The Royal College of Pathologists
Pathology: the science behind the cure

Best practice recommendations

Staffing and workload for neuropathology departments

July 2020

Authors: Professor Tim Dawson, Dr Robin Highley, Dr Ute Pohl, Dr Aditya Shivane, Dr Nitika Rathi, Dr Daniel du Plessis, Dr Aruna Chakrabarty, Dr Jacob Joseph

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Produced by	Professor Tim Dawson, Neuropathology Specialty Advisory Committee Chair and Vice President of the British Neuropathological Society, with members of the Workload Implementation Group: Dr Robin Highley, Dr Ute Pohl, Dr Aditya Shivane, Dr Nitika Rathi, Dr Daniel du Plessis, Dr Aruna Chakrabarty, Dr Jacob Joseph
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The Royal College of Pathologists
6 Alie Street
London E1 8QT
T: 020 7451 6700
F: 020 7451 6701
www.rcpath.org

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Foreword

Best practice recommendations (BPRs) published by the Royal College of Pathologists should assist pathologists in providing a high standard of care for patients. BPRs are systematically developed statements intended to assist the decisions and approach of practitioners and patients about appropriate actions for specific clinical circumstances. They are based on the best available evidence at the time the document was prepared. It may be necessary or even desirable to depart from the advice in the interests of specific patients and special circumstances. The clinical risk of departing from the BPR should be assessed and documented.

A formal revision cycle for all BPRs takes place every three years. The College will ask the authors of the BPR to consider whether or not the recommendations need to be revised. A full consultation process will be undertaken if major revisions are required. If minor revisions or changes are required, a short note of the proposed changes will be placed on the College website for two weeks for members' attention. If members do not object to the changes, a short notice of change will be incorporated into the document and the full revised version will replace the previous version on the College website.

This BPR has been reviewed by the Publishing team. It was placed on the College website for consultation with the membership from 24 January to 16 April 2020. All comments received from the membership were addressed by the authors to the satisfaction of the Clinical Director of Publishing and Engagement.

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Acronyms and abbreviations

ACP	additional capacity payment
AoMRC	Academy of Medical Royal Colleges
BNS	British Neuropathological Society
CCT	certificate of completion of training
CNS	central nervous system
COSD	Cancer Outcomes and Services Dataset
CPC	clinico-pathological correlation
CPD	continuing professional development
DCC	direct clinical care
DGH	district general hospital
DN-WTK	Diagnostic Neuropathology Workload Toolkit
EBs	extra blocks
EGFR	epidermal growth factor receptor
EM	electron microscopy
FTE	full-time equivalent
H&E	Haematoxylin and Eosin
HMDS	Haematological Malignancy Diagnostic Service
ICD	International Classification of Diseases
ICH	intracranial haemorrhage
IDH	isocitrate dehydrogenase
IHC	immunohistochemical staining
LIMS	laboratory information management systems
LUT	Lookup Table
MCCD	medical certificate for cause of death
MDT	multidisciplinary team
MGMT	methylguanine methyl transferase
MPNST	malignant perpheral nerve sheath tumour
NESMET	Neuropathological Slide Metric
NeuroSMART	Neuropathology Slide Metric Analysis Reality Tool
NOS	not otherwise specified
PA	programmed activity
PAC	Professional Affairs Committee
PI	prediction interval
QA	quality assurance
RO	re-orientation
SAC	Specialty Advisory Committee
SDH	subdural haemorrhage
SDW	slide-dependent work
SFT	solitary fibrous tumour
SIW	slide-independent work
Slo-Moh	type of Moh procedure using a fixed/embedded marginal strip
SNOMED	Systematised Nomenclature of Medicine
SNOP	Systematised Nomenclature of Pathology
SPA	supporting professional activity
TERT	telomerase reverse transcriptase
WHO	World Health Organization

1. Introduction

1.1 Background

Guidelines on staffing and workload were first issued by the Royal College of Pathologists in 1992 and updated in 1999. Changes in cellular pathology practice and consultant terms and conditions prompted revisions in 2003 (first edition) and 2005 (second edition). During their evolution, the guidance moved from workloads based on specimen numbers towards a matrix scoring system (in 2003), which took account of individual specimen complexity at both macro and micro levels.

Recognising the essential differences in working practice compared to histopathology, the neuropathology guidelines were formulated as an appendix to the first and second editions, with a 'time-per-specimen' formulation based on information collated by the British Neuropathological Society (BNS) over a decade earlier. Consequently, this failed to reflect changes in practice and in specimen complexity. It also stood in isolation from the matrix system adopted by the first and second editions of the Royal College of Pathologists' guidance, which included other cellular pathology specialisms.

In 2009, the Neuropathology Specialty Advisory Committee (SAC) and BNS Professional Affairs Committee (PAC) undertook to revise the neuropathological appendix of the second edition (2005) along the lines of the established matrix system. While neuropathology remodelled its workload towards a matrix system, the histopathology group moved towards a less granular and more simplistic macro/micro list-based system, to allow for real-time workload assessment and prospective workload balancing.

The Neuropathology SAC considered this model but felt that, with the majority of neuropathology units comprising only two or three consultants, prospective workload balancing was not a priority. It was considered more important to reflect the complexity of handling neuro specimens and realistic time costs of neuropathology work.

The impending establishment of a separate Diagnostic Neuropathology Certificate of Completion of Training (CCT) in 2013 added an imperative to the project. Most of the groundwork was completed in 2012 but the document did not reach publication until 2014. While the document provided a reasonable basis for workload calculation, it was found to be cumbersome and difficult to apply in practice. Also, it did not provide any method for dynamically metering workload capacity.

Since the 2014 guidelines, the advent of the 2016 World Health Organization (WHO) CNS Tumour Classification signposted rapidly changing diagnostic practice. This publication formalised molecular investigations in classification and mandated central nervous system (CNS) integrated reports. The result was a steep increase in reporting complexity for the majority of CNS tumours, in addition to the year-on-year growth in case workload.

1.2. Purpose of these best practice recommendations

This document is intended to:

- support neuropathologists and their employers by providing metrics to ensure workload is within reasonable, safe and practical limits. Excessive workload, whether short-term or sustained, compromises patient safety, quality of service and pathologist wellbeing.
- assist neuropathologists in job planning and in the preparation of supporting documentation for appraisal
- facilitate national and local workforce planning
- reassure the public that the appropriate workforce resources are devoted to the reporting of neuropathology specimens
- provide employers with indicative national benchmarking.

1.3. Revising the second edition

Given the developments in diagnostic practice, the Neuropathology SAC and BNS PAC undertook to revise the neuropathology workload guidelines in 2017. After some initial work, there was realisation that all the workload guidelines to date have been essentially anecdotal and thus lacking a realistic evidence base. Consequently, pilot studies were undertaken to look at both bottom-up (individual case timing) and top-down (annual workload) data to triangulate workload averages. The bottom-up NeuroSMART (Neuropathology Slide Metric Analysis Reality Tool) tool was intended to capture case times against slide numbers, but trials showed poor inter- and intra-observer statistical consistency – although it was notable that the slide metrics correlated with the top-down data.

For top-down data, the BNS has access to a formidable array of long-term data in the form of the Annual Workload Survey. This covers 27 neuropathology centres with over 15 years of data on workforce, direct clinical care (DCC) and supporting professional activity (SPA) sessions, service population, weekly multidisciplinary team (MDT) hours, as well as specimen, autopsy, brain cut (encephalotomy) and electron microscopy (EM) numbers. From 2013, slide numbers for defined specimen groups were also collected.

Statistical analysis of several annual datasets revealed a surprisingly coherent relationship between annual departmental ‘reporting DCC’ time (i.e. annual total clinical DCC time minus annual total MDT time) and NHS surgical slide count. NHS surgical slide counts were used because of their primacy and universality, but data analysis also suggested other slide types (autopsy, encephalotomy and banking) have a slightly different metric due to the different work involved. Slide-based workload assessment is not a new concept and formed the basis of the Keele University benchmarking program in the early 2000s.

By combining the most recent three-year data period (2015–2017) and defining appropriate prediction and confidence intervals, a statistically robust linear formula workload model was developed. This ‘black-box’ approach also automatically incorporated the known-unknown and unknown-known work elements which are otherwise difficult to capture (see Figure 1).

This evidence-based benchmarked workload model allows for a relatively simple programmed activity (PA) predictive tool based on NHS surgical slide count. However, while the surgical service often forms the main part of a neuropathologist’s work, there are other significant areas of work which need to be included to obtain a representative overview. Extending this to the whole

spectrum of neuropathological work required a top-down deconstruction to formulate a surgical slide-based metric (hereafter referred to as NESMET, for NEuropathological Slide METric), which is derived from the linear formula gradient as 'reporting DCC time per 1,000 slides'. This is followed by a per pathologist bottom-up reconstruction using calculated NESMET scores for case types and procedures.

Case type and procedure NESMET scores within a given timeframe, can be combined to provide an overall PA value for comparison against a job plan. Although NESMETs are based on slide/time units, they encompass more activities than just slide handling time and their purpose is solely to attach a metric to a variable which reflects pathologist workload. Consequently, they should not be used outside a job-planned consultant diagnostic neuropathology post. Specifically, they are not intended to calculate stand-alone piece time rates, since the model and its statistics are only valid within the context defined by its dataset.

Using the Diagnostic Neuropathology Workload Toolkit

This guideline document must be used in conjunction with the Diagnostic Neuropathology Workload Toolkit (DN-WTK – see Appendix 3). This is an Excel spreadsheet into which the workload model has been embedded. It provides predictive PA calculations based on NHS surgical service slide count, per consultant NESMET capacity calculations and bottom-up workload reconstruction using NESMET-scored case types and procedures. The DN-WTK has undergone extensive development and testing by the Workload Implementation Group, whose members comprise over 10% of the national workforce. There will be a rolling review of the workload model as BNS survey data becomes available. Changes can be dynamically reflected in the DN-WTK without needing to re-draft this document.

Readers who just wish to use the DN-WTK to assess workload are directed to Appendix 3 and Appendix section 3.6 ('How do I…?'), which provides a step-by-step guide to setting up the tool.

Figure 1: Rumsfeld-Johari window

In this framework, there is work we know we do and we are aware of the time it takes; work that is known but with an unknown ti me element; unknown or unrecognised work that we nevertheless know takes time; and finally, unknown work that will take an unknown amount of time.

Known work **Known time**	**Known work** **Unknown time**
Unknown work **Known time**	**Unknown work** **Unknown time**

2. Recommendations

2.1 Programmed activities

Direct clinical care, available clinical time and work rate

Under the 2003 NHS contract, consultants work in time periods of four hours (or three hours if in premium time) known as Programmed Activities (PAs). There are four types of PA:

- DCC
- SPA
- additional NHS responsibilities
- external duties.

The workload referred to in this document is part of DCC.

In a 52-week year, there are 42 consultant working weeks (allowing for 10 weeks of annual leave, study leave, bank holidays and statutory days). Making further allowance for other leave categories (e.g. professional, special, compassionate, sickness, carer), the consultant working year is taken as 40 weeks.[1]

The RCPath consultant neuropathologist model job description for a standard 10 PA per week contract recommends a 2.5 SPAs and 7.5 DCC PA split. The 7.5 DCC PAs equate to 30 DCC hours per week, or 1,200 hours per year. For annualised job plans, one PA is four hours for 40 weeks or 160 hours per consultant year.

Multidisciplinary team (MDT) meetings are an important clinicopathological event in patient treatment pathways. They tend to be sub-specialism specific (e.g. neuro-oncology, skull base, pituitary, neuromuscular, etc.) so that a unit may have several meetings to service on a weekly, fortnightly or monthly basis, generally covering the full 52-week year (compared with the 40-week consultant year). MDT meetings are DCC time; the total time consultants spend on these should be calculated, and for the DN-WTK, expressed in weekly terms.

Four hours (one PA) is a reasonable allocation for a lead consultant to prepare, attend, present and complete post-meeting administration per MDT. Additional consultant MDT time should be included for pre-MDT multi-consultant review meetings and for non-lead consultants who are mandated to attend the MDT. Establishing an accurate and reasonable MDT allocation may require clinical management input and a diary exercise. Total MDT is subtracted from contractual DCC time to give the available ‘reporting DCC’ time.

The amount of work that a department can achieve in the time available depends on many factors, including supporting resources (see Figure 2). The number and expertise of secretarial and laboratory staff, IT facilities, accessibility of journals and up-to-date textbooks, laboratory and office design, quality of microscopes, dictation system, etc. all affect productivity. Departments should continually seek to improve the efficiency of reporting neuropathology specimens while maintaining high quality.

It is understood that some pathologists work faster than others. However, no pathologist can work at a consistently high intensity throughout the day. Periods of intense concentration must be separated by breaks or less intense types of work, such as dealing with correspondence. The physical strain of microscopy must also be taken into account. Neck problems can afflict pathologists and this can be mitigated by interspersing microscopy with other activities. The reality of a consultant's life is that there are rarely long periods of uninterrupted reporting. There is an unavoidable 'overhead' of a myriad tiny activities during a DCC PA. Resuming interrupted activities can require 25 minutes of re-focusing time.[2] Persistent interruptions cause stress, frustration, time pressure and increased error rate. 'Sterile cockpit' reporting tends to be impractical for neuropathology units, where the small number of consultants face constant reactive demands on their attention.

In departments with research programmes, there may be specific dissection and reporting protocols for research projects that take extra time compared with that for normal specimen handling. It is recommended that the extra time taken is classified as research and that appropriate supporting professional activity (SPA) time is allocated in the job plan.

Supporting professional activity

SPA sessions are defined in the 2003 consultant contract as: 'activities that underpin direct clinical care. This may include participation in training, medical education, continuing professional development, formal teaching, audit, job planning, appraisal, research, clinical management and local clinical governance activities. It should include an appropriate allowance for keeping up to date with relevant medical journals and literature'.[3, 4]

Clinical management includes all administrative activities not directly related to patient care, including department and directorate meetings.

The 2003 consultant contract recommends that full-time equivalent (FTE) consultants receive 2.5 SPA sessions.[4] The contract also states that part-time consultants need to devote proportionately more of their time to SPA to maintaining continuing professional development (CPD) and clinical administration. Some employers have taken the view that the 2.5 SPA sessions should be an average over a department.

It is often not appreciated that SPAs provide much needed flexibility in managing peaks and troughs of DCC activity. Since they are not fixed sessions or urgent activities, SPA time can be flexed into DCC time during a busy week and picked up at a later date when demand has dropped. The trend for reducing SPA time to less than 2.5 sessions limits this buffer and places more stress on the consultant, as well as compromising CPD/revalidation activities.

With the introduction of medical revalidation, the availability of appropriate protected time to complete educational and administrative requirements is imperative. In general, employer pressures have led to reductions in SPA sessions in favour of clinical activity. In response, the Academy of Medical Royal Colleges (AoMRC) has recommended a minimum of 1 to 1.5 SPA sessions to complete revalidation alone.[5] This does not take into account the other clinical management and governance activities that are required of a substantive consultant.

Furthermore, the General Medical Council requires that doctors with a part-time clinical commitment (including those with academic contracts) must undertake the same revalidation as FTE consultants. This requires that they have the same minimum of 1 to 1.5 SPA sessional allowance as an FTE consultant. SPA sessions for clinical management and governance activities may be reduced proportionately and can be assessed by a diary exercise.

2.2 Workload modelling

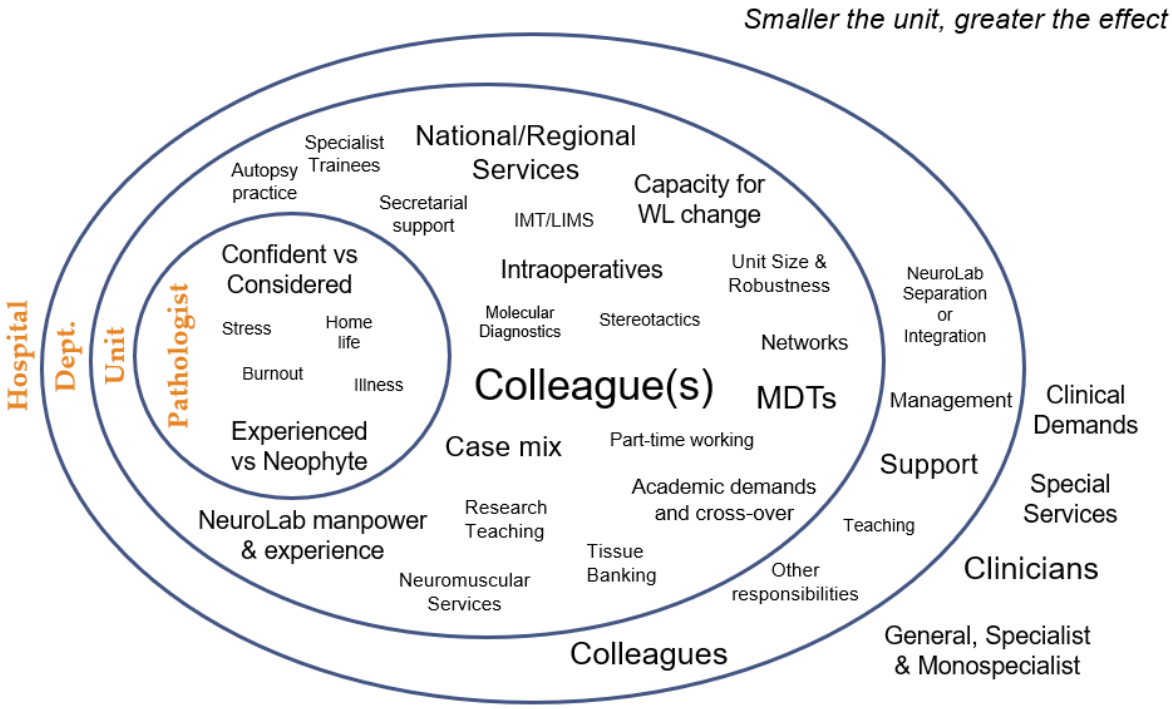
Background

Slide numbers were established in the previous edition as a useful method of workload assessment. This is not without precedent, having been the main data collected by Keele University during their cellular pathology benchmarking exercises in the first decade of the millennium. Examining tissue 'real estate' on a slide is a pathologist's primary function and even a small specimen can generate many slides of special stains, levels and immunostains, all of which require examination and consideration. This approach is not without limitations and one might argue that biopsy size and 'mega' slides* should also be taken into account, but within the constraints of simplicity, this continues to be a reasonable starting point.

There are 27 UK neuropathology units, a few of which operate as networked laboratories with either peripatetic or hub-based consultants. These units are heterogeneous as a result of intrinsic and external factors resulting in a national variation in staffing, workload and throughput. The clustergram (Figure 2) summarises this variability and its relative causes. Several units offer national referral services and some have brain tissue banks or forensic services, all of which have a slightly different work flow to NHS surgical service. This variation is accommodated in the workload modelling by using the NHS surgical service slide count only to develop the regression metric and then applying statistical prediction and confidence intervals to validate a range.

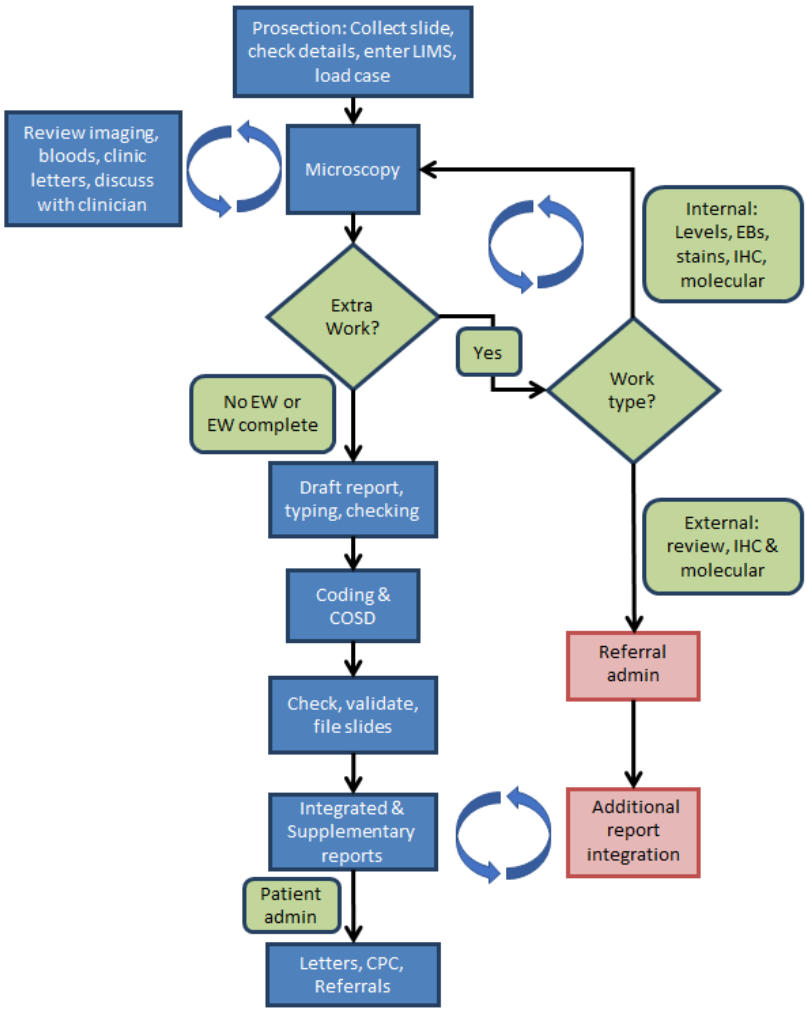
Specimen reporting has also become significantly more complex, particularly with increased focus on diagnostic, prognostic and treatment stratifiers, leading to a more intensive iterative reporting process. While the linear flow pro forma described in Appendix 1, reproduced from the previous edition, was descriptive of a simple linear flow, the reality is that many specimens now require multiple review sessions, at various times, to complete the report (Figure 3).

Figure 2: Clustergram indicating the impact of various intrinsic and external factors on workload and throughput



* Neuropathology often makes use of glass slides larger than the standard 3" x 1" size for larger specimens, such as whole eye mounts and to maintain anatomical relationships in brain sections.

Figure 3: Workflow chart showing additional iterative processes (circling arrows)



Data collection and processing

The BNS undertakes a confidential Annual Workload Survey (see Appendix 2 for the questions). Several years' data was made available to the Workload Implementation Group, but to maintain confidentiality, processing of identifiable data was undertaken only by those BNS officers responsible for data collection.

The response rate is usually over 80%. Some units have difficulties extracting slide count data from their laboratory information management systems (LIMS). Non-responding centres were removed from the dataset.

Several units incorporate a national specialist referral service (genetic, neuromuscular, metabolic, tumour etc.) into their workload, supported either by NHS, academic or other funding streams. These units are known to the data processors and are readily evident as outliers with a disproportionately high slide count. It is not possible to isolate their standard service work from referred work which has a different workflow. These units' data were censored.

Units where there were extended consultant vacancies, non-standard cover arrangements or internal cover spanning the data period are generally known to the data processors and evident as data outliers. These units' data were censored.

Networking units were included according to the partitioned data they provided.

Valid datasets per annum included returns from between 17 and 20 units.

The following data were extracted from the dataset for each unit (see Appendix 2) and transferred to a spreadsheet with lettered colums A to I:

A. service population (defined as the neurosurgical service population)

B. estimated ideal DCC PAs for the unit, taking into account workload, cover, burnout, service robustness and development

C. number of diagnostic consultants in the unit

D. total number of contracted NHS DCC PAs available to the unit

E. unit MDT hours per week including preparation, attendance and post-MDT administration. Fortnightly and monthly MDTs are averaged to produce weekly hours. Pre-MDT multi-consultant review meetings and attendance of non-presenting consultants at the MDTs, if mandated, are included in the total.

F. total number of slides for neurosurgical brain and spinal specimens (excluding muscle and nerve and excluding slides for intraoperative diagnoses)

G. number of slides for intraoperative diagnosis specimens

H. number of slides for neuromuscular and nerve biopsies (all types of stains)

I. number of slides for cytology (cerebrospinal spinal fluids and other neuropathological cytology, excluding smears).

The following data were calculated:

- NHS service slide total = F + G + H + I
- reporting DCC PA (reporting time left after MDT commitment)
  = D - (E * 52 weeks / 160 hours)
- ideal reporting DCC PA (ideal reporting time left after MDT commitment)
  = B – (E * 52 weeks / 160 hours)

Note: MDTs have to be covered over a full year. Multiply the weekly data by 52. Consultant PAs are based on four-hour sessions for a 40-week year = 160 hours. Dividing by 160 gives the annual department MDT commitment as consultant DCC PAs.

The regression module of Excel's Analysis ToolPak was used to analyse the data using slide number as the independent variable. This generated a least squares regression plot with formula f(x) = mx + c, Pearson's correlation coefficient, coefficient of determination, ANOVA and F statistics as well as normality and residuals plots. Excel's known intrinsic floating-point limitations were not considered to have any significant effect on the calculations. These data were iteratively analysed for individual years to identify outliers and influential points and three years' data were then pooled for a regression plot.

It was considered that the workload model prediction interval upper boundary should be relatively tight to the 99% confidence interval, rather than using one standard deviation (sigma 1 - 68%) which could be fiscally more challenging for employers. The polynomial 99% confidence interval was found to approximate to the 50% prediction interval, which could be easily linearised and was felt to encompass an appropriate reporting DCC range. This boundary may need to be revised in further editions if the DN-WTK reduces national variability in the BNS census dataset.

Confidence and prediction intervals were calculated using standard statistical formulae.

The plotted results of the pooled data are shown in Figure 4.

The main statistics derived from the ToolPak regression module are shown in Table 1.

Table 1: Regression statistics for three-year pooled data reporting DCC data

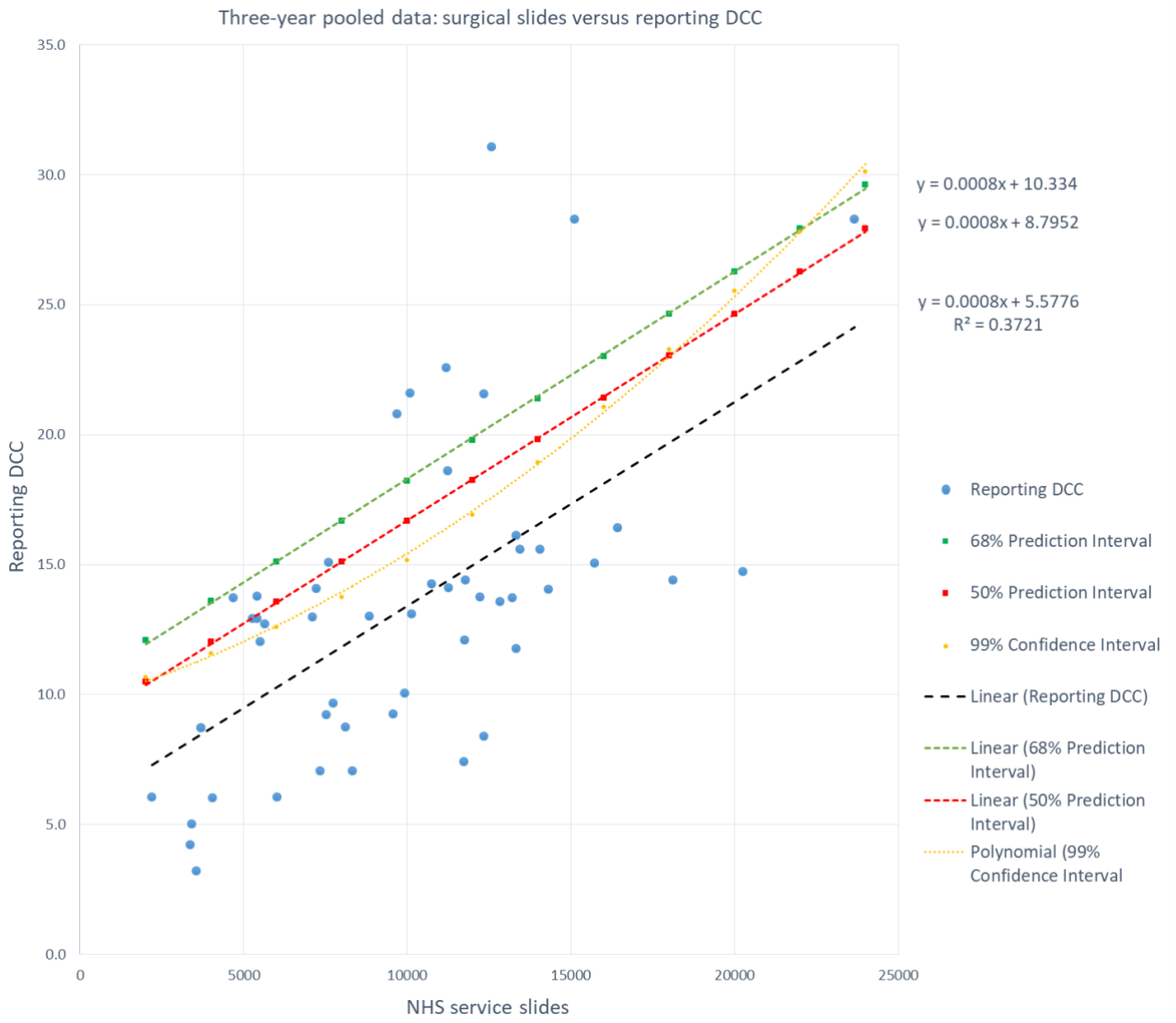
n	52
Pearson correlation coefficient	0.61
Coefficient of determination	0.37
Significance F	1.58 x10-6 rejects H0 (i.e. results occurred by chance) at the 0.01 significance level
Upper 50% prediction interval boundary	f(x) = 0.0008x + 8.8

The two years of ideal reporting DCC data were pooled and subjected to similar treatment for comparison, generating the statistics shown in Table 2.

Table 2: Regression statistics for two-year ideal reporting DCC data

n	30
Pearson correlation coefficient	0.68
Coefficient of determination	0.46
Linear regression formula	f(x) = 0.001x + 7.9

Figure 4: Linear regression plot using three years' pooled NHS surgical service slide data for individual neuropathology units – showing 50% prediction interval, 1SD (68%) upper boundaries and the coincident polynomial 99% confidence interval. n= 52



Data interpretation

Given that these data are effectively derived from a small scale socio-economic study, both datasets gave surprisingly good regression modelling.

The line formula f(x) = mx + c indicates that neuropathology unit workload can be divided into 'Slide-dependent work' (SDW), given by the line gradient ('m' multiplied by 1,000) as 'Reporting DCC per 1,000 slides' and 'Slide-independent work' (SIW) given by the y-axis intersection constant (c). Note that SIW is a value per neuropathology unit, which is apportioned within the unit staffing.

It is important to understand the model uses a 'black-box' approach in relating total workload to reporting DCC and that the SDW, although a slide/time metric, encompasses more than slide handling time. To indicate this overarching nature, it was given the acronym NESMET (NEuropathological Slide METric). Additionally, the model does not directly identify known-known, known-unknown and unknown-known work elements but for pathologists this is axiomatic (see Table 3).

The close alignment of the ideal reporting DCC linear regression formula to the pooled data 50% PI upper boundary formula lends considerable support to the use of the latter in the workload model.

The model has been built into an access-restricted Excel spreadsheet to create a series of workload tools: Diagnostic Neuropathology Workload Toolkit (DN-WTK). Users are referred to Appendix 3 for details on its use. The tool is not restricted to Microsoft products and it can be accessed with open source software Open Office/Libre Office on a variety of computer platforms.

Table 3: Slide-dependent and slide-independent work: f(x) = mx + c

Slide dependent (mx)
Prosection
Viewing, additional stains, levels, RO, EBs, immunostains
Reviewing previous histology
Seeking additional history/results
Validation, coding, COSD, datasets, tariff record
H&E mapping
In vitro and molecular test requests
Referred case and special investigation administration
Formal secondary and tertiary review with slides
Case directed literature review
Supplementary/integrated reports

Slide independent (+ c)
Informal second opinions
Dealing with clinical emails, letters, results and queries
Troubleshooting (stains, lab, IT)
Laboratory and patient administration
Slide sorting and filing, walking
Clinician consultations outside MDTs
Review/QA meetings

Indeterminate
Electron microscopy reporting
Molecular integrated report (basic)
Molecular integrated report (complex)

Limitations and caveats

Users should be aware that such models are only valid for extrapolation within the parameters of their formulating dataset. Use outside the context of a substantive consultant diagnostic neuropathology post would not be valid. Similarly, the model is nonsensical with a consultant number of less than one and loses applicability beyond six consultants per unit.

There were few regional networking units represented in the datasets. They provided partitioned data which seemed to fit largely within the model, though it is likely the SIW involved in running separate laboratories may be higher than stand-alone units.

Molecular analysis represents an area of significant continuing workload expansion which post-dates the datasets used to formulate this model. It has been factored into the reconstructive dynamic workload as a procedure value. This will need ongoing close review.

Using a statistical analysis to set the benchmark at 50% PI automatically places 25% of units above this boundary. It is not possible to identify from the current dataset the specific activities

which put them in this position. However, we know from preliminary data analysis that units with significant tissue banking, forensic and other specialist activities tend to have a higher reporting DCC/PA requirement. It is reasonable to assume this will also apply to the national specialist units whose data were censored from this analysis. These centres should be able to establish their workload by using bottom-up NESMETs reconstruction, though employers are advised that latitude may be required to account for their specialist activities in overall workload assessment.

2.2. Academic and other duties

A neuropathologist employed by an academic institution is likely to have a reduced number of DCC sessions to balance the academic commitment. The precise number is a matter for agreement between the individual consultant, the academic institution and the local NHS trust (or other employer) and should be clearly identified within the consultant's job plan. A reasonable NESMET workload can be formulated from the PA-Tool and Cap-Tool (workload capacity monitoring tool) in the DN-WTK. Academic consultants should apply these directly to their DCC sessions to minimise the conflicting time demands of academic and clinical work. Academic consultant employers should also adhere to the Follett Review principles to ensure optimal line management of these positions.[6]

Available DCC will also be affected by a consultant taking on additional duties such as being head of a department or clinical director, clinical governance lead or educational supervisor. The precise PA commitment allocated to each of these activities would need to be agreed between an individual consultant and their employer. However, each is likely to involve at least one PA per week per activity for an average district general hospital (DGH), rising to perhaps two or more for a large DGH or teaching hospital. There is a minimum requirement for 1.5 SPA to support revalidation (see section 3.2), though this may be split across clinical and academic contracts.

2.3. Single-handed departments

Fortunately, there are few single-handed neuropathology departments left in the UK. Regional networking, inter-department collaboration and digital pathology should eventually eliminate this unsafe situation altogether. There are, however, occasions in which a multi-consultant department is left single-handed as a result of long-term illness, precipitant retirement or failure to recruit. While it is recognised that these situations do occur, medical management should be made aware that this is an unsafe working environment both for the wellbeing of the neuropathologist and for patient safety. Support mechanisms such as locums, regional networking, digital pathology and external case referral should be a priority to mitigate the situation.

2.4. Trainees

The impact of trainees on a consultant's workload is highly variable and difficult to quantify. Trainees can make a significant contribution, the value of which will depend on their level of experience. In the early stages, the time required for supervising and training is undoubtedly resource-negative. Since neuropathology trainees are distributed nationally – and remain in precarious shortage – there is no balancing of experienced versus junior trainees from a regional rotation. On the other hand, once established in a training programme, neuropathology trainees can take on supervised responsibilities.

So overall, while the impact of trainees may ultimately be neutral, this is likely to take significantly longer to achieve for neuropathology than for general pathology. It is expected that some of the time allocated for supporting professional activities in job plans will be spent in teaching the

trainees. Work as a designated clinical or educational supervisor should have a separate SPA time allocation.

2.5. Expert opinions

Some neuropathologists provide a referral service, which accounts for additional workload over and above the internal service. If this is an agreed part of the consultant's DCC activity, the case slide count can be built into the department/consultant workload using the DN-WTK PA-Tool or Cap-Tool.

2.6. Post-mortem examinations

Consented hospital post-mortem examinations in general account for less than 5% of the autopsy workload in most departments. It is assumed that a hospital post-mortem examination will be carried out to the standards recommended by the College and that most examinations will be used as an opportunity to train junior doctors. The contractual arrangements for coronial autopsies are variable. In some cases, they are partly or wholly accepted into the NHS remit for a regional specialised service, particularly since there may be public health implications (e.g. meningitis, encephalitis, CJD). Coronial funding for the mortuary often follows such cases, especially those which present as 'high risk', offering fiscal advantages to the hosting hospital. Other benefits include feedback to clinical teams, detailed clinico-pathological correlation and audit. Since the availability of consented hospital post-mortem examinations is so limited, the importance of coronial cases for teaching and training cannot be underestimated. The individual contractual arrangements should be addressed in the job plan.

Neuropathological autopsies, by their nature, are more involved and time-intensive than standard autopsies. A variety of special techniques may be required, ranging from brain/cord removal to nerve dissection and muscle biopsy. Samples may need special preparation and preservation. The time requirement for examination of brain/cord as a separate procedure ('brain cut') will depend on the complexity of dissection and extent of findings to be recorded, as well as requirements for sampling and photography. Brain cuts are often valuable teaching sessions, usually greatly extending the time requirement that may need to be accounted for in SPA time.

Autopsy and brain-cut workload are included as 'procedures' in the DN-WTK Cap-Tool, with a PA allocation translated into NESMETs. To what degree autopsy work and brain cuts are included in department or consultant workload is a matter of local agreement but should be clearly documented in the job plan.

3. References

[1] First described in the College's *Guidelines on Staffing and Workload* [2nd edition] 2005, section 4.7, but also mentioned (with less detail) in subsequent editions.

[2] Mark G, Gonzalez VM, Harris J. No Task Left Behind? Examining the Nature of Fragmented Work. *CHI* 2005 (Conference on Human Factors in Computing Systems); 321–330.

[3] BMA. *Job Planning for the 2003 Consultant Contract, Guidance from the Central Consultants and Specialists Committee*. October 2003; Section 6, 4–5.

[4] BMA and NHS Employers. *A guide to consultant job planning. Annex 1: Job plan components* 2011. Accessed July 2020. https://www.bma.org.uk/media/1290/bma-nhs-employers-joint-job-planning-guidance-for-consultants-in-england.pdf or

[5] Douglas N (Chairman, Academy of Medical Royal Colleges). *Advice on Supporting Professional Activities in Consultant Job Planning*. 2010. Accessed July 2020. https://www.rcophth.ac.uk/wp-content/uploads/2014/12/SPAs-in-consultant-job-plans.pdf

[6] BMA and NHS Employers. *A guide to consultant job planning. Annex 3: The Follet review*. 2011. Accessed July 2020. https://www.bma.org.uk/media/1290/bma-nhs-employers-joint-job-planning-guidance-for-consultants-in-england.pdf

Appendix 1: Processes involved in reporting a neurosurgical case

Compare with Figure 3 and see also the Royal College of Pathologists' *Dataset for tumours of the central nervous system* and *Tissue Pathways for non-neoplastic neuropathology specimens*.

1. Check identity of specimen and review clinical information
2. Dictate gross description
3. Dissect specimen
4. Dictate further as required
5. Select and trim blocks
6. Recheck identity and cassette blocks
7. Receive slides, etc. in office or reporting room
8. Check identity
9. Examine slides
10. Make preliminary assessment – dictate or write report if possible at this stage
11. Order special stains, recuts, etc. as appropriate
12. Communicate with clinicians in charge of the case as appropriate
13. Discuss with colleagues, etc.
14. Receive specials, etc.
15. Check identity
16. Review all slides and information gathered
17. Dictate/write final report
18. Receive transcribed report
19. Check identity
20. Review transcribed report, amending as appropriate
21. Assign code (SNOMED/SNOP/ICD)
22. Complete Cancer Outcomes and Services Dataset (COSD) as appropriate
23. Complete workload scoring as appropriate
24. Validate/sign/authorise report

Appendix 2: BNS online data collection form questions

The following lists the information required in the BNS's annual workload survey, which is collected via Google Forms.

1a. Name of Centre

1b. Neurosurgical service population

2. Number of diagnostic consultants (contracted for NHS DCC Neuropathology)

3a. Number of NHS-contracted DCC PAs (total number of NHS DCC PAs for all consultants at your centre)

3b. Estimated ideal DCC PAs for your centre, taking into account workload, cover, burnout, service robustness and development

4. Contracted hours for MDT meetings and MDT meeting preparation (total number of hours related to MDT service for all consultants at your centre: please indicate hours, not PAs)

5. Number of trainees

6. Total number of slides for neurosurgical brain and spinal specimens (excluding muscle and nerve and excluding slides for intraoperative diagnoses)

7. Number of slides for intraoperative diagnosis specimens

8a. Number of slides for neuromuscular and nerve biopsies (all types of stains)

8b. Number of teased nerve preparations (number of procedures; NB: if none, please indicate '0')

8c. Number of morphometry preparations (number of procedures; NB: if none, please indicate '0')

8d. Number of muscle biopsy procedures (i.e. performing the biopsy; NB: if none, please indicate '0')

8e. Number of EM reports (number of procedures; NB: if none, please indicate '0')

9. Number of slides for cytology (CSFs and other neuropathological cytology, excluding smears)

10a. Number of post-mortem cases (full or limited neuropathological autopsies)

10b. Number of brain cuts/trimmings

10c. Number of slides for all post-mortem cases (excluding research/cases without any NHS involvement)

Appendix 3: Overview and use of the DN-Workload Toolkit (DN-WTK)

The DN-Workload Toolkit is available for download with this document at:
https://www.rcpath.org/profession/guidelines/specialty-specific-publications.html

The workbook consists of seven worksheets:

- Introduction
- PA-Tool – this sheet provides a prediction of a unit's PA requirement for the NHS surgical service only
- Cap-Tool – this sheet calculates a consultant's NESMET capacity for entry into the 4week and 6week score sheets
- Cap-Scores – this sheet contains an editable list of case types and procedures with NESMET score (see Appendix 4)
- 4week – this sheet allows dynamic workload assessment using a mirror of the Lookup Table (LUT) from the Cap-Score sheet
- 6week – this sheet allows dynamic workload assessment using a mirror of the LUT from the Cap-Score sheet
- Additional Capacity Payment (ACP) – this sheet can be used to score extra-contractual work for additional payment or time in lieu.

Access to the worksheets has been restricted to ensure that only data entry cells are completed and the background formulae are not accidentally altered. Data entry is validated in some fields to ensure appropriate values are entered, and prompts on data type may appear at the tooltip over some cells. The workbook can be unlocked if required by the usual method.

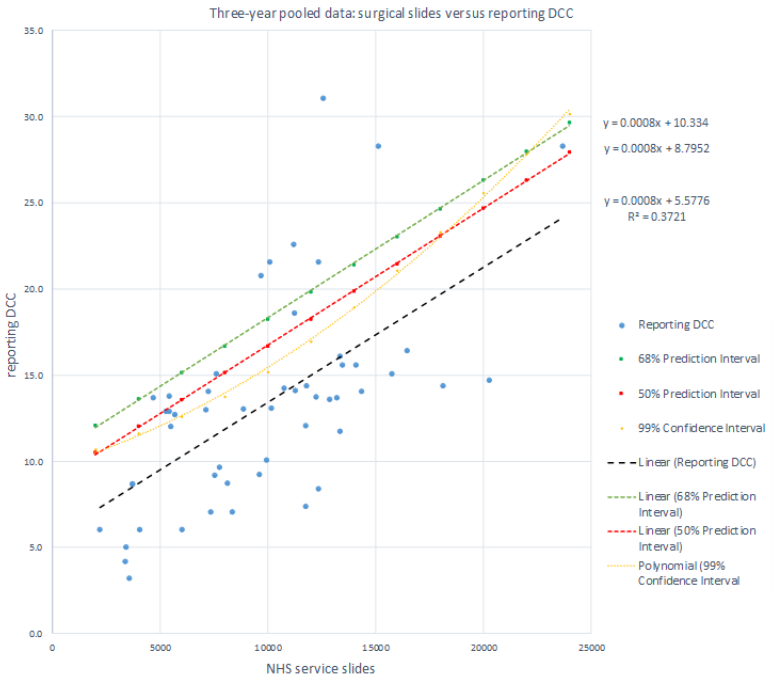
Appendix 3.1: Introduction

The introduction sheet gives an overview of the evidence base for the workload model.

The Workload Toolkit is based on three consecutive years of BNS workload census data which have been modelled by regression analysis onto a linear fit, f(x)=mx+c. This indicates that workload comprises both slide-dependent and slide-independent elements.

Linear fit of the upper 50% prediction interval boundary (a close approximation to the 99% Confidence Interval) has been used in the tool. The data will be reviewed on a rolling basis.

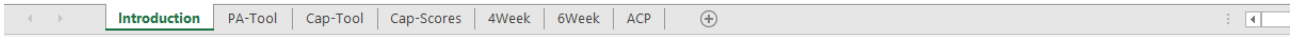
NEuropathological Slide METrics (NESMETs) are the units of workload measurement used in this toolkit.



84% of results (50% + 68%/2) lie below the upper Sigma 1 line
75% of results (50% + 50%/2) lie below the upper 50% line

Mean values
y=0.0008x+5.6
5.6 DCC baseline to run a dept + MDT
0.8 DCC per 1,000 slides

50% Pred Int boundary
y=0.008x+8.8
8.8 DCC baseline to run a dept
0.8 DCC per 1,000 slides
PLUS autopsy, brain cut, EM, biopsy procedures and other non-service NHS work



Appendix 3.2: The PA-Tool

The Department Workload/PA Modelling Tool (PA-Tool) uses three data items to calculate the predicted PA requirement to service the NHS surgical workload for a neuropathology unit. The sample data shown here demonstrates a slight PA under-capacity. The three result cells are flagged with a graded RAG system – yellow to green for within capacity, orange to red for under-capacity. Note that other work streams (molecular and integrated reporting, autopsy, brain cuts, additional procedures) have to be factored into this PA value for an overall workload assessment.

Department Workload/PA Modelling Tool

NOTE: The predicted PA value is a guideline based on the BNS annual national workload census and only reflects the NHS surgical service, including prosection and clinical/laboratory administration. This may vary due to local circumstances and OTHER work will need additional PA time (autopsy, brain cuts, integrated reporting, EM, additional procedures - see Cap-Scores sheet).

Information Required	Enter data here	
Including ALL consultants, what is the total dept clinical DCC PA per week ? (e.g. 2 WTE at 7.5 PA consultants=15PA/week)	15.0	PA
How many surgical slides are reported ? (include neuromuscular, intraoperative, CSF; exclude autopsy and brain histology)	7658	Slides
What are the total weekly consultant hours taken by MDT work within the dept.? (include joint review time, preparation, presentation and follow up for ALL consultants. Include non-weekly MDTs as weekly fractions. Enter decimal time e.g. 6.5 for 6h 30m)	7.30	hours (decimal)
Values set from workload model - Do NOT ALTER		
Model slide-independent work (SIW)	8.80	PA
NESMET Model PA/1,000 slides	0.80	PA
NESMETs /slide	7.68	NESMETs

Dept PA Capacity	Results	
Dept. annual DCC hour capacity based on 40 weeks [PA per week*4hr*40 weeks]	2400	hours
Dept. total MDT hours per year	380	hours
Slide-dependent work (SDW) [NESMETs * slide no.]	980	hours
SIW + SDW + MDT	2768	hours
NHS SURGICAL SERVICE predicted departmental PAs (75% of UK depts service the surgical load within this PA value: 25% have a higher PA value)	17.3	PAs
Hourly variance per year	-367.8	hours
PA variance	-2.3	PAs

Appendix 3.3: The Cap-Tool

The Workload Capacity Modelling Tool (Cap-Tool) also uses three data items to calculate a NESMET target for the contracted week. This value can be entered into the 4week or 6week score sheet (below) to provide a bottom-up reconstruction of workload.

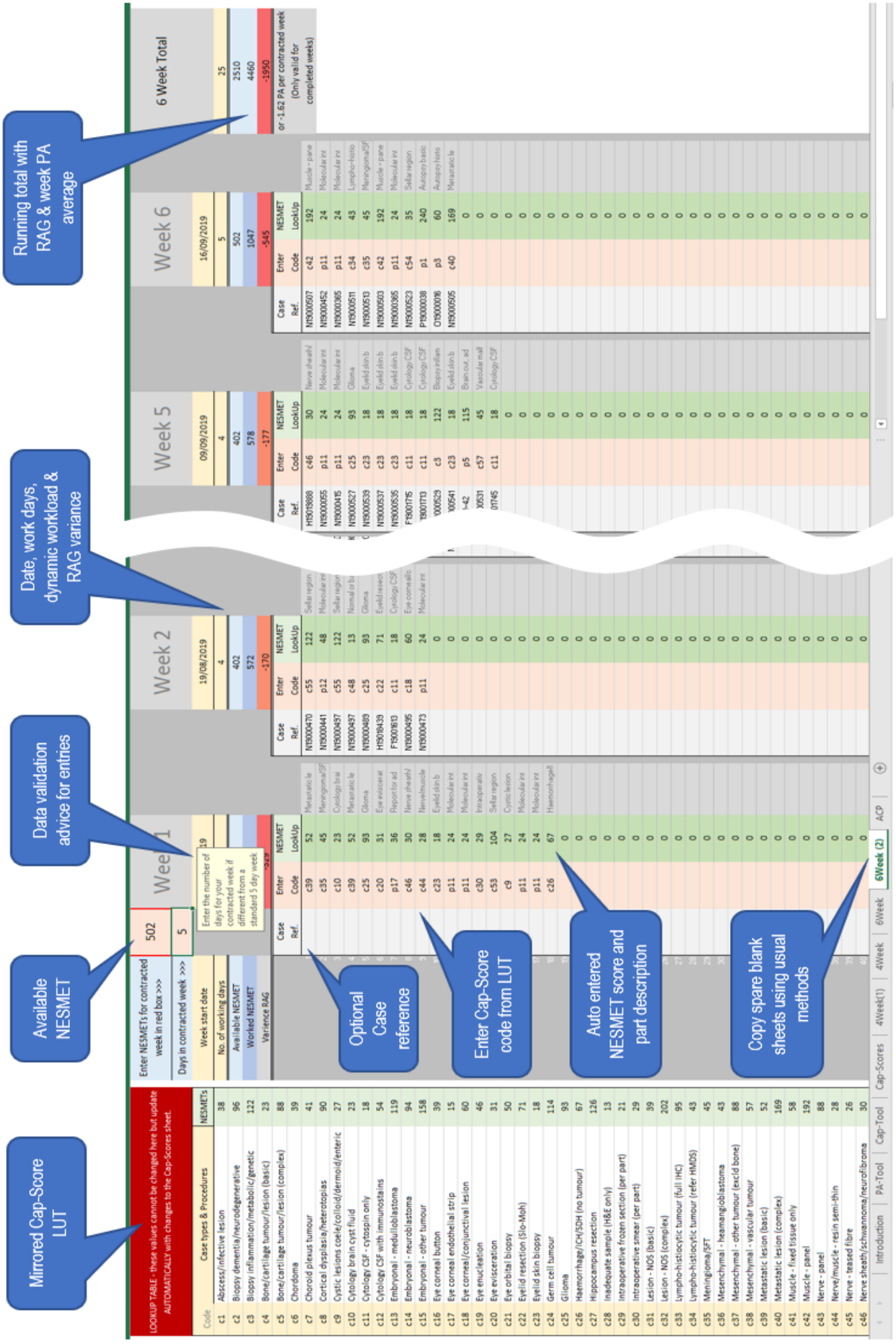
Workload Capacity Modelling Tool

NOTE: This tool calculates available departmental and individual NESMET capacity. This should be used with the 4week/6week sheets to dynamically reconstruct workload using case type and procedure scores from the Cap-Scores sheet.

Information Required	Enter data here	
Including ALL consultants, what is the total dept. DCC PA per week ? (e.g. 2 WTE at 7.5 PA consultants=15PA/wk)	15.00	PA
What is your DCC PA per week commitment out of the total dept DCC entered above ?	7.50	PA
What is the total weekly consultant hours taken by MDT work within the dept.? (include joint review time, preparation, presentation and follow up for ALL consultants. Include non-weekly MDTs as weekly fractions. Enter decimal time e.g. 6.5 for 6h 30m)	7.30	hours (decimal)
Values set from workload model - Do NOT ALTER		
Model slide-independent work (SIW)	8.80	PA
NESMET Model PA/1,000 slides	0.80	PA
NESMETs /slide	7.68	NESMETs

Reporting DCC Capacity Calculation	Results	
Dept. annual DCC hour capacity based on 40 weeks [PA per wk*4hr*40wk]	2400	hours
Dept. total MDT hours per year	380	hours
Dept. available reporting DCC hours (after MDT time deducted)	2020	hours
Department model SIW [SIW*4h*40wk]	1408	hours
Available department annual reporting DCC hours	612	hours
Dept. NESMETs for contracted weeks	919	NESMETs
Your NESMETs for contracted week (Enter value into RED box on Week score sheet)	459	NESMETs

Appendix 3.4: The 4week/6week Scoring Tools



Appendix 3.5: The ACP tool

Some Trusts use ACPs (Additional Capacity Payments) to cover additional work. The ACP sheet allows the user to convert extra-contractual case work into PA equivalents for payment or time in lieu purposes. The entry process is the same as the 4week/6week scoring sheets. There are 240 NESMETs to 1 PA.

LOOKUP TABLE - these values cannot be changed here but update AUTOMATICALLY with changes to the Cap-Scores sheet.

Code	Case types & Procedures	NESMETs
c1	Abscess/infective lesion	38
c2	Biopsy dementia/neurodegenerative	96
c3	Biopsy inflammation/metabolic/genetic	122
c4	Bone/cartilage tumour/lesion (basic)	23
c5	Bone/cartilage tumour/lesion (complex)	88
c6	Chordoma	39
c7	Choroid plexus tumour	41
c8	Cortical dysplasia/heterotopias	90
c9	Cystic lesions coele/colloid/dermoid/enteric	27
c10	Cytology brain cyst fluid	23
c11	Cytology CSF - cytospin only	18
c12	Cytology CSF with immunostains	54
c13	Embryonal - medulloblastoma	119
c14	Embryonal - neuroblastoma	94
c15	Embryonal - other tumour	158
c16	Eye corneal button	39
c17	Eye corneal endothelial strip	15
c18	Eye corneal/conjunctival lesion	60
c19	Eye enucleation	46
c20	Eye evisceration	31
c21	Eye orbital biopsy	50
c22	Eyelid resection (Slo-Moh)	71
c23	Eyelid skin biopsy	18
c24	Germ cell tumour	114
c25	Glioma	93
c26	Haemorrhage/ICH/SDH (no tumour)	67
c27	Hippocampus resection	126
c28	Inadequate sample (H&E only)	13
c29	Intraoperative frozen section (per part)	21
c30	Intraoperative smear (per part)	29
c31	Lesion - NOS (basic)	39
c32	Lesion - NOS (complex)	202
c33	Lympho-histiocytic tumour (full IHC)	95
c34	Lympho-histiocytic tumour (refer HMDS)	43
c35	Meningioma/SFT	45
c36	Mesenchymal - heamangioblastoma	43
c37	Mesenchymal - other tumour (excld bone)	88
c38	Mesenchymal - vascular tumour	57
c39	Metastatic lesion (basic)	52
c40	Metastatic lesion (complex)	169
c41	Muscle - fixed tissue only	58
c42	Muscle - panel	192
c43	Nerve - panel	88
c44	Nerve/muscle - resin semi-thin	28
c45	Nerve - teased fibre	26
c46	Nerve sheath/schwannoma/neurofibroma	30
c47	Neuronal/glio-neuronal tumour	90
c48	Normal or basic lesion (H&E only)	13
c49	Pineal tumour	100
c50	Plasma cell tumour	68
c51	Sarcoma NOS, MPNST	121
c52	Scalp lesion	23
c53	Sellar region/sinonasal - other lesion	104
c54	Sellar region - craniopharyngioma	35
c55	Sellar region - pituitary tumour	122
c56	Temporal artery biopsy	43
c57	Vascular malformation	45
c58	Vertebral disc	34
c59	Add case type & slide count here	8
c60	Add case type & slide count here	8
c61	Add case type & slide count here	8

Only to be used within a substantive job planned consultant post

Additional capacity payment

Week start date		dd/mm/yy		
Worked NESMET		0		or 0 PA
	Case Ref.	Enter Code	NESMET LookUp	
1			0	
2			0	
3			0	
4			0	
5			0	
6			0	
7			0	
8			0	
9			0	
10			0	
11			0	
12			0	
13			0	
14			0	
15			0	
16			0	
17			0	
18			0	
19			0	
20			0	
21			0	
22			0	
23			0	
24			0	
25			0	
26			0	
27			0	
28			0	
29			0	
30			0	
31			0	
32			0	
33			0	
34			0	
35			0	
36			0	
37			0	
38			0	
39			0	
40			0	
41			0	
42			0	
43			0	
44			0	
45			0	
46			0	
47			0	
48			0	
49			0	
50			0	
51			0	
52			0	
53			0	
54			0	
55			0	
56			0	
57			0	
58			0	

Appendix 3.6: How do I…?

How do I estimate the Reporting DCC PA requirement for my unit ?

The PA-Tool is intended to provide a quick estimate of a unit's PA requirement (i.e. Reporting DCC plus MDT time) from accessible retrospective data. It will generally be an underestimate since it does not take into account other work such as molecular diagnostic interpretation and autopsies.

1. Collect the following data:

    - total number of DCC sessions contracted to the unit
    - annual NHS service slide total (see section 2.2 in the main document)
    - unit total commitment for all MDT-related activities converted to a weekly average (see section 2.1 in the main document)

2. Enter this data into the PA-Tool

The result box will show the predicted weekly PA value and variance in hours and PAs. The boxes will provide a RAG indication. Yellow/Green – within capacity. Orange/Red – under-capacity. This value is generally an underestimate since it ONLY accounts for the NHS surgical service plus MDT time. Other work (autopsy, brain cuts, integrated reporting, EM, additional procedures) must be factored in by local estimation or using the 4week/6week scoring tools.

How do I use the 4week/6week scoring tools ?

These tools can be used as either a short-term diary exercise to assess work elements not included in the PA-Tool calculation or for ongoing workload management. The only difference between the sheets is the number of weeks covered to allow for rota variations.

1. Collect the following data:

    - total number of DCC sessions contracted to the unit
    - your contracted weekly DCC PAs
    - unit total commitment for ALL MDT related activities converted to a weekly average (see section 2.1 in the main document)
    - number of clinical days in your contracted week (i.e. ALL DCC + SPA PAs, where 1PA = 0.5 of a day). The tool uses this value to calculate weekly PA averages. For full-time workers it will be five days (=10 PAs) but for those working less than full time and academics with split weeks, it will be lower. Enter part-days as a decimal fraction.

2. Enter data a-to-c into the Cap-Tool. The results box will give your contracted week NESMET capacity.

3. Select the 4week/6week score sheet to fit your clinical service rota cycle so it evenly covers both your 'on' and 'off' rota periods. For two weeks 'on' and two weeks 'off', you would use the 4week sheet. For a three-week rota, the 6week sheet would be appropriate. One-week rotas could use either.

4. Enter the NESMET capacity from Cap-Tool in the red-edged box. Check the default five-day contracted week entry is correct for your situation.

5. At the start of each week, enter the week start date and number of days worked in that week. The number of days worked will usually be the same as your contracted week. However, it will be less for weeks with bank holidays and annual/study leave days and the reduced NESMET capacity will be recalculated for that week.

6. Cases are best entered when they have been completed. Some cases can take weeks (sometimes months for autopsies) to work up, but it is recommended that the score is entered on specimen sign-out. Note that cases that have been signed out but require extra work will attract additional NESMETs listed under the procedure section of the LUT, e.g. code p18 'Report for additional investigation'.

7. As cases are completed, a case reference can be optionally entered for audit purposes, followed by the case type or procedure code from the LUT on the left. The LUT can be printed from this document (Appendix 4) or the Excel Cap-Score sheet is formatted to print on six A4 sheets.

   The NESMET score and first 12 letters of the description, as an aide memoir, are automatically entered in the next two columns. A dynamic NESMET Variance RAG is shown at the top of each column (negative value, orange/red indicating under-capacity, yellow/green indicating within capacity) and a weekly under-capacity PA value is flagged on the far right of the table. This is only valid when a full week has been completed on the sheet.

8. Some work events might need multiple entries to fully describe the workload. For example, a straightforward adult autopsy with subsequent brain cut and histology of 40 slides would require serial entries at each stage of completion for:

   - code 'p1' (autopsy basic + report/administration <4h)
   - code 'p5' (brain cut, adult, generating 40 histology blocks)
   - two entries of code 'p4' (autopsy/bank histology 20 slides – adult)

   Another example of multiple entries might be a muscle biopsy performed by the neuropathologist, examined as a standard stain panel and then sent for mitochondrial genetics, with the report subsequently integrating all results:

   - code 'p15' (neuromuscular biopsy procedure)
   - code 'c42' (muscle – panel)
   - code 'p12' (molecular integrated report [complex])

   Similarly, a glioma with intraoperative smear that was inadequate, requiring a frozen section, definitive paraffin sections with immunohistochemical staining (IHC) and subsequent molecular diagnostics comprising two separate reports received at different times, would require serial entries:

   - code 'c30' (intraoperative smear [per part])
   - code 'c29' (intraoperative frozen section [per part])
   - code 'c25' (glioma, for the paraffin section diagnosis)
   - code 'p11' (molecular integrated report [basic] for IDH/TERT/EGFR sequencing)

- code ‘p11’ (molecular integrated report [basic] for MGMT methylation)

9. Due to the ‘enter-when-signed-out’ rule, weekly scores will fluctuate. A busy week working up but not signing out cases can produce a low NESMET score. This will be picked up in the following weeks as cases are signed out; hence a workload assessment should be run over at least four weeks or a couple of rota cycles. Transfer of cases between consultants within a department, for example on change of rota or for leave, will require local arrangements to ensure appropriate scoring is credited to each consultant involved.

10. ‘Basic’ and ‘complex’ categories are best judged in context. Diagnosis on H&E or up to three tinctorial/IHC stains could be regarded as ‘basic’. Multiple rounds of extra work (levels, special stains etc.) or researched/consulted cases are ‘complex’. Looking at the slide numbers against those logged in the Cap-Scores sheet will also give an indication of the appropriate category.

    Autopsy basic and complex cut-offs are ‘less than’ and ‘greater than’ four hours. This time includes ALL activities – reading notes, investigating history with clinicians/coroners’ officers, getting to the mortuary, conducting the autopsy, contemporaneous note-taking, tissue retention and MCCD administration, formulating report, validating and sign-out. Brain cuts and autopsy histology are ADDITIONAL activities with their own NESMET score that will need to be serially added when signed out. However, whether and which autopsy activities are included in assessments of overall workload is a local management decision.

11. The Cap-Score sheet can be customised for local variations. Existing case and procedure types can be altered and there are slots for adding new cases and procedures:

    - add case type and slide count here
    - add procedure and mean PA value here.

    Mean slide and PA values can also be changed. All changes on the Cap-Score sheet will be automatically mirrored in all the score sheets, copied or original, within one workbook.

12. SAVE your score sheets regularly and BACK UP to safe storage.

13. Score sheets can be copied by the usual Excel process of right clicking on the tab, select ‘Move or Copy…’, tick box ‘Create a copy’ and ‘(move to end)’. It is advisable to generate spare sheets BEFORE you start completing them. However, data can be easily cleared by right clicking on a cell or selection and choosing ‘Clear Contents’.

14. Case references are optional but can be entered by bar code wand in some LIMS systems.

Appendix 4: Case types/procedures with NESMET values (Cap-Scores sheet)

Note: these scores take into account all activities involved in a case (prosection, reporting, special stains, IHC, molecular requesting, SNOMED coding, COSD datasets, etc.).

Code	Case types	Mean slide count*	NESMETs
c1	Abscess/infective lesion	5.0	38
c2	Biopsy dementia/neurodegenerative	12.5	96
c3	Biopsy inflammation/metabolic/genetic	15.9	122
c4	Bone/cartilage tumour/lesion (basic)	3.0	23
c5	Bone/cartilage tumour/lesion (complex)	11.4	88
c6	Chordoma	5.1	39
c7	Choroid plexus tumour	5.3	41
c8	Cortical dysplasia/heterotopias	11.8	90
c9	Cystic lesions coele/colloid/dermoid/enteric	3.5	27
c10	Cytology brain cyst fluid	3.0	23
c11	Cytology CSF – cytospin only	2.4	18
c12	Cytology CSF with immunostains	7.1	54
c13	Embryonal – medulloblastoma	15.5	119
c14	Embryonal – neuroblastoma	12.2	94
c15	Embryonal – other tumour	20.6	158
c16	Eye corneal button	5.1	39
c17	Eye corneal endothelial strip	2.0	15
c18	Eye corneal/conjunctival lesion	7.9	60
c19	Eye enucleation	6.0	46
c20	Eye evisceration	4.0	31
c21	Eye orbital biopsy	6.5	50
c22	Eyelid resection (Slo-Moh)	9.3	71
c23	Eyelid skin biopsy	2.3	18

c24	Germ cell tumour	14.8	114
c25	Glioma	12.1	93
c26	Haemorrhage/ICH/SDH (no tumour)	8.7	67
c27	Hippocampus resection	16.4	126
c28	Inadequate sample (H&E only)	1.7	13
c29	Intraoperative frozen section (per part)	2.8	21
c30	Intraoperative smear (per part)	3.8	29
c31	Lesion – NOS (basic)	5.1	39
c32	Lesion – NOS (complex)	26.4	202
c33	Lympho-histiocytic tumour (full IHC)	12.4	95
c34	Lympho-histiocytic tumour (refer HMDS)	5.6	43
c35	Meningioma/SFT	5.9	45
c36	Mesenchymal – haemangioblastoma	5.6	43
c37	Mesenchymal – other tumour (excld bone)	11.4	88
c38	Mesenchymal – vascular tumour	7.4	57
c39	Metastatic lesion (basic)	6.8	52
c40	Metastatic lesion (complex)	22.0	169
c41	Muscle – fixed tissue only	7.5	58
c42	Muscle – panel	24.9	192
c43	Nerve – panel	11.4	88
c44	Nerve/muscle – resin semi-thin	3.7	28
c45	Nerve – teased fibre	3.3	26
c46	Nerve sheath/schwannoma/neurofibroma	3.9	30
c47	Neuronal/glioneuronal tumour	11.8	90
c48	Normal or basic lesion (H&E only)	1.7	13
c49	Pineal tumour	13.0	100
c50	Plasma cell tumour	8.9	68

c51	Sarcoma NOS, MPNST	15.8	121
c52	Scalp lesion	3.0	23
c53	Sellar region/sinonasal – other lesion	13.6	104
c54	Sellar region – craniopharyngioma	4.6	35
c55	Sellar region – pituitary tumour	15.9	122
c56	Temporal artery biopsy	5.6	43
c57	Vascular malformation	5.8	45
c58	Vertebral disc	4.4	34
c59	Add case type and slide count here	1.0	8
c60	Add case type and slide count here	1.0	8
c61	Add case type and slide count here	1.0	8
c62	Add case type and slide count here	1.0	8
c63	Add case type and slide count here	1.0	8
c64	Add case type and slide count here	1.0	8
c65	Add case type and slide count here	1.0	8
c66	Add case type and slide count here	1.0	8
c67	Add case type and slide count here	1.0	8
c68	Add case type and slide count here	1.0	8
c69	Add case type and slide count here	1.0	8
c70	Add case type and slide count here	1.0	8

Code	Procedures	Mean PA value*	NESMETs
p1	Autopsy basic + report/admin <4h	1.00	240
p2	Autopsy complex + report/admin >4h	1.50	360
p3	Autopsy histology 20 slides – paediatric	0.25	60
p4	Autopsy/bank histology 20 slides – adult	0.21	50
p5	Brain cut, adult	0.48	115
p6	Brain cut, banking	0.25	60
p7	Brain cut, fetal	0.20	48
p8	Brain cut, forensic	0.50	120
p9	Brain cut, paediatric	0.50	120
p10	Electron microscopy reporting	0.25	60
p11	Molecular integrated report (basic)	0.10	24
p12	Molecular integrated report (complex)	0.20	48
p13	Molecular service referred case	0.10	24
p14	Nerve teasing procedure	0.25	60
p15	Neuromuscular biopsy procedure	0.38	90
p16	Neuromuscular morphometry	0.13	31
p17	Report for additional immunostaining	0.15	36
p18	Report for additional investigation	0.07	17
p19	Small fibre neuropathy analysis/report	0.38	90
p20	Tissue banking (tumour/genetics)	0.12	29
p21	Add procedure and mean PA value here	1.00	240
p22	Add procedure and mean PA value here	1.00	240
p23	Add procedure and mean PA value here	1.00	240
p24	Add procedure and mean PA value here	1.00	240
p25	Add procedure and mean PA value here	1.00	240
p26	Add procedure and mean PA value here	1.00	240

Code	Procedures	Mean PA value*	NESMETs
p27	Add procedure and mean PA value here	1.00	240
p28	Add procedure and mean PA value here	1.00	240
p29	Add procedure and mean PA value here	1.00	240
p30	Add procedure and mean PA value here	1.00	240
p31	Add procedure and mean PA value here	1.00	240
p32	Add procedure and mean PA value here	1.00	240
p33	Add procedure and mean PA value here	1.00	240
p34	Add procedure and mean PA value here	1.00	240
p35	Add procedure and mean PA value here	1.00	240
p36	Add procedure and mean PA value here	1.00	240
p37	Add procedure and mean PA value here	1.00	240
p38	Add procedure and mean PA value here	1.00	240
p39	Add procedure and mean PA value here	1.00	240
p40	Add procedure and mean PA value here	1.00	240