- under 60 forecast to grow by 4 per cent
- 20-29 year olds forecast to decline by 4 per cent
- 40-49 year olds forecast to decline by 5 per cent.

Figure D1: Changing population 2012 to 2028, England

	Age and population (thousands)									
	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+
2012	6,477	6,294	7,281	7,031	7,764	6,577	5,805	3,757	2,070	438
2028	6,935	7,032	7,006	7,783	7,389	6,941	7,050	5,136	3,284	903
2012 to 2028 change	7%	12%	-4%	11%	-5%	6%	21%	37%	59%	106%
	11%									
	4%						36%			

Source: ONS, 2013

Estimated 2028 T&O inpatients based on 2012 prevalence rates

2012 inpatient data is only available in the four age bands shown.

*ONS forecasts

**Based on 2012 prevalence rates

Figure D2: Estimated 2028 T&O inpatients based on 2012 HES prevalence rates

Age	Inpatients				
	0-14	15-59	60-74	75+	Total
2012 T&O inpatients	72,251	576,748	320,091	230,449	1,199,539
2012 population (thousands)	9,485	31,940	7,857	4,212	
2012 rate/thousand population	7.6	18.1	40.7	54.7	
2028 population (thousands)*	10,453	32,634	9,784	6,589	
2028 T&O inpatients**	79,628	589,283	398,568	360,479	1,427,958
overall change in demand by 2028					19%

Source: HSCIC, 2012b

Estimated 2028 T&O outpatients based on 2012 prevalence rates

2012 outpatient data is available in the 10 age bands shown.

*ONS forecasts

**Based on 2012 prevalence rates

Figure D3: Estimated 2028 T&O outpatients based on 2012 HES prevalence rates

Age	Outpatients										Total
	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90+	
2012 T&O outpatients	426,611	711,782	610,129	643,647	976,149	1,108,693	1,229,645	936,645	418,940	51,044	7,113,285
2012 population (thousands)	6,477	6,294	7,281	7,031	7,764	6,577	5,805	3,757	2,070	438	
2012 rate/thousand population	65.9	113.1	83.8	91.5	125.7	168.6	211.8	249.3	202.4	116.5	
2028 population (thousands)*	6,935	7,032	7,006	7,783	7,389	6,941	7,050	5,136	3,284	903	
2028 T&O outpatients**	456,788	795,270	587,109	712,575	928,925	1,169,977	1,493,308	1,280,541	664,778	105,163	8,194,435
overall change in demand by 2028											15%

Source: HSCIC, 2012a

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