



## **Meeting the Future Challenge of Stroke**

### **Stroke Medicine Consultant Workforce Requirements 2011-2015**

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# Meeting the Future Challenge of Stroke

## British Association of Stroke Physicians

### Stroke Medicine Consultant Workforce Requirements 2011-2015

The purpose of this document is to provide an estimate of the consultant workforce required to deliver specialist stroke services across the UK. The method used is described in detail in order to facilitate local job plan development and the prediction of trainee numbers needed for Stroke Specialist leadership of modern services. This report has been produced by the British Association of Stroke Physicians (BASP) in collaboration with the JRCPTB Stroke Medicine Specialist Advisory Committee (SAC).

#### 1. Summary

Clinical developments in UK stroke services have overtaken the specialist resource needed to support them. Using nationally approved clinical standards, it is calculated that 22 Direct Clinical Care (DCC) Programmed Activities (PAs) are required to support a comprehensive stroke and TIA service admitting 600 stroke patients per year. This comprises 10.5 PAs for 24 hour acute care, 3 PAs for rehabilitation and 8.5 PAs for outpatient reviews including a rapid access neurovascular service. A population of 60 million requires 2800 DCC PAs from Stroke Specialists. This is equivalent to 350 whole time equivalent (WTE) consultants, but census data collected by the Royal College of Physicians of London indicates that most Stroke Physicians also provide input into another specialty such as Geriatric Medicine, Neurology, Acute Medicine, Clinical Pharmacology, Rehabilitation Medicine or Cardiology. It is acknowledged that some aspects of stroke care are currently provided by consultants who are not primarily Stroke Specialists according to the criteria specified by BASP. By estimating that an additional 1.5 DCC PAs are available from this Sub-Specialist support, and assuming that most BASP members divide their clinical time equally between stroke and another specialty, it is calculated that the Stroke Specialist shortfall is currently 163 posts, i.e. 513 Stroke Specialists are required in total for a UK population of 60 million.

At the time of publication of this report, 40 Stroke Medicine trainees are registered for completion of specialist training by 2014. BASP strongly recommends that, as a continuation of the 2008 English Department of Health initiative, an extra 30 Stroke Medicine trainee places are created per year in the UK for the next 4 years. This will address the current shortfall by providing an additional 120 Stroke Specialists. The distribution of these trainee posts should be determined on a population basis with sensitivity to the existing specialist resource. To provide a specialist workforce for the ageing population in the future, BASP recommends that after the next 4 years, the total number of Stroke Medicine trainee posts should be 30 per year.

## 2. Background

Stroke Medicine is a new specialty yet to reach saturation within clinical services. Using data from the 2006 National Sentinel Stroke Audit and the Scottish Stroke Care Audit, BASP recommended in a 2007 report that a UK-wide consultant expansion of 117 posts was required to provide a uniform standard of patient care<sup>1</sup>. This estimate requires revision for two reasons:

- In the last three years there have been very significant developments in expected standards of stroke care irrespective of service configuration and the parent specialty of the physicians concerned. These new standards have increased the amount of direct specialist input required into stroke services, including a substantial commitment outside of normal working hours.
- Despite the launch of a Stroke Medicine curriculum in 2007 and creation of a cohort of trainees with a sub-specialty interest in stroke, the approved training schemes have not been systematically funded. After completion of specialist training, trainees may enter a consultant post which does not permit full use of their Stroke Medicine training. It is therefore unclear how much progress has been made towards providing specialist-led stroke services.

The stages outlined below to reach a numerical estimate are:

- What service should be provided by Stroke Specialists?
- What amount of specialist direct clinical care is required to deliver this service?
- How does direct clinical care translate into consultant numbers?
- How many Stroke Specialist direct clinical care sessions already exist?
- What is the number of trainees required in the short term?
- What is the number of trainees required in the long term?
- What are the implications for each region?

Each section will summarise relevant details from the original 2007 BASP document and consider what adjustments are now required.

### **3. What service should be provided by Stroke Specialists?**

Since 2007, there have been significant and appropriate changes in the expectation of care delivered by clinical stroke services as a result of the National Stroke Strategy<sup>2</sup>, the Coronary Heart Disease and Stroke Strategy for Scotland<sup>3</sup>, and similar strategies for Northern Ireland<sup>4</sup> and Wales<sup>5</sup>, together with related guidance such as the 2008 SIGN and NICE guidelines<sup>6,7</sup> and the 2010 NICE Quality Standard<sup>8</sup>.

Any workforce estimate should reflect the content of these national guidelines, which are summarised in terms of service provision by the 2010 BASP Stroke Service Standards<sup>9</sup>. They are also implicit within the JRCPTB Stroke Medicine curriculum<sup>10</sup>. In summary these include:

- Daily assessment of new confirmed stroke and TIA inpatients including weekends and bank holidays
- Daily assessment of suspected stroke and TIA inpatients including weekends and bank holidays
- Availability of an opinion for intravenous thrombolysis treatment from a specialist at any time, aiming to treat 10% of all stroke admissions
- Weekly acute and rehabilitation multidisciplinary team meetings
- Twice weekly ward round of rehabilitation patients
- Outpatient review of high risk TIA patients within 24 hours and low risk TIA patients within 7 days
- At least two outpatient review opportunities after discharge from a stroke unit
- Easily accessible specialist clinics for spasticity, pain and other stroke specific complications
- Liaison with a range of specialties including emergency medical services, critical care, radiology, interventional neuroradiology, neurosurgery, ophthalmology, neurorehabilitation and vascular surgery.

**4. What Amount Of Specialist Direct Clinical Care Is Required To Deliver This Service?**

In order to reflect stroke specialist activity irrespective of service configuration, workforce estimations are based upon the number of consultant sessions required to deliver care meeting current national care quality indicators and standards<sup>8,9</sup>. Using the example of a unit admitting **600** stroke patients per year, the number of Direct Clinical Care (DCC) PAs is described below.

**4.1 Hyperacute and Acute Care**

The 2007 BASP estimate considered the workload of specialist input in order to provide weekday senior review for 600 new admissions annually:

Hyperacute/Acute Stroke Unit (HASU/ASU) ward rounds of current inpatients	2.5
MDT & communication sessions	1.5
New urgent referrals weekdays only	2
Neuroradiology and audit meeting	0.5
<b>Total</b>	<b>6.5</b>

The 2007 BASP estimate did not include:

- weekend review of acute stroke admissions
- weekend review of high risk TIA (see Neurovascular clinic below)
- out of hours or weekend thrombolysis service.

In simple terms extension to a daily specialist service would add:

- 2.0 PAs for weekend daytime review of new urgent referrals and inpatients within 24 hours of admission. This is based upon 4.5 PAs during weekdays for HASU/ASU ward round and new urgent referrals (2.5 + 2 = 4.5) being extended by a further 2 days and bank holidays
- 1.0 PA to provide a weekend thrombolysis service and neuroscience liaison
- 1.0 PA to provide weekday out of hours thrombolysis service and neuroscience liaison.

It should be noted that the total number of PAs required for hyperacute stroke care will increase in future as the selection of patients for individual treatments becomes more sophisticated. More time will be necessary for communication, review of investigations and liaison with neurointerventional providers. Collaboration across service boundaries may be necessary to provide weekend specialist input and thrombolysis service on a viable rota, but this would not change the overall number of PAs required.

**Total DCC PAs to support a hyperacute and acute stroke service: 10.5**

**4.2 Rehabilitation**

Out of 600 patients admitted each year with new stroke, it is expected that at least 200 would require specialist rehabilitation, requiring the following consultant DCC PAs:

Multidisciplinary team and patient & carer meetings	1.0
Ward rounds	1.5
Assessments between ward rounds	0.5
<b>Total</b>	<b>3.0</b>

This has been increased by 0.5 PA since the previous report to reflect the BASP standard of a twice weekly consultant ward round of all rehabilitation patients.

**Total DCC PAs to support in-patient rehabilitation service: 3.0**

**4.3 Outpatient Stroke Review And Community Rehabilitation**

In a service admitting 600 patients per year, at least 400 would be discharged alive and require specialist follow up on at least two occasions: 6 weeks and 6 months after discharge. In many localities this is provided by the secondary care stroke service. In addition to standard review, specific clinics are required for a smaller number of patients with complications such as spasticity, pain and non-oral feeding. Patients discharged with a supported discharge team require additional medical input, as the stroke service remains responsible for their care until formally discharged.

Therefore in 2007 BASP estimated that the DCC PAs required after discharge from a stroke unit would be:

Stroke review clinic	1.5
Stroke special interest clinic	0.5
Community stroke team / Supported Discharge team input	1.0
<b>Total</b>	<b>3.0</b>

It is possible that some of these activities may be provided by healthcare professionals other than a Stroke Specialist. However, there should remain a consultant responsible for their training and clinical supervision. The cost of providing the additional healthcare professional is also assumed to be taken from the DCC PAs, so there would be no net change in overall resource required. This figure has not been modified since 2007.

**Total DCC PAs to provide outpatient review & community stroke service: 3.0**

**4.4 Outpatient Neurovascular Service**

BASP acknowledges that there is considerable variation in the structure of neurovascular services, but all must have a rapid response which is flexible to demand. High risk TIA patients must be assessed within 24 hours of their event, but TIA mimics also form a large proportion of referrals. BASP previously estimated that depending upon the local service model, the DCC PAs required by these clinics are:

Neurovascular clinic	3.0 – 4.5
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This estimate did not consider the urgent review of high risk TIA patients at weekends, including TIA mimics. Although sometimes unavoidably admitted, these cases should be seen as outpatients within 24 hours rather than as inpatients. Organisation of investigations and liaison with vascular services at weekends when routine support is not available requires greater direct input from the Stroke Specialist. The processing of a new patient can often be spread over several hours, requiring the Stroke Specialist to be available for more than 1 PA in order to review investigations and discuss management options with the patient. To acknowledge the additional weekend workload, it is recommended that the upper limit of the



original BASP estimation plus a further 1PA is used for provision of a responsive and flexible 7 day outpatient neurovascular service.

**Total DCC PAs to support a 7 day outpatient neurovascular service: 5.5**

**4.5 Summary**

Applying current standards of clinical care according to UK policies and specialist society standards has increased the number of DCC PAs from the estimate of 16.5 in 2007.

**Total DCC PAs to support a comprehensive stroke service admitting 600 stroke patients per year: 22**

A “sliding scale” of DCC PAs for stroke according to number of admissions per year is indicated below.

**Table 1. Sliding scale of DCC PAs for stroke**

<b>No. of acute stroke admissions per year</b>	<b>Approx population (1000’s)</b>	<b>Acute</b>	<b>Rehab</b>	<b>Outpatients</b>	<b>Total</b>
300	180	8	2	6	<b>16</b>
400	240	9	2.5	6.5	<b>18</b>
500	300	10	2.5	7.5	<b>20</b>
600	350	10.5	3	8.5	<b>22</b>
700	400	11	3.5	8.5	<b>23</b>
800	475	11	4	9	<b>24</b>
900	530	12	4	9	<b>26</b>
1000	600	13	5	10	<b>28</b>

## 5. How Does Direct Clinical Care Translate Into Consultant Numbers?

There are two additional factors to consider in the estimation of consultant numbers from stroke DCC PAs:

- 5.1. Supporting programmed activity (SPA).
- 5.2. DCC PAs in a main or “parent” specialty.

### 5.1. SPA activities include:

- Audit and service development
- Clinical governance
- Continuing professional education
- Staff training
- Trainee and non-medical specialist staff supervision
- Service development including introduction of emerging therapies
- Support for clinical research.

To accommodate these activities, a figure of **2.0** is proposed for SPAs in a 10 session job plan. This should be included in the calculation of consultant numbers required for clinical service provision. The British Medical Association has recommended that 2.5 SPAs are included within a 10 PA contract, and BASP endorses this advice whenever it is possible to achieve such a job plan. However many Stroke Specialists have complex job plans and trusts/hospitals have reduced formal SPA time, so a pragmatic approach has been taken. Whilst the proposed 2.0 SPAs within this modelling represents a compromise, we believe this is more realistic for engaging with employing organisations.

**5.2.** Individual job plans should be considered in the local calculation of consultant numbers. For the purpose of this document, a range of consultant numbers will be presented according to time spent working in parent specialty, assuming that the stroke related workload is spread equally across all participating consultants.

BASP proposes that a Stroke Specialist should provide a minimum of **5** PAs specifically into stroke care, which would typically consist of 4 DCC PAs + 1 SPA. The remaining 5 PAs can

support a parent specialty. Consultants may provide more or less time than this into stroke care. A Stroke Sub-specialist would provide a minimum of 2.5 DCC PAs + 0.5 SPA to maintain expertise in stroke care at a specialist level, targeted at a specific aspect of service provision such as TIA clinic or rehabilitation. A full time Stroke Specialist could provide 8 DCC PAs + 2 SPAs, but would then not provide any input into a parent specialty. For the purpose of this modelling exercise, it is assumed that a 1.0 WTE Stroke Specialist would still provide a minimum of 2.5 DCC PAs into a parent specialty within their 10 PA job plan.

It also necessary to consider the impact of out of hours work and weekend on call frequency. The maximum intensity of on call frequency should be 1 in 4. According to local arrangements the DCC PAs in Table 2 below can be divided between individuals with a different stroke focus as long as the on call rota intensity does not exceed local agreements. Therefore in a service admitting 600 patients per year, the range of consultant numbers is:

- minimum: 4 (contributing 5.5 DCC PAs to stroke and 2.5 to parent specialty)
- maximum: 8 (contributing 2.5 DCC PAs to stroke and 5.5 to parent specialty)

This model assumes that consultants work a 10 session job plan with 2 SPAs, and each post makes an equal contribution to stroke care. No distinction has been made between acute, rehabilitation and outpatient DCC PAs in the maintenance of clinical expertise. Different session types can be swapped between specialists according to local service configuration as long as the overall balance reflects service requirements.

Many stroke specialists also contribute towards on call activity in their parent specialty or GIM. However this is determined on an individual basis and for the purpose of this document such activities are assumed to be in addition to a 10 PA job plan.

**Table 2. Sliding scale of Stroke Specialist numbers with parent specialty activity. This assumes application of the rules above (i.e. a maximum on call intensity of 1 in 4 and a minimum of 2.5 DCC PAs to maintain clinical expertise in any specialty).**

No. of acute stroke admissions per year	Approx population (1000's)	Total stroke DCC PAs for this service	Stroke DCC PAs per specialist or sub-specialist	Parent DCC PAs per specialist or sub-specialist	Number of Stroke Specialists (WTE)
300	180	16	4	4	4
			3	5	5
			2.5	5.5	6
400	240	18	4.5	3.5	4
			3.5	4.5	5
			3	5	6
			2.5	5.5	7
500	300	20	5	3	4
			4	4	5
			3.5	4.5	6
			3	5	7
			2.5	5.5	8
600	350	22	5.5	2.5	4
			4.5	3.5	5
			3.5	4.5	6
			3	5	7
			2.5	5.5	8
700	400	23	5.5	2.5	4
			4.5	3.5	5
			4	4	6
			3	5	7
			3	5	8
			2.5	5.5	9
800	475	24	5	3	5
			4	4	6
			3.5	5.5	7
			3	5	8
			2.5	5.5	9
900	530	26	5	3	5
			4	4	6
			3.5	4.5	7
			3	5	8
			3	5	9
1000	600	28	5.5	2.5	5
			4.5	3.5	6
			4	4	7
			3.5	4.5	8
			3	5	9

If consultants with Stroke Medicine expertise do not provide clinical input into another specialty then fewer posts are required:

**Table 3. Sliding scale of Stroke Specialist numbers  
assuming full 8 DCC PAs input into stroke services**

<b>No. of acute stroke admissions per year</b>	<b>Approx population (1000's)</b>	<b>Total stroke DCC PAs for this service</b>	<b>Number of full time Stroke Specialists (WTE)</b>
300	180	16	2
400	240	18	2.25
500	300	20	2.5
600	350	22	2.75
700	400	23	2.9
800	475	24	3.0
900	530	26	3.25
1000	600	28	3.5

However it is important to consider the sustainability and flexibility of services reliant upon a small number of full time individuals, the impact on parent specialties and the viability of Stroke Medicine on-call rotas. Therefore it will not be assumed that full time working in Stroke Medicine reflects a typical job plan.

## **6. How Many Stroke Specialist DCC PAs Already Exist?**

Using this model, a population of 60 million requires 2800 DCC PAs from Stroke Specialists (the BASP 2007 report<sup>1</sup> calculated 2379). The number of consultants to provide this will depend upon the distribution of time between stroke and parent specialty.

**Table 4. Consultants required according to stroke DCC PAs in job plan**

<b>Number of stroke DCC PAs</b>	<b>Number of consultants</b>	
2.5	1120	Sub-specialist
3	933	
3.5	800	
4	700	
4.5	622	

5	560	Stroke specialist	Note that above 5.5 DCC PAs for stroke, fewer than 2.5 DCC PAs will be attributed to a parent specialty within a 10 PA job plan
5.5	509		
6	467		
6.5	431		
7	400		
7.5	373		
8	350		

BASP is the recognised professional society for Stroke Specialists in the UK. There are currently 350 BASP members, but most currently provide less than 8 DCC PAs into stroke services. For example, in 2009 only 69 consultants identified themselves as Stroke Physicians as their main role in the Royal College of Physicians census compared to 969 Geriatric Medicine consultants<sup>11</sup>.

Some services are partially supported by specialists who are not BASP members, particular for rehabilitation and outpatient sessions. It is important that any local calculation of stroke DCC PAs reflects the formal care arrangements irrespective of the nature of the provider. For example, if a stroke service routinely uses a separate specialist rehabilitation service in a formal agreement, the consultant activity in that service should be included towards DCC PAs even if the contributing consultants do not primarily view themselves as Stroke Specialists.

It is possible to estimate the short term need for Stroke Specialists using the data in Table 4 to consider the combined impact with sub-specialist input with the following assumptions:

- the membership BASP is stable at 350
- the BASP Stroke Specialist definition requires a minimum of 4 DCC PAs
- all non-specialist DCC PAs occur below 4 DCC PAs

Table 5 estimates the national specialist shortfall (in italics). The range is from 0 – 350 posts.

Most current BASP members have a background in Geriatric Medicine or Neurology. It is unlikely that many work 8 DCC PAs exclusively into stroke services, and most are likely to provide 4 DCC PAs. By making a broad assumption that there are 1.5 additional DCC PAs available from sub-specialty support, the shortfall currently would be 163 posts, i.e. 513 stroke specialists are required nationally in total.

**Table 5. Estimation of the national number of Stroke Specialist required and the current shortfall (in italics) according to the number of specialist DCC PAs worked and additional sub-specialist input**

Number of stroke specialist DCC PAs	Number of additional sub-specialist DCC PAs			
	0	1.0	2.0	3.0
4	700 <i>350</i>	560 <i>210</i>	467 <i>117</i>	400 <i>50</i>
4.5	622 <i>272</i>	509 <i>159</i>	431 <i>81</i>	373 <i>23</i>
5	560 <i>210</i>	467 <i>117</i>	400 <i>50</i>	350 <i>0</i>
5.5	509 <i>159</i>	431 <i>81</i>	373 <i>23</i>	
6	467 <i>117</i>	400 <i>50</i>	350 <i>0</i>	
6.5	431 <i>81</i>	373 <i>23</i>		
7	400 <i>50</i>	350 <i>0</i>		
7.5	373 <i>23</i>			
8	350 <i>0</i>			

## **7. What Is The Number Of Trainees Required In The Short Term?**

Whatever the exact figure for existing Stroke Specialist and Sub-specialist DCC PAs, the immediate need for trainees will be greater than in the longer term due to the rapid increase in clinical standards which have demanded greater direct input from senior clinicians. It will be necessary to consider when existing trainees reach their Certificate of Completion of Training (CCT) date in order to consider the short term expansion in posts required. JRCPTB registered trainees as of 01/11/2010 indicates that the number of new Stroke Specialists available will be:

**Table 6. Projection for new Stroke Specialists gaining CCT (as of 01/11/2010)**

2011	9
2012	16
2013	14
2014	1
<b>Total</b>	<b>40</b>

It is possible that some trainees are not registered, but may do so before they achieve their parent specialty CCT. However there is also no guarantee that trainees completing Stroke Medicine training will be appointed to a Stroke Specialist post. In 2008 the Department of Health provided core funding for 30 Stroke Medicine trainees to undergo the additional one year of approved specialty experience required by the JRCPTB curriculum. This funding has not been renewed.

Based upon these figures, there appears to be a shortfall of  $163 - 40 = 123$  new Stroke Specialists over the next 4 years. BASP recommends that, as a continuation of the original DH initiative, a further 30 Stroke Medicine trainee places are provided per year for the next 4 years to create an additional 120 consultants on top of the existing trainee posts.

## **8. What Is The Number Of Trainees Required In The Long Term?**

Assuming that the initial shortfall in specialist has been corrected by a short term increase in trainee numbers so that the total number of specialist is 513, and attrition is estimated at 5% of consultant workforce, then 26 trainee posts should be created annually. It is likely that this is an underestimate, and epidemiological pressure on stroke will continue to increase. As more people avoid and survive other serious conditions there will be an increase in stroke incidence, with an increase in the average age of patients and consequently a greater co-morbidity burden requiring more specialist care. BASP recommends that the total number of trainee posts after 4 years of additional posts should continue at 30 per year in order to provide the specialist workforce for the future.



## **9. What Are The Implications For Each Region?**

The distribution of Stroke Specialist DCC PAs can be calculated on a population basis and compared against known DCC available within any region. The development of the workforce can then represent the clinical need within each Deanery.

In some regions, service reconfiguration is centralising certain aspects of specialist stroke care with a clear distinction between hyperacute/acute and rehabilitation services. However this should only reflect the distribution of trainees within a region rather than the actual number and it would remain the responsibility of the Stroke Medicine Training Programme Directors to ensure that the balance of specialist training is maintained. All stroke patients should be under the care of a physician with a specialist interest in Stroke Medicine for the duration of their admission and the necessary aftercare<sup>6-9</sup>.

## 10. References

1. Specialist Stroke Services: Consultant Workforce Requirements. T P Cassidy, H Rodgers, M S Dennis, M A James on behalf of the Service Development and Quality Committee of the British Association of Stroke Physicians 2007. <http://www.basp.ac.uk/resources/resources.aspx>
2. Department of Health (2007) National Stroke Strategy, *London: Department of Health*. [www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_081062](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_081062)
3. Coronary Heart Disease and Stroke in Scotland, Strategy Update 2004. <http://www.scotland.gov.uk/Resource/Doc/30859/0012660.pdf>
4. Improving Stroke Services in Northern Ireland. Department of Health, Social Services and Public Safety, July 2008. <http://dhsspsni.gov.uk>
5. Welsh Health Circular (2007) 082: Improving Stroke Services: A Programme of Work. Welsh Assembly Government, December 2007. [http://wales.gov.uk/docrepos/40382/dhss/welshhealthcirculares/WHC\(2007\)082.pdf?lang=en](http://wales.gov.uk/docrepos/40382/dhss/welshhealthcirculares/WHC(2007)082.pdf?lang=en)
6. Scottish intercollegiate Guidelines Network. Management of Patients with Stroke or TIA: Assessment, Investigation, Immediate Management and Secondary Prevention. December 2008. <http://www.sign.ac.uk/guidelines/fulltext/108/index.html>
7. National Institute of Health and Clinical Excellence. Stroke: the diagnosis and initial management of acute stroke and transient ischaemic attack. Clinical guidance 68, 2008. [www.nice.org.uk/CG68](http://www.nice.org.uk/CG68)
8. National Institute of Health and Clinical Excellence. Stroke Quality Standard, June 2010. <http://www.nice.org.uk/guidance/qualitystandards/stroke/strokequalitystandard.jsp>

9. Stroke Service Standards 2010. BASP Clinical Standards Committee.  
<http://www.basp.ac.uk/LinkClick.aspx?fileticket=%2fKYTIcgdxg0%3d&tabid=653&mid=1053>
  
10. Sub-Specialty Training Curriculum for Stroke Medicine. Joint Royal Colleges of Physicians Training Board, August 2010. <http://www.jrcptb.org.uk/specialties/ST3-SpR/Pages/Stroke-Medicine.aspx>
  
11. Royal College of Physicians (2011). Census of consultant physicians and medical registrars in the UK, 2009. <http://bookshop.rcplondon.ac.uk/details.aspx?e=325>