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PHYSICIANS: ADULTS AND PAEDIATRICS

4.1 ADULTS

Renal physicians (nephrologists) provide a wide range of services for people with kidney disease. The many roles of the consultant nephrologist are described in detail by the Royal College of Physicians document *Consultant Physicians Working for Patients* (5th Edition).¹ There is great variation between units in the way the service is delivered, but consultants working collaboratively (often with subspecialty roles) as part of an integrated multi-professional team is usual. Twenty-three out of 72 renal departments in the UK are also transplant centres where nephrologists have specialist duties in acute transplantation in conjunction with surgical colleagues.

Role of the renal physician

Renal replacement therapy

Renal physicians provide long-term care for patients receiving dialysis (haemodialysis and peritoneal dialysis) and those who have received a kidney transplant. Often these patients are allocated to a named consultant. These patients are complex and require care which extends beyond their renal management. This leads to a high administrative burden which is directly linked to clinical care and should be regarded as such by trusts. The appropriate amount of time for these duties can be estimated by relating the administrative burden to the number of outpatient clinics. The Royal College of Physicians recommends 1.5 to 2 Programmed Activities (PA) per nephrology clinic.¹

In some trusts, the management of acute renal replacement therapy in acutely sick patients lies entirely within the remit of intensive therapy physicians. In others, it is included in the duties of the nephrologists who may run specialist high-dependency wards with a high degree of consultant oversight. Where the latter arrangement is adopted, more consultant PAs will clearly be required.

Outpatients

Added to nephrologists' work with patients on renal replacement therapy (RRT) programmes is the provision of a specialist outpatient referral service for primary care and an inpatient referral system for other specialties. These duties place increased demands on some renal centres (e.g. those with cardiothoracic centres, vascular surgery hubs or liver units) and these local factors need to be taken into account when trusts establish the requirement for renal physicians. Unlike many specialties, renal departments usually provide outreach clinics and inpatient in-reach to neighbouring trusts. Travel time for these duties (which should be included as direct clinical care in job plans) varies greatly depending on geography and population density. This factor will affect the number of physicians a renal unit requires to provide an adequate service to its catchment area and must be taken into account in setting consultant staffing levels.

Inpatient care

In many trusts, physicians undertake clinical procedures (peritoneal catheter insertion, vascular access procedures, biopsies). In others, many of these practical procedures are undertaken by surgical colleagues or radiologists. Some nephrologists have sub-specialised into "interventional nephrologists". Most consultants involved in this work also teach techniques and supervise junior doctors. Where responsibility for practical procedures forms part of the consultants' duties, this must be reflected in staffing numbers.

About 30% of nephrologists contribute to General Internal Medicine (GIM) duties. The 2013 *Shape of Training Report*² states: "Patients and the public need more doctors who are capable of providing general care in broad specialties across a range of different settings" (p5). It is therefore possible that nephrology consultant appointments over the next 5-10 years will include greater amounts of GIM duties. It is important to emphasise that these GIM duties are not included in the renal workforce data described in this document.

Transplantation

There are 23 adult kidney transplant centres across the UK³, each providing transplantation services for their local kidney patients and most receive referrals from one or more non-transplanting centres, where the preparation and follow-up of living donors and recipients is shared between 'linked' transplant and referring nephrology units. Several kidney transplant centres contribute to the abdominal National Organ Retrieval Service teams.

The 2010 British Transplantation Society report on the provision of transplant services⁴, recommended that a transplant centre supporting a population of 2 million and delivering 75 transplants per year required five surgeons to cover an on call rota of 1:4, but this was subsequently increased to a 1:5 rota, which remains the current standard. Appropriate transplant workforce planning will be aided by coordination between adjacent units (as exemplified by the Oxford-Coventry network and the recently established London Transplant Collaborative).

Histocompatibility and immunogenetics (H&I)

Currently, there is no comprehensive information available to inform physician workforce planning in H&I laboratories although it is recognised as a core support service to deliver transplantation.⁴

Academia

Academic nephrology has been a major driver for the development of renal medicine in the UK. There is good evidence that research improves the quality of patient care in addition to attracting capable trainees into the specialty.⁵ Job plans which include academic roles are therefore to be encouraged. Our workforce planning recommendations relate to NHS-funded Programmed Activities but it is implicit that university and other academic sessions funded from outside the NHS are integral to the delivery of a quality renal service.

Current workforce

Age, ethnicity and the maturity of the renal replacement programme all affect the number of RRT patients within a given population. For this reason, it is usual to relate workload (and thus the number of renal physicians required) to the number of patients on a unit's RRT programme, taking into consideration if it is a transplanting centre. This is an imperfect metric because it does not account for the intensity of other nephrology duties, including number of regional clinics provided, and the availability of support from trainees and non-training non-consultant (NTNC) doctors. Recent census data shows that disequilibrium in the availability of non-consultant support clearly exists and this factor needs to be accounted for when interpreting the data relating to the number of consultants per RRT patient. Another important factor is the extent to which the work of other members of the MPT (notably nurse specialists) reduces demands on consultants. There are no accurate data to show the effect of this, but the degree of support (or its absence) needs to be taken into account when interpreting physician staffing requirements. Despite these caveats, the ratio of consultants to RRT remains the most readily available comparator for which there are reliable data relating to previous years. Accordingly, it will be used in this description of current staffing levels.

A survey of the consultant physician workforce survey carried out by the Renal Association in 2018, (internal document, unpublished) concluded that there had been an increase in the total number of nephrology consultants of 27.3% (37.2% WTE) in the period 2013-18. This compares with an increase of RRT patients of 15.1% (total dialysis patient numbers 6.2%) during the same period. Results are shown in Tables 1 and 2.

TABLE 1. NUMBER OF CONSULTANTS PER COUNTRY.

	England	Scotland	N.Ireland	Wales	UK
No of consultants (% of whom are women)	616 (31%)	79 (39%)	24 (29%)	28 (21%)	747 (30%)
WTE of renal work (10PAs)	526	64.4	22.6	24.1	637
No. of WTE per million population	9.4	11.9	11.9	7.7	10.2

TABLE 2. NUMBER OF RRT PATIENTS PER WTE CONSULTANT (10PAS OF RENAL) BY COUNTRY.

	England	Scotland	N.Ireland	Wales	UK (all units)	UK (Transplant centres)
Mean No RRT patients per consultant	102	84	60	98	96	121
Highest No RRT patients per consultant	193	121	76	166	193	175
Lowest No RRT patients per consultant	29	50	45	46	29	65
Median No RRT patients per consultant	97	81	59	94	94	115

The 2002 Report of the National Renal Workforce Planning Group recommended that there should be approximately 100 RRT patients per WTE nephrologist (75/RRT for physicians participating in GIM).⁶ Data from the 2018 Royal College of Physicians Renal Workforce and Job Planning Guidance⁷ shows that, taking the UK as a whole, this has been achieved and the ratio between consultant numbers and RRT patients had improved in the last five years. However, there is wide disparity between units (the units with the highest and lowest numbers of RRT patients per consultant show a more than a six-fold difference) and this is unlikely to be explained solely by the variations in local circumstances and practices described in the paragraphs above. It is therefore likely that those units which have much greater numbers of RRT patients per consultant than the national mean are inadequately staffed.

Future recommendations

Over the next 5-10 years the number of renal physicians required for a given population of RRT patients will be subject to several competing influences:

Effects which may increase requirement for renal physicians

- Although the rate of increase in RRT programmes has slowed in recent years (currently 3% per annum), the prevalence of type 2 diabetes (the commonest cause of ESKD) has doubled in the UK in the last 20 years. This may lead to a renewed increase in demand for renal services over the next 10 years.
- Chronic kidney disease is commoner in older age groups. Furthermore, lower mortality from cardiovascular events may lead to greater numbers of older patients surviving to ESKD, often with significant comorbidities. The time and resources needed to care for older, more dependent patients (and thus the required number of consultant PAs per RRT patient) will be greater, particularly in areas of the UK with an older population.
- In the past (notably at the time of the 2002 National Renal Workforce Planning Group⁶) renal units depended on junior doctors to provide much of the acute clinical service. A change to a primarily consultant-delivered service, which requires nephrologists to be available out-of-hours may require more consultant PAs (to provide safe on-call rotas etc.) for a given population of RRT patients

Effects which may decrease requirement for consultant numbers

- The deployment of non-consultant members of the MPT into extended roles varies widely between renal centres. There are growing numbers of physicians' assistants in some units. Where pharmacists prescribe and specialist nurses undertake autonomous practice, the requirement for consultant time (and thus PAs per RRT patient) may reduce. The extent to which these factors already affect current consultant numbers, or may affect them in future, cannot be defined from the available data.
- The degree to which innovative practice (e.g. use of information technology to empower patients, remote clinics or involvement of primary care teams in monitoring) is utilised varies widely between renal centres. These approaches are encouraged by NHS England and are likely to increase. In the future, best practice may be to work smarter rather than to work harder and this may reduce the number of consultants required to provide high-quality care to a given population of renal patients.

Summary

The requirement for renal physicians is determined by local variations in responsibilities and the level of non-consultant support, as described above. The currently accepted ratio of one WTE renal physician to 100 RRT patients remains a minimum standard. By sharing best practice through peer-review, it should become clear how renal physicians can best be deployed in future. The Getting It Right First Time (GIRFT) initiative⁸ has recently reported following review of renal services, and uptake of its recommendations focusing on quality of care may lead to optimisation of physician workforce in the context of the MPT. Examples of practices which influence renal physician numbers, but are only evident in some centres, include:

- a. Relating renal physician requirements to patient acuity scores
- b. Use of remote on-line monitoring or telemedicine in place of clinics
- c. Provision of a comprehensive in-reach service to referring hospitals
- d. Establishment of sub-specialty MDTs for complex disease areas

GIRFT should also identify units where the number of consultant renal physicians is demonstrably too small and investment by trusts is therefore required. The current apparent inequities in consultant numbers should thereby be reduced.

4.2 PAEDIATRICS

Introduction

The information provided herein has been obtained following detailed consultation with all clinical leads in paediatric nephrology and the executive of the British Association for Paediatric Nephrology (BAPN).

Service configuration and commissioning

There are 13 UK centres delivering specialised paediatric nephrology services. All paediatric nephrology centres are now located within a wider children's hospital. This represents a significant reconfiguration since the 2002 British Renal Society (BRS) workforce report.⁶ Paediatric intensive care, surgery and anaesthetics and paediatric nephrology were identified as having absolute dependency requiring co-location.⁹ While there are clear benefits of this approach, systems to mitigate the disadvantages of physical separation from adult nephrology, renal histopathology, interventional radiology, and transplant services are required.¹⁰ Appendix I illustrates the current complex and differing interactions between adult and children's services in transplant, interventional radiology and urology services.

All centres offer expert care of children and young people with complex kidney disease including those requiring renal replacement therapy with dialysis and kidney transplantation.¹¹ Kidney transplant surgery is carried out in 10 centres with integrated care arrangements between the three non-transplanting units and their partner transplant centres. The need for improved access to treatment was recognised by the BAPN and the Royal College of Paediatrics and Child Health (RCPCH) leading to the development of a Special Interest Training Module (SPIN training) which was launched in 2009.¹² This now provides recognised accreditation in paediatric nephrology for paediatricians working in secondary care. The success of this approach requires on-going professional development and collaborative working with tertiary paediatric nephrologists.

Transition to adult services

The importance of a supported transition for young people with long term conditions is increasingly recognised, with adult and paediatric nephrology multi-professional teams at the forefront of work to reduce the risk to patients arising from poor transfer of care.¹³ NICE guidance recommends the establishment of a structured, patient-centred transition process across adult and children's services and this approach has been shown to improve long-term outcomes and patient experience.^{14,15} Such provision needs to be available across the country.

Equitable and high quality care through clinical networks

Improving the standard of care of children with kidney disease through paediatric nephrology networks was an influential report co-produced by the RCPCH, BAPN and NHS Kidney Care in 2011.¹⁶ It advocates equitable access to high quality multi-professional care through the development of clinical networks. In Scotland and Wales paediatric nephrology is commissioned as part of a managed network. In England, service delivery through clinical networks is inferred in the E3a national service specification for paediatric renal medicine but not yet commissioned as such.¹⁷

The changing patient population

Since 2002 the UK population has increased in size and diversity.¹⁸ Over this period there is evidence of poorer health linked to increasing societal inequity and levels of obesity, declining mental health and stalling in improvements in life expectancy and neonatal death.¹⁹ Demands on paediatric services have risen with increasing patient complexity, co-morbidities, patient expectation, the impact of social media and associated increased public awareness due to high profile ethical and medico-legal cases.²⁰

Children under 16 are almost exclusively cared for in paediatric units, so it is possible to calculate population-level statistics. From 16 to 18 years of age, young people are cared for in either an adult or a paediatric unit according to their preferences and local service provision, so population-level statistics are not routinely calculated for this age group in the UK Renal Registry reports.¹¹ These data show that patients over the age of 16 account for approximately 20% of the caseload in paediatric centres.¹¹

Table 3 shows UK childhood established kidney failure population change data, Table 4 treatment modality and Table 5 prevalent kidney replacement therapy population by centre.

TABLE 3. UK CHILDHOOD ESTABLISHED KIDNEY FAILURE POPULATION CHANGE.

Prevalence (per million age-related population)	2002	2018	Percentage Change
0-4	17.8	22.3	+25%
4-8	32.1	52.2	+60%
8-12	59.0	77.2	+31%
12-16	95.5	112.3	+18%
< 16 yrs	52.4	65.4	+25%

TABLE 4. TREATMENT MODALITY.

Prevalent patients	2002	2018	Percentage Change
Transplant	76%	78%	+3%
Peritoneal Dialysis	15%	11%	-26%
Haemodialysis	9%	11%	+22%

TABLE 5. PREVALENT KIDNEY REPLACEMENT THERAPY POPULATION BY CENTRE IN 2018.

	Dialysis	Transplant	Total
Belfast	6	26	32
Birmingham	33	66	99
Bristol	14	41	55
Cardiff	10	23	33
Glasgow	13	44	57
London-Great Ormand Street Hospital	26	122	148
London-Evelina	15	65	80
Leeds	11	47	58
Liverpool	11	31	42
Manchester	16	63	79
Newcastle	11	25	36
Nottingham	14	63	77
Southampton	3	27	30
Total	183	643	826

Paediatric nephrologists

Paediatric nephrologists have expertise in the care of infants, children and young people with acute and chronic kidney disease including dialysis and transplantation. They manage a wide range of conditions including severe congenital anomalies of the renal tract, complicated nephrotic syndrome, glomerulonephritis, vasculitis, inherited and acquired tubulopathies, kidney stone disease, hypertension, inborn errors of metabolism and inherited nephropathies. They provide support throughout childhood from antenatal counselling to transition to adult services. In addition to clinical care consultants have responsibilities for quality improvement, service development, teaching and mentoring, and research.²¹

Training in paediatric nephrology

Paediatric training in the UK is a competency based programme (ST1 to ST8) run over eight years. Trainees interested in paediatric nephrology apply for 'Grid' subspecialty training at ST5 or ST6 training levels. The duration of UK nephrology grid training is currently two years and successful completion of curriculum-based capabilities leads to Certificate of Completion of Training (CCT) from the RCPCH with dual accreditation in both general paediatrics and paediatric nephrology.

The RCPCH paediatric training programme allows for opportunities such as OOPE/R/T (Out of Programme for Experience, Research or Training) which enables trainees to gain supplemental advanced clinical or research skills. This training can take place between Grid nephrology training years, or at an earlier point, maintaining a training post whilst gaining experience outside the programme. This flexibility enables trainees to shape and individualise their training whilst keeping their training number secure and continuing to achieve generic and speciality-specific mandatory competencies.

In response to the UK Shape of Training Report to improve training flexibility, and provide more doctors with general skills to meet the future needs of children and young people, the RCPCH is working towards changing the current training scheme by 2022.^{2,12} Thus, the current paediatric nephrology training pathway will change from the two-year scheme to a three-year programme. The provisions to take time out of training for clinical or academic experiences will remain and achieving CCT in the sub-speciality will still be capability based.

Special interest in nephrology (SPIN) paediatricians and general paediatricians with nephrology interest

General paediatric consultants who have undergone SPIN training and have developed paediatric nephrology skills are based in secondary care centres and lead the care of children with less complex kidney diseases and other general nephrology conditions. Their role in management of children in this healthcare setting addresses the requirements contained in the Facing the Future Standards document published by RCPCH (revised 2015); to ensure that services are planned and organised around the child, with care provided closer to home where appropriate.²² Their role includes:

- Co-ordinating local resources for children with wider health and social care needs;
- Managing non-complicated underlying renal diseases e.g. nephrotic syndrome, congenital kidney tract abnormalities, hypertension and glomerulonephritis;
- Liaising with local paediatric nephrologists in monitoring children with early stages of chronic disease;
- Undertaking a key role in transition of young people.

The importance of the role of the SPIN paediatrician in providing equitable access to care was recognised in the 'Improving the standard of care of children with kidney disease through paediatric nephrology networks report'¹⁶

SPIN training

SPIN training (12-18 months) for paediatric trainees and consultants working towards expertise in paediatric nephrology within secondary care requires the acquisition of specific competencies during a rotation in a District General Hospital and a specialist nephrology centre.¹²

Current workforce

In the 2002 renal workforce plan, 37.8 whole time equivalent paediatric nephrologists were recorded as being in post, with a proposed target of 72.0 WTE.⁶

A survey regarding the existing work force of all paediatric nephrology units was conducted in October 2018. The results are presented in Tables 6 and 7 below. Table 6 shows data relating to consultant paediatric nephrology posts and PAs by Devolved Nations, Table 7 England only.

A further survey of consultant paediatric nephrologists was carried out in November 2019. This survey provided data on the number of consultant paediatric nephrologists and consultants with an interest in paediatric nephrology by region, population data from the ONS, the number of patients receiving RRT reported to the UK Renal Registry (UKRR) and the number of patients under follow up reported by the units, were used for denominator data.^{11,23}

TABLE 6. CONSULTANT PAEDIATRIC NEPHROLOGY POSTS AND PROGRAMMED ACTIVITIES (PAs) BY DEVOLVED NATIONS.

Unit	Posts	PAs	Renal replacement therapy Population - UKRR 2018	Population Estimates (million) from 2018 ONS data	PAs per million population
Scotland	6	63	57	5.4	11.6
Wales	4	40	33	3.1	12.9
NI	4	37.4	32	1.9	19.6
England	63	609	704	55.9	10.9
Total	75	749.4	826	66.4	11.2

ONS, Office for National Statistics; PA, programmed activities

TABLE 7. CONSULTANT PAEDIATRIC NEPHROLOGY POSTS AND PAs BY UNIT IN ENGLAND.

Unit	People	Total PAs	Direct clinical care
Birmingham	7	63.6	54
Bristol	6	61	42.5
Evelina	9	80	64.5
Great Ormond Street Hospital	11	94	77
Leeds	5	54.75	46.75
Liverpool	4	40	37.5
Manchester	7	65	53
Newcastle	6	48	40.5
Nottingham	7	69.5	58.5
Southampton	3	33	28.5
Total	65	609	502.8

Since 2002 there has been an increase in the UK consultant paediatric nephrology workforce to a total of 750 PA equating to 75 WTE. The 2017 RCPCH workforce census shows an increase in the consultant paediatric workforce of 6.7% WTE between 2015 and 2017 but estimates that demand for paediatric consultants in the UK is around 21% higher than the documented 2017 workforce levels.²⁴ The RCPCH estimate for the need to increase the consultant workforce applies to paediatric nephrology due to:

- Increase in the number of children with established kidney failure of 25% between 2002 and 2018;
- Increasing patient complexity;
- Younger infants requiring dialysis and more intensive treatments;
- Small infants weighing under 1000g being considered for haemodialysis;
- Increasing parental expectation;
- Support for development of advanced nurse and other practitioner roles;
- Requirement to participate in quality improvement and guideline development;
- Requirement to participate in clinical research to foster improved patient outcomes;
- Extended grid training.

The changes to training of paediatricians arising from the UK Shape of Training Report are expected to result in increased reliance on specialist advice in the medium term, while the lengthening of GRID training will increase the requirements to provide trainee support and supervision.² Consultants continue to provide services out of hours and support where deficiencies arise in junior doctors' shifts. There will be benefits from training and development of advanced nurse practitioners and other allied roles, but currently their development is dependent upon consultant support and mentorship, hence increasing workload in the short term.

New ways of working including improvements in networking facilitated by further development of the SPIN role, virtual meeting platforms and development of advanced practitioner roles may mitigate some of the developing gap between workload and consultant workforce. Improved recognition of kidney disease in children (e.g. AKI, molecular genetic diagnosis or following chemotherapy in oncology), together with the development of novel therapeutic options and the ability to provide further advances in renal replacement therapy for infants and younger children, will require an increase in consultant posts.

Digital platforms create pressure for staff by reducing the demarcation from work time to non-work time, compounded by a growing expectation to be immediately accessible to colleagues at all times. Nephrology consultants do not work in shifts but their duties are defined by the patient load, which is noted to be increasing in number and complexity. Thus workforce balance is required to address this. Revised recommendations should be informed by a detailed understanding of catchment populations taking socioeconomic deprivation into account.

In total, 52 consultant general paediatricians and five staff grades and associated specialists self-identified as having a special interest in nephrology in 2017, out of 1791 (3%) UK general paediatricians, and 232 (2%) of staff grades and associated specialists (SAS) paediatricians. The UK has 189 in-patient paediatric units. Table 8 shows the number of paediatricians in the UK with an interest in Paediatric Nephrology from RCPCH Workforce Survey 2017.²⁴

TABLE 8. PAEDIATRICIANS WITH AN INTEREST IN PAEDIATRIC NEPHROLOGY.

Region	Consultant paediatricians	Staff grades and associate specialists	Total
East of England	10	1	11
South London, Kent Surrey and Sussex	3		3
North London	5		5
North East and Cumbria	3		3
North West	3		3
South West	7		7
Wessex	5		5
Midlands	7		7
Yorkshire and the Humber	4		4
Scotland	3	3	6
Wales	2	1	3
Total	52	5	57

Summary

The paediatric nephrology workforce has developed in the last two decades with increases in the medical workforce. The number of paediatricians in district hospitals identifying themselves in the RCPCH workforce survey as having a nephrology interest is encouraging.²⁴ However, the needs of our patient cohort have changed particularly with the increased prevalence of younger and more complex children with kidney diseases. In response, a flexible and resilient medical workforce which provides integrated care across organisational boundaries with support from paediatric nephrology networks is required.

Recommendations

- An increase of 20% in the consultant paediatric nephrology workforce, in line with the 2017 recommendations of the RCPCH²⁴, is needed to meet clinical demand, as well as to lead the development of paediatric nephrology networks with links nationally, regionally and to adult nephrology. Engagement in quality improvement, clinical research and education is critical.
- Implementation of recommendations from *Improving the standard of care of children with kidney disease through paediatric nephrology networks 2011 report*¹⁶ by increasing training and recruitment of SPIN paediatricians in district hospitals. SPIN paediatricians with good links to their local specialist centre play a pivotal role in providing equitable access to care as close to home as possible.
- Work with UK Renal Registry to measure catchment populations for each network.
- Arrangements should be in place for regular shared clinical meetings and professional development activities with adult nephrology, histopathology, interventional radiology, and transplant services.
- A structured transition process should be in place led by a named paediatric nephrologist and a named adult nephrologist identified from each nephrology unit and supported by MPT members from adult and children's services. In paediatric nephrology services a named key worker for transition is required to support the coordination of key medical and psychosocial issues in people with complex kidney disease.

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APPENDIX I - INTER-RELATIONSHIP BETWEEN ADULT AND CHILDREN'S SERVICES IN TRANSPLANT, INTERVENTIONAL RADIOLOGY AND UROLOGY SERVICES

Centre	Number of transplant surgeons undertaking paediatric work	Living Donor nephrectomy on site? Y / N	Paediatric IR on site? Y / N If yes: number of IR	AVF creation performed on site? Y / N If yes: approx. num / 5 years	PD catheter insertion operator	Chronic haemodialysis catheter insertion operator	Number of surgeons undertaking dialysis access in your unit PS (US)
Belfast	2	N	Y:2	Y:1	Paediatric surgeon	Paediatric surgeon or interventional radiologist	7
Birmingham	4	N	Y:2	Y:12	Paediatric surgeon	Anaesthetics	4
Bristol	4	N	N	Y:1	Paediatric surgeon	Paediatric surgeon	8(3)
Cardiff	(Bristol)		N	Bristol	Paediatric surgeon	Paediatric surgeon/anaesthetics	6(3)
Evelina	5	N	Y:5	Y:27	Transplant surgeon	Interventional radiologist	N/A
Glasgow	1	Y	Y:1	Y:0	Paediatric surgeon	Paediatric surgeon	12(4)
GOSH	4	N	Y:5	Y:35	Transplant surgeon	Interventional radiologist	N/A
Leeds	3	N	Y:2	Y: 2-3	Paediatric surgeon	Interventional radiologist	(3)
Liverpool	(Manchester)		N	Manchester	Paediatric surgeon	Paediatric surgeon	
Manchester	8	Y	Y:1	Y:10	Paediatric surgeon	Paediatric surgeon/anaesthetics/ interventional radiologist	Paediatric surgeon (12), anaesthetists (4) & interventional radiologist (1)
Newcastle	4	Y	Y:1	Y:0	Urology surgeon	Paediatric surgeon/anaesthetics	7(3)
Nottingham	4	N	Y:6	Y:5	Paediatric surgeon	Paediatric surgeon	10
Southampton	(Evelina)		N	Evelina London (smaller children) Portsmouth (older patients)	Paediatric surgeon	Paediatric surgeon	6(3)

AVF, Arteriovenous fistula; HD, Haemodialysis; IR, Interventional radiologist; PD, Peritoneal dialysis; PS, Paediatric surgeon; US, Urology surgeon