National Organ Retrieval Service (NORS) Review

May 2015

Contents

Chair's foreword	1
Summary and recommendations	3
Introduction and background	5
Realignment of capacity	9
Commissioning for quality	
The future service requirements	
Annex A: National Organ Retrieval Service (NORS) Review Terms of Reference (ToR)	
Annex B: Our approach – methodology	
Annex C: NORS review capacity workstream	
Annex D: Example Rota	70

Chair's foreword

In March 2014 I was asked by the Board of NHSBT to chair a Review of the National Organ Retrieval Service in the United Kingdom (NORS).

The attached Report sets out the conclusions and recommendations of the Review Board, and I commend them to you.

The aim of the Review was to benchmark the current NORS provision, identify any gaps or shortfalls and make recommendations in line with certain principles, all with the aim of ensuring that the service can meet the challenges and requirements of the UK Taking Organ Transplantation to 2020 strategy.

The membership of the Review Board comprised senior representatives from the professionals involved in organ retrieval and transplantation, the donation community, commissioning and policy representatives from all four UK countries and NHSBT.

From the outset, the strategy has been to have as inclusive an information gathering and consultation process as possible. The Review Board, and I personally, made it our aim to involve all the relevant stakeholders in this process. We wanted to hear from as many as possible of the people who provide and work in NORS, the donor hospitals, those who transplant the recovered organs, and the wider donation community, as well as NHSBT itself.

The formal way in which the Review did this was by holding Challenge Events in July and October 2014, to which a wide range of stakeholders were invited and attended. We also invited stakeholders to make written submissions to the Review Board, and to invite the anonymous completion of a survey. For me, however, the most valuable and informative part of the Review process has been the visits which the Review Manager and I made to every NORS team in the UK, together with various teleconferences with other stakeholders.

During those visits and discussions, I was repeatedly impressed by the passion, commitment and dedication of those working in NORS teams, and indeed the whole transplantation pathway. I would like to thank all those who made the time and effort to meet us.

Attending potential organ donors, and retrieving organs, is challenging work. The demand is unpredictable, and teams often have to travel considerable distances, usually at night. It is a service of which the vast majority of the population of the UK is entirely ignorant, but is a service which is absolutely vital if organ transplantation is to take place.

If there is not an effective and efficient retrieval service, there will be fewer transplants, fewer lives saved or transformed, and more sick people on the waiting lists denied a transplant.

It was, therefore, extremely important that this Review carried out a thorough assessment of the operation of the current NORS, identified its strengths and weaknesses, and considered how to ensure the future provision of a high quality retrieval service across the UK.

It became clear during the course of the Review that most (although not all) of the professionals involved in organ transplantation thought that organ retrieval in the UK was much better since the implementation of NORS, prior to which there could be multiple retrieval teams in theatre recovering organs from one donor, or no retrieval teams available at all, resulting in the loss of a donation opportunity.

However, we also heard comments about NORS which were less positive. Some transplant surgeons were not confident in the ability of surgeons from other hospitals to recover organs for their patients; there were concerns expressed about the quality of organs retrieved, and a recurring theme was concern about lack of, or erroneous, information being provided by NORS teams on the state of organs.

If there is one word which can summarise the cause of most of these concerns it is 'communication', or rather the lack of it. Nearly every concern or problem which was discussed with me was caused by a lack of communication somewhere in the process.

The transplant health professional community is a relatively small one. It should not be difficult to achieve a significant and measurable improvement in communication between those working in NORS, and others in the transplantation pathway. Indeed, most of those working in NORS are also involved in the wider transplantation pathway, i.e. they are the same people fulfilling different roles at different times, so they should have no difficulty knowing when and what to communicate to each other.

Improved communication would also help to break down the barriers (real or imagined) which currently appear to exist between certain members of NORS teams, commissioners, donor hospitals, and those who receive and transplant the organs.

I hope that implementation of the Review Board's recommendations will also help foster a culture of openness, feedback and accountability throughout the work of the NORS teams, which will in turn lead to feedback being used in a positive way to improve the quality of the service.

I have been very clear throughout the Review that the Board must always keep in mind the needs of the real people involved in the transplant pathway, of which NORS is only one (but a vital) part – donors and their families, patients waiting for transplants, recipients of organs, and all the health professionals involved in the various stages of the process.

The aim of the recommendations which are made in this Report is to ensure that there is a high quality, effective service in the UK for retrieving organs from donors, capable of adapting to the demands and challenges which undoubtedly lie ahead, and ensuring that more successful organ transplants take place.

It is now up to NHSBT to take this work forward, to implement the recommendations which the Review Board has made to improve the organ retrieval service in the UK.

I do not underestimate the challenges which this will present, but I am confident that, with the support of the four Health Departments, this can be achieved.

It will be especially important to ensure that the implementation of these recommendations is considered and integrated during other NHSBT reviews that are relevant for the donation/ transplant pathway (for example the review of the workforce of Specialist Nurses in Organ Donation, the pilot projects into the use and value of 'scouts' in donor assessment, and the Hub).

I would like to thank all the stakeholders who attended the Challenge Events, responded to the Survey circulated to them, and contributed to the Review in other ways for their valuable contributions.

Finally, I would like to thank all the members of the Review Board, the members of the Workstream groups, the staff of NHSBT, and the Review Team, for all the time and effort which they have devoted to the Review.

Yours sincerely,

Katalien H. S. Prestin.

Kathleen Preston Chair, National Organ Retrieval Service Review

Summary and recommendations

The National Organ Retrieval Service (NORS) is a vital part of the transplantation pathway, which makes organ transplantation a realistic option for the 7000 people on the transplant waiting list.

As we look to the future, the primary objective for NORS must be the provision of a high quality, safe service for the donation hospitals and transplant centres, and, most importantly the recipients of the organs, delivered by a wellcoordinated, flexible and responsive group of teams, with a shared strategy. Achieving this will require better management of the Service, a rigorous focus on quality and a realignment of the current service provision, to ensure that available capacity in the system is matched as closely as possible to demand.

The case for realignment of the current service provision is based on data presented to the Review Board on the current activity of NORS teams across the UK. Wide variations in activity between providers were found, and analysis of these variations confirms both the data collected by NHSBT and what we were told by the teams about their experience of working in the current system. Under the current contracting arrangements, certain areas feel stretched, whilst others have capacity. Modelling exercises based on current and projected demand were undertaken for the Review Board. These showed that significant improvements could be achieved through better management of the Service, with centrally coordinated dispatch of NORS teams, together with team availability requirements being more appropriately matched to projected demand, based on certain criteria and assumptions.

Service realignment is necessary if NORS is to continue to play an effective role in the transplantation pathway. There is already good provision, but if this crucial service is to continue to develop and meet future requirements and challenges, both providers and commissioners need to work together to develop a service fit for the future.

This means improving service quality, responsiveness and cost-effectiveness, by enabling resources to be better utilised, effectively appraising the opportunities presented by innovation and technology and responding swiftly to the challenges set out in this report. **Recommendation 1.** NHSBT make the modelling of the retrieval service part of its core business, to ensure that capacity is better aligned to demand in the future (para 80).

Recommendation 2. A change to the current 24/7 NORS into an annual NORS rota, which does not necessarily mean that every NORS team will need to be available 365 days a year (para 81).

Recommendation 3. The call-out and dispatch of NORS teams is co-ordinated centrally and we consider it essential that NHSBT moves forward, as quickly as possible, with the development of this capability to enable it to implement the recommendations in this report (para 85).

Recommendation 4. The current first on call system is changed, so that the closest available team is despatched, to ensure the available capacity is best utilised to meet demand (para 86).

Recommendation 5. NORS moves to joint working arrangements, where there is provision for Standard (abdominal) retrieval and Extended (cardiothoracic) retrieval (para 96).

Recommendation 6. Commissioning arrangements are based on the provider's participation in an annual NORS rota (para 124).

Recommendation 7. Reimbursement for consumables, instruments and disposables is moved to a block contract (para 131).

Recommendation 8. A move to central provision and management of retrieval team transport and that, in particular, a review of use of flights is undertaken to ensure more effective use (para 134).

Recommendation 9. The focus of the Future Service Requirements be on achieving a high quality service, and the quality of the organs retrieved, to support an increase in the number of patients successfully transplanted (para 145).

Recommendation 10. The Future Service Requirements encourage and support more,

and better, communication and sharing of information across all parties involved in the donation, retrieval and transplantation pathway. In particular, the Review supports the work, currently underway at NHSBT, looking at electronic reporting of retrieval data (para 147).

Recommendation 11. The Future Service Requirements are flexible and adaptable to ensure that NHSBT is able to look at the further development of the NORS in the future (para 149).

Recommendation 12. The Future Service Requirements ensure training with certification and availability of all functions required for NORS teams and that the current KPIs are revised in order to focus on process, quality and outcomes (para 156).

Recommendation 13. The solid organ advisory groups, in consultation with their communities, produce guidance on pre-determined categories, with well-defined criteria, within which it would be expected that organs would be retrieved (para 158).

Recommendation 14. The Novel Technologies in Organ Transplantation working party evolves into an advisory group for NHSBT that brings together stakeholders and commissioners and explores the role of novel technologies and innovative approaches to increase organ recovery and transplantation rates (para 163).

Recommendation 15. A biannual Audit of a representative number of procedures is conducted, to ask stakeholders to comment on their perceptions of how the system works (para 170).

Introduction and background

- In January 2008 the Organ Donation Taskforce published 'Organs for Transplants.'¹ The report made recommendations towards increasing the UK deceased donor rates by 50%. By April 2013, following a detailed programme of work and with the support of donor families, the NHS and the health professions, that target was met.
- 2. The National Organ Retrieval Service (NORS) has played a vital role in contributing to the increase in deceased donors and organ transplants carried out. The service was established by NHSBT in April 2010 following a specific recommendation from the Taskforce.² As a key component of the organ donation and transplantation infrastructure, it provides a 24 hour service for retrieving organs from UK donors.
- NHSBT uniquely commissions the service on behalf of the four UK Health Departments, who contribute funding for the provision of an integrated UK wide retrieval service. In 2013/14 the cost of NORS was £25.2m, including transport and consumables.
- 4. The system has moved retrieval away from the previous arrangements, where multiple teams might attend a single donor and there are currently:
 - five stand-alone cardiothoracic teams
 - seven stand-alone abdominal teams (some working on a shared rota)
 - one joint team
 - and one multi-organ team (combined abdominal and cardiothoracic expertise).

- 5. This corresponds to retrieval capacity for six cardiothoracic and seven abdominal donors at any time.
- 6. The service has been very successful. The combined efforts of the four UK Health Departments, NHSBT and the service providers in establishing and maintaining a reliable and responsive UK wide retrieval service should be commended. The commitment and dedication of the healthcare professionals involved, in what is often a service delivered in challenging circumstances, across the UK, during antisocial hours, should also be acknowledged, and appreciated.
- 7. The net result is that donor hospitals and the wider transplant community have confidence that they are supported by a professional, skilled service, whose availability, at any given time, can be relied upon.
- 8. The service is well regarded internationally and organ procurement organisations from other countries have expressed interest in learning from the NORS experience.
- There are few serious adverse incidents/ untoward events and few major clinical governance issues. As a system, it works.
- 10. However, the current NORS is not without issues. In order to set up the service in a timely manner, some pragmatic decisions and compromises had to be made. This has resulted in some inconsistencies in service provision. There are also inconsistencies in the cost, utilisation, efficiency and funding of the service..

^{1.} Organs for Transplants A report from the Organ Donation Taskforce – 2008.

^{2.} Recommendation 10: A UK-wide network of dedicated organ retrieval teams should be established to ensure timely, high-quality organ removal from all heartbeating and nonheartbeating donors. The Organ Donation Organisation should be responsible for commissioning the retrieval teams and for audit and performance management.

- Moving forward, better quality assurance is needed across the whole pathway, along with a potential shift of focus from only increasing the number of donations to increasing the number of successful transplants and the quality of the organs retrieved.
- 12. We must also not lose sight of the needs of the donor hospitals. The NORS teams are ambassadors for transplantation, often the public face as far as the wider NHS goes, and it is absolutely vital that any changes have the support of the donation community.
- **13.** NORS role in the transplantation pathway continues to be vital. Without a high quality, well regarded, effective and efficient retrieval service, more donors and donated organs will not result in more transplants.
- 14. Fundamentally, as we look to the future, if NORS is to continue to meet the needs of the donor hospitals and transplant centres, work must be done to ensure that it is operating as a true UK service, with a joint strategy, which is equitably funded and providing the same standard of quality service across the four countries, irrespective of which NORS team is called to retrieve.

Taking Organ Transplantation to 2020 (TOT 2020)

15. In 'Taking Organ Transplantation to 2020 (TOT 2020),'³ NHSBT has built on the success of the years since the Organ Donation Taskforce reported. It has outlined a strategy which follows the clinical care pathway and highlights a number of areas for improvement. NHSBT recognises that better systems and processes need to be in place to enable more donation and transplant operations to happen in the future.

16. For NORS, this means the commissioning of an effective and cost-efficient retrieval service that is responsive to the needs of the donor hospitals and transplant centres. TOT 2020 recognises that the current service configuration works well, but it calls for a review to ensure that the service will remain fit for purpose as the new strategy is implemented.⁴

The NORS Review

- 17. The Board of NHSBT agreed to commission the Review in September 2013, to ensure that NORS could meet the requirements of the TOT 2020 Strategy and has the capability and flexibility to meet demand and contribute to the improvement of transplant rates stated within the Strategy.
- 18. The aim of the Review was to benchmark the current service provision, identify any gaps or shortfalls and make recommendations in line with the following principles:
 - Equity and timeliness of access to a retrieval team for all potential donors whilst acknowledging geographical challenges
 - Sufficient flexibility to cope with peaks/ troughs in activity
 - High quality and cost effective
 - Ability to cope with projected future activity levels.
- 19. A Review Board composed of senior representatives drawn from professionals in the field of donation and transplantation and the NHS system, providers and commissioners, including lay representation, was convened, chaired by Kathleen Preston, a lay member of the NHSBT Liver Advisory Group, and a solicitor by profession.
- **20.** The Board's Terms of Reference and details of the composition of the Board are given in Annex A.

3. Taking Organ Transplantation to 2020: A UK strategy – 2013.

^{4.} Taking Organ Transplantation to 2020: A detailed strategy – 2013. 'Review the NORS service to ensure that there is sufficient capacity and flexibility within the retrieval teams to meet any increase in donation.'

- 21. We, the Review Board looked to evaluate the effectiveness of the current NORS provision, with due regard to advances in technology, to ensure the future provision of a quality service across the UK.
- **22.** The Review took a phased, consultative approach, which sought to:
 - gather information and opinion
 - explore and appraise options for improvement and
 - validate our ideas and thinking.
- 23. We actively encouraged Stakeholders to engage in our process, to generate as wide a discussion as possible on the issues and potential solutions and we are very grateful to all who gave their time and expertise.
- 24. Workstreams were commissioned, which looked at:
 - Capacity
 - Workforce
 - Commissioning
 - Future Service Requirements.
- **25.** We looked at the configuration and capacity of the current NORS provision and considered its ability to deliver the expected increase in demand.
- 26. Modelling work was undertaken, which looked at the current service configuration and this was mapped against NHSBT's TOT 2020 strategy, to evaluate the service`s ability to deliver that strategy.
- 27. The Review investigated the current workforce and staffing arrangements relating to the overall provision of NORS, exploring the variability, and considered the minimum workforce requirement to deliver a 24/7 service, taking into account projected future demand.

- **28.** A broad range of delivery models have been considered for alternative service configuration and management.
- 29. The current commissioning arrangements have been assessed and consideration has been given to what amendments and improvements NHSBT needs to make to the way in which it articulates its service requirements, to enable NORS to support the organisation in delivering its TOT 2020 strategy.
- **30.** The membership, aims and objectives of the workstreams is set out in Annex B.

The Current NORS

- **31.** Throughout the Review, we have heard much that is good about NORS. The standard of retrieval is considered to be much better under NORS than it was previously, and it is considered to have led to more standardisation and success of transplantation. Support and communication with donor hospitals has improved and the various NORS teams are now working more collaboratively.
- **32.** We heard that NORS has played a key part in developing the organ sharing scheme and organs are considered as a 'national resource' rather than the 'property' of a particular team. NORS has also reduced delays relating to the despatch and arrival of retrieval teams and it allows capture of organ damage rates, which means that teams can be held to account for performance.
- 33. We have also heard that the agreed NORS funding stream provides security to appoint sufficient staff to provide the service 24 hours a day, 365 days of the year.
- **34.** NORS has played a key role in achieving the 50% increase in donors.

Areas for Improvement

- 35. We have, however, also heard about a number of areas where things are working less well and could be improved. As reflected in TOT 2020, it has been expressed that there may be a need to shift focus from increasing the number of donors/donations to increasing the number of successful transplants and the quality of the organs retrieved.
- **36.** There is a need to reduce unnecessary delays throughout the donation and retrieval process.
- 37. We heard that more could be done to build confidence between some transplanting surgeons and the NORS teams' around competence/skills and the assessment of organs.
- 38. We have heard that better Quality Assurance is needed – (i) common training/ accreditation; (ii) a need to assure the quality of the retrieval team to improve the quality of the process and achieve better outcomes for patients.
- **39.** There is also a need for better measures to deal with poor performance and there have been some calls for standard protocol reports for retrieving surgeons and standard donor assessment. Generally, a standardisation of the information shared is required.
- **40.** The Review team has heard a lot about relationships across the service and there is potentially a need to break down some barriers between: Cardiothoracic and Abdominal teams; NORS teams and Transplant Centres; SNODs and NORS teams; NORS teams and NHSBT.
- **41.** There are inequities in funding. Some teams consider that there is a lack of funding, reward and encouragement for innovation and use of new technologies.

- **42.** There is concern about the current NORS ability to cope with increased demand in the future.
- **43.** A lack of flexibility in some of the service requirements has been identified, with some concern around how some of them are understood and applied.
- **44.** We have also heard calls for changes to the commissioning arrangements. Some felt a need for a single commissioner for retrieval and transplantation, whilst others saw benefit to the separating out of NORS, seeing the service as being provided by a secure funding stream.
- **45.** There are still some exclusions to the current service definition e.g. paediatric, intestinal/multi-visceral and commissioning arrangements for these exclusions need to be clarified.

The Future

- **46.** NORS is crucial to transplantation in the UK. This Review is not simply about extracting the most efficiency from an established service. It is about meeting the changing demands that will be placed on the retrieval service as NHSBT strives to deliver TOT 2020.
- **47.** As one part of the wider transplant pathway and as the various strategies for increasing donation and transplants are implemented, we need to ensure that NORS continues to be fit for purpose. This means better management, better use of time and resource, better dispatch, better co-ordination, better training, better quality leading to more successful transplant outcomes and appropriate funding.
- **48.** So our report focuses on three main themes:
 - realignment of capacity
 - commissioning for quality
 - identifying the future service requirements.

Realignment of capacity

A 24/7 National Organ Retrieval Service

- **49.** Based on the evidence we have collected, we believe there is a strong case for the realignment of the available capacity in the current NORS provision to improve quality, outcomes and efficiency.
- **50.** We think this can be done without major service redesign, by capitalising on what is already good practice and working together to develop and consolidate a service, of which the UK can continue to be rightly proud.
- **51.** The key issue is how to deliver realignment. Where we have identified that capacity does not best match demand, it is easier to see how stretched services might quickly benefit from some improvements in system management and workflow. But over capacity is potentially more difficult to solve.
- 52. Retrieval is intimately linked to transplantation, indeed, this is the single most influencing factor as to why there is currently a mixed economy of service provision – each provider had a different historical starting point. However, the service is now more mature and we have an opportunity to better match the available capacity to current and projected demand, whilst also building in the flexibility to develop the service in the future.
- **53.** One way of dealing with over capacity in the service could be a reduction in the number of contracted providers within NORS. However, to retain the link to transplantation, training, education and development, the Review does not

recommend this approach, preferring instead the concept of a shared rota for provider teams, with more joint working across the service.

- **54.** A large number of stakeholders have told us that they would support more joined up and joint working, and already there are excellent and commendable examples of collaborative ways of working which are delivering a high quality retrieval service. For example, in Scotland, the Scottish Organ Retrieval team (SORT) runs a multi-organ service and there are joint arrangements between Oxford and the Royal Free, and Birmingham and Cardiff who share a rota of time on call.
- **55.** Everyone we have spoken to acknowledges that driving up standards, quality and transplant outcomes, at the same time as reducing administrative burdens and unnecessary waste in the system is an ambition worth pursuing. To do this, we need:
 - an effective metric for monitoring and managing demand and activity
 - a common understanding of our workforce assumptions
 - contracting arrangements which better match the available provision to the resource required, with sufficient flexibility to cope with peaks/troughs in activity
 - assurance that the associated funding is equitable and based on solid foundations
 - and a set of flexible and adaptable service requirements that focus on quality.

Demand and Capacity

56. When it was first introduced, in April 2010, NORS comprised six abdominal organ only retrieval teams, five cardiothoracic organ only retrieval teams and one multi-organ retrieval team. Three of the abdominal only teams were formed by combining two centres and in 2012 two of these teams started to work independently on a rota basis which means that there are now considered to be eight independent abdominal only retrieval teams. Figure 1 shows the current configuration.

Figure 1: Current configuration of the National Organ Retrieval Service.



- **57.** The current mix of teams within the NORS, corresponds to retrieval capacity for six cardiothoracic donors and seven abdominal donors at any given time.
- **58.** Each donor hospital in the UK is allocated a first on call (in zone) abdominal and cardiothoracic retrieval team and the other NORS teams provide back-up (out of zone) support, should the first on call be out on retrieval.

Current NORS team activity and capacity

- 59. On average, abdominal teams attend more donors than cardiothoracic teams (Figure 2, 3).
- Figure 2: Number of proceeding and non-proceeding abdominal donor attendances during 2013/14, by NORS team, split by within zone/out of zone.



** Shared rota with Oxford on-call 26 weeks/year and Royal Free on-call 26 weeks/year All other teams are on-call 52 weeks/year

Figure 3: Number of proceeding and non-proceeding cardiothoracic donor attendances during 2013/14, by NORS team, split by within zone/out of zone.



- **60.** When abdominal teams are on call, the proportion of days when they are not attending at least one donor ranges from 26-65% (Figure 4). For cardiothoracic teams, this proportion ranges from 62-84% (Figure 5).
- Figure 4: Distribution of the number of proceeding and non-proceeding abdominal donors attended on any one day by each NORS team, during 2013/14.



Figure 5: Distribution of the number of proceeding and non-proceeding cardiothoracic donors attended on any one day by each NORS team, during 2013/14.



- **61.** With a few notable exceptions, travel times are relatively similar across the service, with median travel times being less than 3 hours (Figure 6 and 7). Retrieval teams are geographically close to hospitals with high donor numbers, with the exception of Belfast and Plymouth (Figure 8) and it is most common for retrieval teams to arrive between midnight and 0400hrs (Figure 9). Sundays and Monday have the lowest donation activity, and winter is the busiest time of year (Figure 10 and 11).
- Figure 6: Boxplots of travel times from base to donor hospital for proceeding and non-proceeding abdominal donor attendances during 2013/14, by NORS team.



Figure 7: Boxplots of travel times from base to donor hospital for proceeding and non-proceeding



*Where travel time reported (7% missing)





Figure 9: Time of day that first team arrived at donor theatre for proceeding and non-proceeding donors attended by a NORS team during 2013/14.



Figure 10: Heatmap of time of the day and day of the week that NORS teams were asked to leave base during 2013/14.

			Hour																						
	Weekday	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	Monday	18	23	14	12	7	21	16	12	10	13	3	6	4	4	8	3	2	5	3	10	13	15	17	28
	Tuesday	17	33	23	18	12	21	29	19	11	6	8	1	6	2	3	3	11	10	14	13	16	16	17	36
Total -	Wednesday	20	30	29	31	27	23	27	10	19	9	13	11	4	4	4	6	5	6	14	8	12	20	26	36
2200	Thursday	29	20	29	28	17	19	16	12	16	16	5	13	4	3	0	6	9	7	11	9	19	16	16	38
2300	Friday	34	46	26	16	13	26	13	20	11	10	9	1	4	3	6	2	4	8	9	9	12	11	17	25
	Saturday	28	17	25	17	29	23	11	13	22	10	9	8	1	5	7	5	5	5	8	12	16	9	17	32
	Sunday	12	20	27	15	13	17	14	14	4	14	8	4	5	2	2	1	4	4	7	9	16	18	21	16

Figure 11: Average monthly numbers of DBD and DCD donors adjusted for underlying trends, calculated using donor activity between 1 April 2010 to 31 March 2014.



62. The type of donor (DBD, DCD) and the organs donated influence retrieval operation length (Figure 12, 13 and 14) and the time taken from departing the NORS base to leaving the donor theatre is approximately 1.5 hours longer for actual DBD donors than actual DCD donors; this difference is the same for both abdominal and cardiothoracic retrievals and cardiothoracic and abdominal NORS teams have similar times between departing base to leaving the donor theatre (Figure 15).





Figure 13: Boxplots of length of retrieval operation by organs retrieved, for proceeding DBD donors during 2013/14.



*Where retrieval duration reported (3% missing)

Figure 14: Boxplots of length of retrieval operation by organs retrieved, for proceeding DCD donors during 2013/14.



*Where retieval duration reported (3% missing)

Figure 15: Boxplots of time between team departing from base and leaving donor theatre after retrieval, by donor type and type of NORS team, for proceeding donors during 2013/14.



63. Losing organs due to the unavailability of a NORS team appears to be rare. In 2013/14 there were three Critical Incidents where organs were lost due to apparent unavailability of a NORS team and there were 142 instances in the last financial year where a donor family refused consent, as they felt the process was too long (reported via the Potential Donor Audit); it is not possible to ascribe this to unavailability of a NORS team, as the donation / retrieval process also includes the time required for organ offering, additional investigation and donor theatre availability.

64. Non-NORS team attendances at possible UK deceased donors occur infrequently, representing just 0.8% of the total number of attendances between 2010/11 and 2013/14 (Table 1).

Table 1: Non-NORS team attendances at proceeding and non-proceeding UK donors, 1 April 2010 –31 March 2014

		DBD		DCD				
retrieval centre	Proceeding	Non- proceeding	Total	Proceeding	Non- proceeding	Total		
Bristol	0	0	0	1	0	1		
Great Ormond Street	11	0	11	0	0	0		
Liverpool	0	0	0	3	5	8		
Nottingham	0	0	0	3	2	5		
Plymouth	0	0	0	5	2	7		
Portsmouth	0	0	0	0	1	1		
Sheffield	0	0	0	1	0	1		
St George's	0	0	0	6	5	11		
Overseas	16	3	19	0	0	0		
Total	27	3	30	19	15	34		

Note: 10 of the Great Ormond Street attendances were at donors weighing <=30kg (which is permitted by the NORS Standards) and all 19 proceeding DCDs were kidney only donors (also permitted by the NORS Standards).

Projected donation activity in 2019/20

- **65.** Projected retrieval activity in 2019/20 has been calculated based on the following main assumptions:
 - Consent rate targets of 82% for DBD donors and 78% for DCD donors are achieved, in line with the NHSBT TOT2020 Strategy
 - The conversion rate from consented donors to NORS attended donors is 95% for DBDs and 90% for DCDs
 - The distribution of donors across trusts/ boards and hospitals remain the same as in 2013/14

- Widespread utilisation of uncontrolled (Maastricht category I and II) DCD donors does not occur by 2020
- Extended use of hearts donated from controlled DCD donors has not been taken into account.
- 66. From these projections, the estimated number of abdominal retrieval team attendances would increase from 1728 (2013/14) to 2500 (2019/20), and cardiothoracic team attendances would increase from 565 to 808 over the same time periods (45% and 43% increases, respectively).

67. The impact of increased retrieval duration due to the use of novel technologies for DCDs on NORS capacity was estimated as part of the modelling work (Annex C, Further model results – accounting for use of novel technologies). Increasing the retrieval duration by 2 hours for 50% of proceeding DCDs had a very minimal effect on the modelling results and did not change the conclusions from this work.

Modelling demand

- **68.** All the statistical information presented to the Review, the previous work undertaken by NHSBT, data presented by some of the NORS teams and what we had seen and heard from a range of perspectives made a compelling case for change.
- **69.** Provision did not seem well matched to demand and projecting forward there appeared to be both some significant 'pinch points' and some areas where over capacity remained.
- **70.** Furthermore, some concerns were raised surrounding the data collection, analysis and presentation. For example, some issues regarding the calculation of retrieval times were mentioned, particularly in relation to the issue of 'scouting' and the assessment of potential donors in ITU whose organs are subsequently declined.
- **71.** Recognising conflicting opinion on some issues, the Review commissioned a detailed piece of modelling work, which took a demand based approach to the question of capacity.
- 72. Annex C details the modelling work undertaken by the Review. Four different demand based scenarios were modelled to understand the capacity requirements:
 - Cardiothoracic NORS Teams 2013/14 actual retrieval activity
 - Abdominal NORS teams (as individual teams) – 2013/14 actual retrieval activity
 - Cardiothoracic NORS Teams 2019/20 projected retrieval activity

- Abdominal NORS teams (as individual teams) – 2019/20 projected retrieval activity.
- **73.** The 2013/14 model was based on the actual individual calls for retrieval per hospital, day of the week and hour and actual muster time and theatre time.
- 74. The 2019/20 model was based on projected individual calls for retrieval per hospital, day of the week and hour were NHSBT to achieve its 2020 targets, using the sampling of historic patterns.
- **75.** The model ran a simulation that allocated each donor to the closest retrieval team by travel time. If the closest team was busy with another retrieval, the model allocated the second closest team and so on. If all the teams were busy, then it indicated that for that donor 'no teams available'.
- **76.** In each simulation, the model allowed the selection of how many of the existing NORS teams were contributing to retrieval at any given time and which teams those were.
- 77. The length of time a team was busy was based on muster time + theatre time + travel time to the hospital and back. This was rounded up to the nearest hour and the model allowed a 1hr overlap.
- 78. The inclusion or exclusion of specific teams was not a reflection of commissioning intentions, but rather examples to help understand the trade-off of different scenarios and in each step the team with the lowest utilisation rate was excluded. Further modelling is required, excluding other teams (on a rotational basis), prior to commissioning of the service.
- **79.** This demand based modelling showed that:
 - In 2013/14 the donor requirements could have reasonably been served with 3-4 CT teams (Figure 16) and 6-7 AB teams (Figure 17) on-call 24x7 every day.
 - For 2019/20 the projected donor requirements could reasonably be served by 4-5 CT teams (Figure 18) and 8-9 AB teams (Figure 19) on-call 24x7 every day.

Figure 16: 2013/14 actual cariothoracic activity could have been served with 3-4 CT teams on-call 24x7 every day



Figure 17: 2013/14 actual abdominal activity could have been served by 6-7 AB teams on-call 24x7 every day



Figure 18: 2019/20 projected cardiothoracic activity could be served by 4-5 CT teams on-call 24x7 every day



Figure 19: 2019/20 projected retrieval activity could be served by 8-9 AB teams on-call 24x7 every day



- 80. From all the data provided, it would appear that NHSBT commissioned a service with more capacity than they were able to use and therefore the Review recommends that NHSBT make the modelling of the retrieval service part of its core business, to ensure that capacity is better aligned to demand in the future. The assumptions and metrics for this should be open and transparent and reported through the National Retrieval Group (NRG) and the Organ Donation and Transplantation (ODT) Senior Management Team (SMT) at NHSBT.
- 81. Furthermore, based on the initial work on actual and predicted retrieval activity and the detailed demand based modelling work undertaken by the Review, we recommend that there is a change to the current 24/7 NORS into an annual NORS rota, which does not necessarily mean that every NORS team will need to be available 365 days a year.
- 82. The Review sees central co-ordination of the call-out and despatch of NORS teams as being essential to increasing efficiency and the optimisation of capacity. A central function with knowledge of potential donor activity across the UK would enable co-ordinated direction of NORS teams, resulting in the minimisation of inefficient team travels and an increase in available capacity.
- **83.** The Review Team visited both the Fire and Rescue service and Ambulance service to look at the systems they had in place and saw excellent examples of how central co-ordination can improve service delivery.

- 84. Since August 2014, the NHSBT Duty Office (DO) has been collecting real-time data on key stages of the retrieval process (time to incision). Oversight of where the NORS team is in the retrieval process will facilitate manual central coordination of the NORS teams and this should commence in Q1 2015/16.
- 85. The Review supports this work and recommends that the call-out and dispatch of NORS teams is co-ordinated centrally and we consider it essential that NHSBT moves forward, as quickly as possible, with the development of this capability to enable it to implement the recommendations in this report.
- 86. With heightened awareness and better control of activity across the UK, The Review further recommends that the current first on call system is changed, so that the closest available team is despatched, to ensure the available capacity is best utilised to meet demand.

The NORS Workforce

- 87. Alongside the demand-based modelling work, the Review's workforce workstream took a 'bottom up' approach to how the service is delivered and considered, from a provider perspective, what staffing requirements were needed to participate in and deliver NORS.
- **88.** The workstream looked at the workforce requirements for retrieval surgery, balancing the need for a full team while minimising the impact on the donor theatres. It was noted that the Organ Donation Taskforce recommended that anaesthetist support could be provided within retrieval teams, however, the experience in Scotland has shown that this would not be sustainable across the UK.

- **89.** The workstream felt that provision of 'back office' staff, including admin, finance and management support, should be included in the recommended staffing model.
- **90.** They took a detailed look at the current service and the different delivery models, including the current staff rotas.
- **91.** Following validation at our Challenge Events and Board approval, the workstream was asked to evaluate three options:
 - Stand-alone teams for abdominal and cardiothoracic retrieval
 - Multi-organ (joint) retrieval teams
 - Separate DCD and DBD teams.
- **92.** The option for separate DBD and DCD teams was rejected, as the workstream felt the NORS teams should be skilled to safely retrieve organs from all potential donors.
- **93.** Throughout the Review, the Workstream was inclined to support separate stand alone abdominal and cardiothoracic NORS teams. However, the NORS Project Board felt that the Workstream should explore the joint (multi-organ) model in more detail, as this is the model used by most other international organ procurement organisations and is more efficient than mobilising two fully staffed stand-alone teams.
- **94.** The multi-organ model was discussed by the Workstream and some concern was raised on behalf of the cardiothoracic teams about sharing scrub teams, and whether

the scrub nurse would have the right skills and competencies to support both abdominal and cardiothoracic retrieval. The Lead Theatre Practitioner of the SORT (multi-organ) team reassured the group that the skills were transferrable and also suggested that standardisation of skills could be supported by a nationally agreed framework for training and competency.

- Discussion took place about whether 95. two abdominal surgeons and two cardiothoracic surgeons would be required in the joint model – it was suggested that two abdominal and two cardiothoracic surgeons would be needed for a DCD donor, whereas in the case of a DBD a single cardiothoracic surgeon can be assisted by other members of the theatre team. Despite proceeding cardiothoracic DCD retrievals making up only a small percentage of retrievals, it was felt that the impact of changing the model at this stage could limit opportunities for training and clinical competence. The group, therefore, recommended funding a lead and an assistant cardiothoracic surgeon, but suggested this be reviewed 12 months after implementation.
- **96.** The Review therefore recommends that **NORS moves to joint working arrangements, where there is provision for Standard (abdominal) retrieval and Extended (cardiothoracic) retrieval** and the Review duly recommends a model to meet the minimum staffing requirements (Figure 20).

Figure 20

Standard Team Model for Abdominal-Only Donors	Banding/Level	Total WTE
Surgical team		
Lead Surgeon – ABDO	Consultant/Speciality Doctor	5.33
Assistant Surgeon – ABDO	Speciality Trainee	5.33
Theatre team		
Scrub Nurse ABDO	AfC Band 5	5.33
Theatre practitioner ABDO	AfC Band 5/6	5.33

Extended Team Model for Multi-Organ Donors	Banding/Level	Total WTE
Surgical team		
Lead Surgeon – ABDO	Consultant/Speciality Doctor	5.33
Assistant Surgeon – ABDO	Speciality Trainee	5.33
Lead Surgeon – CT	Consultant/Speciality Doctor	5.33
Assistant Surgeon – CT	Speciality Trainee	5.33
Theatre team		
Scrub Nurse ABDO	AfC Band 5	5.33
Theatre practitioner ABDO	AfC Band 5/6	5.33
Theatre practitioner CT	AfC Band 5/6	5.33

Back Office Support	Banding/Level	Total WTE
Abdominal NORS Centre		
Admin/Audit ABDO	AfC Band 4	1.00
Management ABDO	AfC Band 8A	0.20
Finance ABDO	AfC Band 7	0.10
RCPOC/Retrieval coordinator on-call ABDO	AfC Band 7	0.67
Consultant (clinical lead/management) ABDO	Consultant	0.20

Back Office Support	Banding/Level	Total WTE
Cardiothoracic NORS Centre		
Admin/Audit CT	AfC Band 4	0.50
Management CT	AfC Band 8A	0.10
Finance CT	AfC Band 7	0.10
RCPOC/Retrieval coordinator on-call CT	AfC Band 7	0.33
Consultant (clinical lead/management) CT	Consultant	0.10

97. The Workforce Workstream discussed the requirement for a consultantdelivered service (a consultant is present at each retrieval), versus consultant-led (a consultant is responsible for leading the team, overseeing any governance issues and ensuring all team members are competent to safely retrieve organs). It was felt that a competent and certified lead surgeon should be present at each retrieval but this need not be a consultant.

- **98.** A review of the current service found that 75% of lead retrieval surgeons are not consultant grade. The Workstream felt that it was more important for the lead surgeon at every retrieval to be competent and certified, rather than basing this role on seniority, and pay should reflect their progress and stage in their career.
- **99.** The lead surgeon should be supported by an assistant surgeon to facilitate training in retrieval surgery.
- **100.** The Workstream also advised that a consultant-led service must ensure the clinical lead has protected time to carry out the clinical management role of the team (training/management of the workforce, and to oversee any governance issues).
- 101. Currently not every abdominal NORS team has an identified staff member who will perform perfusion of the organs (in these cases, perfusion is carried out by the SNOD). The group therefore felt that each standard theatre team should be funded for a Theatre Practitioner. The workstream recommended this be funded as a Band 5, but the Review Board increased this to a 5/6, on the understanding that this will be subject to further review. The Workstream acknowledged that in future, a business case would be submitted by NTOT to increase the banding to support new technologies (machine perfusion).
- **102.** A Theatre Practitioner would also be funded to support the cardiothoracic teams. The Theatre Practitioner may not be present at every retrieval unless there is a specific clinical need (such as to support machine perfusion of organs). However, the funding will cover those occasions when the post is required. There were also discussions about this role becoming interchangeable with the donor management role, should there be a recommendation to fund the scouts following the current pilot.
- **103.** The Workstream recognised that the scrub nurse performs an essential role in supporting the safe and efficient retrieval of organs, and

that sufficient workforce should be funded to support a rota 24 hours a day, 365 days a year. The banding of scrub nurses varies across teams and the Review Board were clear that jobs should be graded according to the job description, but indicative funding would be based on band 5.

- **104.** For the theatre team, the number of Whole Time Equivalents (WTE) required to staff a rota for 24 hours a day, 365 days a year, is 5.33 for each staff group.
- **105.** Administrative support was initially proposed to be 1.5 WTE for each abdominal team and 1.0 for each cardiothoracic team. However, on further consideration, this was reduced to 1.0 and 0.5 respectively. There will be further work undertaken to streamline processes, along with the national contract for transport and a block contract for consumables, which should reduce the amount of administrative resource teams need (see para's 130-134).
- **106.** The Workstream recommended protected management time for the NORS Clinical Lead should be 0.2 WTE for the Abdominal Lead and 0.1 WTE for the Cardiothoracic Lead.
- **107.** Operational Management time would reflect the protected time for the NORS Clinical Lead.
- **108.** Although NHSBT does not fund recipient coordinators, it was acknowledged that these post holders often undertake roles within the retrieval process over and above their core responsibilities and as such the Workstream recommended that some funding should be allocated to support this function.
- **109.** A medical staffing manager was consulted to sense check the theatre workforce assumptions, to ensure that there was sufficient staffing to run a full shift rota, including prospective cover. It was acknowledged that different grades/levels of seniority work can work to different types of rotas. Annex D provides indicative examples of full shift and partial shift rotas.

Commissioning for quality

- 110. In considering the commissioning arrangements, the issue of a single commissioner for retrieval and transplantation was raised on a number of occasions. Some felt that one commissioning pathway for the entire transplant and retrieval process might be optimal, providing better linkage between organ donation and transplantation. However, it was recognised that this may be difficult to achieve.
- 111. One commissioning pathway, bringing all funding under one umbrella to drive quality and focus on better patient outcomes, might reduce conflict between the different parts of the transplantation pathway, lower overheads, offer greater influence across the Health Departments and provide a more holistic approach to the transplant pathway. However, questions about how this would work across all four Health Departments were often raised.
- **112.** Risks around the potential loss of overall funding and expertise were articulated and there were concerns that if NHS England were to look to take the lead this could result in more fragmentation of the process, as transplantation sits in the Local Area Teams. And were NHSBT to take the lead, there were concerns about capacity and the difficulty of separating transplant from NHS England.

- **113.** In considering the commissioning options, the workstream looked at and consulted with individuals involved in services in the UK and internationally, both within the field of transplantation and beyond.
- 114. They looked at: Eurotransplant, US Transplant – Organ Procurement & Transplantation Network, United Network for Organ Sharing, Centers for Medicare & Medicaid Services – the Spanish and Australian transplantation services, the commissioning of the London Ambulance Service and the Paediatric Critical Care Transport/Retrieval Service Specification.
- **115.** NORS is unique, not only in that NHSBT commissions the service on behalf of the four UK Health Departments, but also in that the organisation has dedicated policy, commissioning and finance responsibility for delivery of an integrated UK wide service.
- **116.** In a system, where the NHS is organised differently in the four countries of the UK, it was difficult to see benefit in a change here. Nevertheless, NHSBT, NHS England and the National Health Authorities need to ensure a shared vision, which is jointly and consistently articulated to providers to implement TOT 2020, which is, of course, a four nation strategy.

- **117.** The commissioning workstream recognised the importance of the work by the workforce and capacity workstreams and saw it as important to establish a full activity picture for the whole of the UK service before commissioning decisions could be made.
- **118.** Irrespective of the ultimate capacity requirement though, their work identified two key funding options:
 - Pay for availability
 - or pay for activity.
- **119.** Both options they felt should be calculated from a zero base, to ensure transparency and equity and to eradicate concerns raised by some teams around the current remuneration structure.
- **120.** The workstream also discussed a perretrieval tariff, but considering the nature of the service, which is not elective plannable but an emergency service, they felt establishing a rate for either availability or activity would be preferable. Also, with better coordination of activity this should effectively establish a tariff.

Availability

121. Paying for availability would involve establishing an agreed annual rate and adjusting this pro rata against time on-call.

Activity

- **122.** An activity based approach would involve a block contract for a pre-agreed number of retrievals against the service specification, with an annual adjustment relating to actual retrieval attendances at year end.
- 123. Of the two key funding options, the workstream felt that the availability route was preferable. On-call frequency could be 1:1 or 1:2 or 1:3 and both providers and commissioners would have clarity around participation at any given time. It also fits in with the current service model and offers potential for more collaborative working going forward teams could share the rota or collaborate more closely as one team to provide 100% of the contracted time.
- 124. Therefore, the Review recommends that future commissioning arrangements are based on the provider's participation in an annual NORS rota.
- **125.** The commissioning, contracting and funding arrangements should be fair, transparent, equitable and consistent for NORS teams across the UK, paying teams for their time on call in the UK service.
- **126.** The model presented by the workforce workstream has been costed (Figure 21) and we suggest NHSBT contract using this recommended model. It was noted that, in the unlikely event that redundancies are unavoidable these would be undertaken following normal NHS guidelines.

Figure 21

Costed Workforce for Abdominal Team	Banding/Level	Cost for 24/7/365 £
Surgical team		
Lead Surgeon – ABDO	Consultant/Speciality Doctor	501,660
Assistant Surgeon – ABDO	Speciality Trainee	396,933
Theatre team		
Scrub Nurse ABDO	AfC Band 5	165,327
Theatre practitioner ABDO	AfC Band 5/6	186,007
Total cost of abdominal surgical team		1,249,927

Back Office Support	Banding/Level	Cost for 24/7/365 £
Abdominal NORS Centre		
Admin/Audit ABDO	AfC Band 4	25,798
Management ABDO	AfC Band 8A	10,956
Finance ABDO	AfC Band 7	4,442
RCPOC/Retrieval coordinator on-call ABDO	AfC Band 7	29,761
Consultant (clinical lead/management) ABDO	Consultant	22,566
Total cost of abdominal back office support	93,522	
24/7/365 CONTRACT VALUE – ABDOMINAL NORS CEN	1,343,449	

Costed Workforce for Cardiothoracic Team	Banding/Level	Cost for 24/7/365 £
Surgical team		
Lead Surgeon – CT	Consultant/Speciality Doctor	501,660
Assistant Surgeon – CT	Speciality Trainee	396,933
Theatre team		
Theatre practitioner CT	AfC Band 5/6	186,007
Total cost of cardiothoracic surgical team	1,084,600	

Back Office Support	Banding/Level	Cost for 24/7/365 £
Cardiothoracic NORS Centre		
Admin/Audit CT	AfC Band 4	12,899
Management CT	AfC Band 8A	5,478
Finance CT	AfC Band 7	4,442
RCPOC/Retrieval coordinator on-call CT	AfC Band 7	14,659
Consultant (clinical lead/management) CT	Consultant	11,283
Total cost of cardiothoracic back office support	48,760	
24/7/365 CONTRACT VALUE – CARDIOTHORACIC NOR	1,133,360	

*NB – these costs reflect any NORS team on-call for 365 days of the year. Centres will be funded for the time they are contracted to be on-call. For example, if two centres share a week-on/week-off rota, they will receive 50% of the costs outlined above (£671,725 for an abdominal team, £566,680 for a cardiothoracic team)

- 127. The Review is not recommending a specific rota, it will be for NHSBT to decide on what that looks like and how best to take forward implementation. However, our data suggest 3-4 cardiothoracic teams on call, at any given time, rising to 4-5 in 2019/20 and 6-7 abdominal teams on call, at any given time, rising to 8-9 in 2019/20. Any increase would need to be justified as a result of increased activity and we further reference Review Recommendations 1,2,3,4 and 5.
- **128.** The criteria for any retrieval scenarios outside of and/or exceptions to the on-call contractual arrangements should be pre-determined and pre-approved with advice provided to the Organ Donation and Transplantation (ODT) Senior Management Team (SMT) by the National Retrieval Group (NRG).
- **129.** Further consideration should also be given to the establishment of a tariff for any NORS team not on rota. Should there be exceptional circumstances, which result in no on rota team being available, providers who can muster a team, should be able to participate, with appropriate remuneration.
- **130.** Currently each NORS centre is paid a tariff for each donor they attend to cover the cost of retrieval consumables (including instruments, drugs and fluids); different tariffs are paid depending on whether the retrieval was proceeding or non-proceeding, and which organs were consented for donation. The teams are sent a list of all retrievals on a quarterly basis and asked to inform NHSBT of any discrepancies.
- 131. The Review recommends that reimbursement for consumables, instruments and disposables is moved to a block contract. This should reduce the administrative burden to the providers.
- **132.** For any transport, NORS teams are reimbursed for travel associated with taking the team from their base to the donor hospital, and the return journey back to

base. They are also reimbursed for transport of unaccompanied organs. Each quarter the NORS teams are asked to submit a breakdown of their costs for each retrieval, highlighting whether the transport was for the team only, for team and organ, or for organ only. Each journey must be linked to a donor identification number for audit purposes.

- 133. Currently, all NORS teams hold their own contracts with a number of individual transport providers, invoicing NHSBT for reimbursement of cost. This adds additional requirements for audit trail and there is variability on costs incurred between teams.
- 134. The Review recommends that there is a move to a central provision and management of retrieval team transport and that, in particular, a review of use of flights is undertaken to ensure more effective use.
- 135. NHSBT has recently undertaken a new tender for their own contract for transport of SNOD and unaccompanied organs. A new lot was added to this transport tender: NORS team transport, providing NORS teams with the ability to draw down on a central contract for team transportation. Even if teams continued to make their own arrangements in future, they would be reimbursed at the negotiated rate for the NHSBT contract. This lot will take time to mature, as all teams have contracts with their own providers of varying lengths.
- **136.** With the right process and systems in place the management of the service can focus on:
 - Quality and better clinical outcomes
 - Increasing donor organ utilisation and more successful transplants
 - And fostering a culture of openness, feedback and accountability a move to shared learning and development.

The future service requirements

- **137.** The Future Service Requirements Workstream looked at the current NORS contract and Service Requirements. The Workstream also considered the views and comments from across the transplantation pathway and came to the following conclusions and the Review advises that NHSBT takes account of these conclusions when considering and articulating its future service requirements for NORS.
- **138.** The NORS Contract and Service Requirements need to be clear so that both providers and commissioners have a common understanding of the commissioned service.
- **139.** The Contract, Service Requirements and funding should be fair, transparent, equitable and consistent for NORS teams across the UK. There must, however, be some flexibility to accommodate unforeseen or changing circumstances.
- 140. It must be clear and transparent which services are within the scope of the Contract (and thus will be covered by the funding provided), and which services are out with the scope of the Contract (and accordingly are not funded by the NORS commissioner(s)).
- 141. The minimum resource requirements for an effective NORS service should be built into the contract. This includes the minimum requirement for the composition and competencies of a NORS team.

- **142.** A proactive contract management approach is required which identifies and resolves issues quickly. That approach should focus on, and provide support for, constant improvement.
- **143.** All NORS providers must have an agreed, signed contract before receiving any funding for NORS and the provisions regarding termination of the Contract by either party, and transitional arrangements, should be clearly set out and understood by both parties.
- 144. Fundamentally, the Service Requirements should emphasise that NORS is a UK wide service, with the same standards and requirements expected of teams across all four countries, so that the quality of the service is universal, and the outcome is not influenced by which NORS team retrieved the organ(s).
- 145. Accordingly, the Review recommends that the focus of the Future Service Requirements be on achieving a high quality service, and the quality of the organs retrieved, to support an increase in the number of patients successfully transplanted.
- 146. We also heard much about communication. There would appear to be a need for better communication between and within NORS teams, between providers and commissioners, between NORS teams, SNODS and donor hospitals, and between NORS teams and transplantation units. The Service Requirements should encourage and support more consistent sharing of information between the various parties.

- 147. The Review recommends that the Future Service Requirements encourage and support more, and better, communication and sharing of information across all parties involved in the donation, retrieval and transplantation pathway. In particular, the Review supports the work, currently underway at NHSBT, looking at electronic reporting of retrieval data.
- **148.** The Service Requirements should also allow for and accommodate changing roles e.g. Scouts and/or donor practitioners, enhancement/extension of the teams role in donor assessment and the development of novel technologies.
- 149. The Review recommends that the Future Service Requirements are flexible and adaptable to ensure that NHSBT is able to look at the further development of the NORS in the future.
- **150.** One issue around the current service specification and the KPIs, which was frequently raised, was the 1hr muster time. The KPI, which stipulates that a NORS Team must be able to mobilise within one hour of request by a SNOD was singled out by NORS Teams as the Service Requirement which caused them the most difficulty.
- **151.** Investigating this further, the Review felt that the issue was not necessarily the time, but how the KPI was being interpreted and applied, which appeared to vary. Certainly, any relaxation of this KPI would be seen by many, in particular the donation community, as being backwards step.
- **152.** However, the Review would suggest that this particular KPI is looked at and considers that it should be about any on-call team's ability to leave within the hour, should the circumstances necessitate, for example, if the donor is unstable. The mobilisation time must be negotiated, taking into consideration travel time, family wishes, complex recipients and planned theatre time.

- **153.** The Service Requirements should also drive a quality cycle, which includes documentation regarding the retrieval process, organ abnormalities and surgical injury available at the time of offering, which would be ratified by the transplant team.
- **154.** To date, NORS teams have been operational due to the participation of experienced transplant surgeons. The National Retrieval Group (NRG) has identified the need for certified training and accreditation of organ retrieval surgery for transplantation.
- 155. Knowledge, skills and good communication are crucial for high quality retrieval of donor organs. Therefore it is necessary to provide training for those surgeons entering the field of donation and transplantation. A training system that underpins continuing education will guarantee high technical quality, reduce the discard rate of organs, improve organ viability and establish regional expertise in donor surgery.
- **156.** The Review recommends that **the Future Service Requirements ensure training** with certification and availability of all functions required for NORS teams and that the current KPIs are revised in order to focus on process, quality and outcomes.
- **157.** The expectation would be that should a donor fulfil the relevant criteria, a NORS team should mobilise to further assess and recover the organs. With the development of novel technologies, we anticipate there will be further refinement of assessment and organ acceptance criteria, and other aspects of NORS, and the Service Requirements must be flexible enough to accommodate such changes.
- **158.** The Review recommends that **the solid organ advisory groups, in consultation with their communities, produce guidance on pre-determined categories, with well-defined criteria, within which it would be expected that organs would be retrieved.**

The Future – a forward look

- **159.** Building a responsive adaptable service is vital. The ability to trial innovative approaches in delivering improvements in the quality, safety and outcomes of the NORS and transplantation more widely should be supported.
- 160. The review acknowledges the work of NTOT, which identified a number of novel technologies that are likely to have a significant impact on the transplantation pathway. Several of these technologies are currently undergoing evaluation and it is expected that they will translate into clinical practice. Some of these will impact on the retrieval process, funding and training and therefore, NORS should be flexible to accommodate these developments and the changes in the retrieval process.
- **161.** Other novel initiatives such as the Scout project, may lead to a higher proportion of donated hearts retrieved and transplanted, in comparison to cardiac donors who are managed without direct CT input. Such initiative should be supported and explored further.
- **162.** This would clearly have an impact on the NORS service, so the contract needs to be flexible enough to support innovation and introduce changes to the service, following successful trials. The way in which service developments are to be handled needs to be clear.
- **163.** The Review recommends that **the Novel Technologies in Organ Transplantation** working party evolves into an advisory group for NHSBT that brings together stakeholders and commissioners and explores the role of novel technologies and innovative approaches to increase organ recovery and transplantation rates.

- 164. We see this as a valuable forum for commissioners, clinicians and teams to discuss, review and evaluate novel technologies and other potential developments and make recommendations regarding the impact on UK organ donation and transplantation.
- **165.** The focus should remain on how many transplants may result from use of novel technologies, the quality of organs for transplantation and what the cost implications are.

Measuring Success

- **166.** As we look forward, we need to have in mind what success would look like. From a NORS Team perspective, this might be:
 - Confidence that the resource required to participate matches activity
 - Transparent, fair, equitable funding
 - Better communication
 - A sensible use of resources allocated e.g. minimising waits at donor hospitals.
- **167.** From a donor hospital perspective, they care about:
 - What time the NORS team arrive and the length of the procedure
 - What impact the team have on the donor hospital's service
 - How the members of the team behave
 - If the visiting team do their job to a high quality
 - And as a result of that retrieval, will the next one be easier or harder.
- **168.** And from a transplant centres' perspective, they want:
 - Quality organs
 - More successful transplants
 - Timely, accurate, more effective communication.

- **169.** So for NHSBT, who commission the services on behalf of the wider transplant pathway, they need:
 - A high quality, flexible and adaptable service that ensures no donors are missed due to the unavailability of a NORS Team
 - Support from the UK Health Departments and from the professional groups involved in donation and transplantation
 - To be able to demonstrate the services vital contribution and value for money.
- 170. The Review recommends that a biannual Audit of a representative number of procedures is conducted, to ask stakeholders to comment on their perceptions of how the system works.
- 171. This should not only include the behaviour of the NORS teams during retrieval, but also SNOD management and communication as well as other aspects to be improved, including responses from receiving/ transplanting hospitals and teams.

Conclusion

- 172. Throughout the Review we have worked with a wide range of people – providers and managers at local, regional and national levels in the NHS, the Health Departments across the UK, and outside, at both operational and strategic levels. They have contributed enormously to our work and we should like to thank them all.
- **173.** In Taking Organ Transplantation to 2020, NHSBT has set out a vision for the next few years. It is clear that moving forward we need change if NORS is to continue to support the needs of the donation and transplant community and to make its contribution to meeting the targets.
- **174.** We need to ensure that we have a National Organ Retrieval Service with the skills, ability, capacity and willingness to deliver against the wider objectives set out in TOT 2020 and we hope that the recommendations in this report will ensure that NORS can continue to play its vital part on behalf of the 7000 people on the transplant waiting list.
Annex A: National Organ Retrieval Service (NORS) Review Terms of Reference (ToR)

The NORS Review is being conducted for NHSBT, as a timely review of service provision.

Aim and objectives

- The aim of the Review is to benchmark current service provision, identify any gaps or shortfalls and make recommendations in line with the following principles:
 - Equity and timeliness of access to a retrieval team for all potential donors whilst acknowledging geographical challenges
 - Sufficient flexibility to cope with peaks/ troughs in activity
 - High quality and cost effective
 - Ability to cope with projected future activity levels
- The Review Board will be composed of senior representatives drawn from the profession and the NHS system, providers and commissioners and will include lay representation
- The Board will evaluate the effectiveness of the current NORS provision and make recommendations, with due regard to advances in technology, in a report to ensure the future provision of a quality service across the UK.

Remit

 The Board's remit is to drive and steer the Review - adhering to agreed timescales for delivery, - bringing in expert knowledge and advice as necessary, in order to make recommendations with due consideration of the overall impact of any suggested changes, their interdependencies and associated collateral effects.

To achieve these objectives the board will:

- provide strategic oversight and governance to the Review and its outputs
- ensure appropriate experts are consulted and data used to inform the Review
- define the areas for discussion, the processes to be scrutinised and the overall coverage
- commission working "subgroups" as required to undertake detailed work on specific areas for exploration
- deliver an in-depth report on the current circumstances, where areas for improvement have been identified and what recommendations the Review advises NHSBT make in terms of service reform
- take a broad view of the service and consider it as part of a larger system.

Governance



Board Membership

- Chair: Kathleen Preston
- Review Manager: Daniel Gosling
- James Neuberger: Associate Medical Director, NHSBT
- Rutger Ploeg: National Clinical lead for Organ Retrieval, NHSBT
- Karen Quinn: Accountable Executive and Assistant Director UK Commissioning, NHSBT
- Bimbi Fernando: British Transplantation Society
- Argyro Zoumprouli: CLOD / Intensivist and National Organ Donation Committee
- Triona Norman: Department of Health England
- Veronica Gillen and Dr Diane Corrigan: Northern Ireland Health & Social Care Board and the Public Health Agency of Northern Ireland
- Mike Winter: Scottish Health Department and NSD Commissioning representative

- David Hayburn: Welsh Health Specialised Services Committee
- David Nix: Donor Family Network
- Tracey Baker: Provider Management Representative
- Sarah Watson: NHS England
- Magdy Attia: NORS Lead abdominal
- Stephen Clark: NORS Lead cardiothoracic.

Review Team

NHSBT Accountable Executive – Karen Quinn: Assistant Director UK Commissioning

Core Team – Daniel Gosling: Review Manager, Emma Billingham: Senior Commissioning Manager, Roberto Cacciola: Associate National Clinical Lead for Organ Retrieval, Lisa Drakett, Laura Fenn and Trudy Monday: Shared administrative support.

Additional resource – Communication support, Finance support, Human Tissue Authority (HTA) compliance, Statistical support, Subject Matter Experts.

Annex B: Our approach – methodology

The Review commissioned four workstreams to help carry out its task.

- Capacity
- Workforce

- Commissioning
- Future Service Requirements

The workstream aims, objectives and membership of the groups are as below. Additionally, the Review Chair and Review Manager visited all NORS Teams, we held two stakeholder Challenge Events, sent out a survey and attended a wide range of national and local meeting across donation and transplantation and invited direct submissions.

Workstream One: Capacity

Workstream lead: Chris Callaghan (Consultant Transplant and Vascular Access Surgeon).

1. Working Group membership:

Daniel Gosling – NORS Review Manager

Aaron Powell- Transplant Support Services, NHSBT

Susan Richards – Regional Manager, NHSBT

Karen Quinn – Assistant Director UK Commissioning, NHSBT

Michael Faluyi – Financial Analyst, NHSBT

Sally Rushton – Statistics and Clinical Studies, NHSBT

Rajamiyer Venkateswaran – Consultant Cardiac Surgeon, Manchester

Laura Hontoria del Hoyo – Assistant Director of Strategic Business Transformation Blood Supply, NHSBT 2. Aim:

To look at the configuration and capacity of the current NORS provision and consider its ability to deliver the expected increase in demand and provide a written report to the Chair of the Review Board, which makes recommendations as to whether the current service configuration might need to change if NHSBT is to deliver its 2020 strategy.

3. Objectives:

- **3.1.** To model the current service configuration against NHSBT's 2020 strategy and to evaluate its ability to deliver the organisation's vision.
- **3.2.** To consider a broad range of delivery models and provide appraised options for alternative service configuration and/or management.

Workstream Two: Workforce

Workstream lead: Roberto Cacciola (Consultant Transplant Surgeon).

1. Working Group membership:

Daniel Gosling – NORS Review Manager

Phil Walton and Karen Morgan – Regional Manager South Wales and South West, NHSBT

Helen Tincknell – Lead Nurse Recipient Co-ordination, NHSBT

John Stirling – Lead Theatre Practitioner, Scottish Organ Retrieval Team

Michael Faluyi – Financial Analyst, NHSBT

Diane Goodwin – Transplant Directorate Manager, Papworth Hospital

Magdy Attia – Clinical Lead for Transplantation, St James's Hospital

Stephen Clark – Director of Cardiopulmonary Transplantation, Freeman Hospital

Emma Billingham – Senior Commissioning Manager, NHSBT

2. Aim:

To review the current workforce and staffing arrangements relating to the overall provision of NORS and to provide a written report to the Chair of the Review Board, which makes recommendations as to how working practice might need to change if NHSBT is to deliver its 2020 strategy.

3. Objectives:

- **3.1.** To benchmark the current UK service, exploring variability.
- **3.2.** To consider the minimum workforce requirement to deliver a 24/7 service, taking into account projected future demand.

Workstream Three: Commissioning (including funding)

Workstream Lead: Tracy Baker (Transplant & Divisional Support Manager, Harefield Hospital).

1. Working Group membership:

Daniel Gosling – NORS Review Manager

Karen Quinn – Assistant Director UK Commissioning, NHSBT

Mike Winter – Medical Director, NHS National Services Scotland

Nesta Hawker – Regional Programme of Care Manager, Internal Medicine (North), NHS England

Emma Billingham – Senior Commissioning Manager , NHSBT

Triona Norman – Policy Lead for Organ Donation & Tissue, Department of Health,

Dave Metcalf – Divisional Finance Director, NHSBT

2. Aim:

To review the current commissioning model and provide a written report to the Chair of the Review Board, which makes recommendations as to how practice might need to be changed to enable the service to deliver against NHSBT's 2020 strategy.

3. Objectives:

- **3.1.** Consider whether the current performance criteria are fit for purpose.
- **3.2.** In light of the findings from the workforce and capacity workstreams, consider the range of commissioning and funding models, which will enable the service to deliver against NHSBT's 2020 strategy.
- **3.3.** To advise how best we ensure there is a commissioning model which reflects the future requirements.

Workstream Four: Future Service Requirements

Workstream Lead: Kathleen Preston (NORS Review Chair) and Gabriel Oniscu (Consultant Transplant Surgeon, Royal Infirmary of Edinburgh).

1. Working Group membership:

Daniel Gosling – NORS Review Manager

Rutger Ploeg – National Clinical Lead for Organ Retrieval, NHSBT

Claire Williment – Head of Transplantation Development, NHSBT

Emma Billingham – Senior Commissioning Manager, NHSBT

Bimbi Fernando – Consultant Transplant Surgeon, Royal Free Hospital

Colin Wilson – Consultant Hepatobiliary Surgeon, Newcastle NHS Foundation Trust

2. Aim:

Based on the outcomes of the workforce, capacity and commissioning workstreams, and in light of the original principles of NORS, consider what amendments and/ or improvements NHSBT needs to make to the way in which it articulates its service requirements to enable NORS to support the organisation in delivering its 2020 strategy.

3. Objectives:

- **3.1.** To explore both NHSBT and the NORS teams' understanding of the current service requirements, highlighting variation where found.
- **3.2.** To evaluate the current service requirements against the findings of the workforce, capacity and commissioning workstreams, identifying areas for improved clarity.
- **3.3.** To advise how best the service requirements are developed, articulated and managed in the future to ensure the future service configuration has sufficent capacity and flexibility to embrace new technology as appropriate.

Annex C: NORS review capacity workstream

Modelling different configurations of the National Organ Retrieval Service with current and projected retrieval activity

Summary

This report describes the modelling work that has been undertaken to evaluate the National Organ Retrieval Service (NORS). The work has been done by Laura Hontoria del Hoyo, Assistant Director of Strategic Business Transformation Blood Supply at NHS Blood and Transplant (NHSBT), and Sally Rushton, Statistician at NHSBT.

A mathematical simulation model was built in Microsoft Excel 2010 to simulate different configurations of the NORS. A dataset of actual proceeding and non-proceeding (PNP) donors attended by a NORS team between 1 April 2013 and 31 March 2014 and a simulated dataset of projected future PNP donors attended by a NORS team between 1 April 2019 and 31 March 2020 were used for this purpose. These datasets are summarised in **Figure 1**. If the aims of the Taking Organ Transplantation to 2020 NHSBT strategy are met, and the patterns of donors is similar to that previously experienced in the UK, we can expect roughly a 45% increase in the annual number of PNP donors and an increase in the mean number of PNP donors per day from 4.8 to 6.8.



At an individual team level, if the current NORS configuration is maintained and teams are allocated to demand on a closest-first basis, the modelling exercise estimated an increase in the average annual number of abdominal NORS team attendances from approximately 250 to 350. For cardiothoracic NORS teams this expected increase is from an average of approximately 90 to 130 attendances per year. The proportion of days spent attending at least



one donor increases from an average of 53% to 68% for abdominal NORS teams, and from 24% to 32% for cardiothoracic NORS teams. If there are no changes in the proportion of non-proceeding donors we can expect an overall increase in non-proceeding abdominal NORS team attendances from approximately 420 to 640, and for cardiothoracic NORS team attendances, from approximately 230 to 330.

Figure 1: Current (2013/14) and possible future (2019/20) retrieval demand.

The modelling suggests that while 6-7 abdominal NORS teams are sufficient to cover current demand, there would be no team immediately available for a small number of PNP donors if the expected increase in activity in 2019/20 is realised and so, 8-9 abdominal NORS teams are likely to better meet demand. For cardiothoracic NORS teams, 3-4 teams are sufficient to cover current demand while 4-5 teams are more likely to be required in future.

Data and methods

A mathematical simulation model was built in Microsoft Excel 2010 to simulate different configurations of the NORS. The model uses a dataset of retrieval demand and a matrix of the time taken to travel between each NORS team base and the location of the demand and assigns NORS teams to the demand under different conditions. The dataset of demand comprises all proceeding and non-proceeding (PNP) donors attended by a NORS team in the UK within a one year period. Two datasets of demand were considered; one representing the current demand and one representing the expected demand in the future if the Taking Organ Transplantation to 2020 (TOT2020) NHSBT strategic objectives are met.

Current demand

All PNP donors attended by a NORS team between 1 April 2013 and 31 March 2014. This dataset is based on actual attendances reported to NHSBT and is summarised in **Table 1**. Donors that were attended by local retrieval teams were excluded.

Future demand

A simulated dataset of all PNP donors attended by a NORS team between 1 April 2019 and 31 March 2020. This dataset is based on projected figures for consented DBD and DCD donors at each trust/board in the UK in 2019/20 that were estimated for the SN-OD Workforce Design Project. Key rates that were observed in the 2013/14 data were used to convert the projected consent figures into numbers of NORS attended donors, for DBD and DCD separately. A list of the main assumptions used is shown in Appendix I and a demonstration of the method for a particular trust/board is shown in Appendix II. It was necessary for donors to be assigned to hospitals rather than trusts/boards so an explanation of how this conversion was made is shown below Appendix II. The resulting dataset is summarised in Table 1.

Time period	No. proceeding and non- proceeding donors	No. attended by an abdominal team	No. proceeding abdominal donors	No. attended by a cardiothoracic team	No. proceeding cardiothoracic donors
2013/14 (current demand)	1732	1728 (99.8%)	1311 (75.7%)	565 (32.6%)	339 (60.0%)
2019/20 (future demand)	2507	2500 (99.7%)	1864 (74.6%)	808 (32.2%)	480 (59.4%)

Table 1: Summary of retrieval activity data used in NORS modelling.

Appendices IV-VI show the location and density of the current and future retrieval demand, split by abdominal and cardiothoracic team activity. The areas of high density are similar in the two datasets as expected.

In the model, the rule by which a team is assigned to a donor is simply to assign the team who can get there quickest and, if they are busy, assign the second closest team, and so on. The travel times between each NORS team base and each donor hospital are based on those extracted from Google Maps in April 2013. A few adjustments were made to these times in instances where data reported to NHSBT showed that a team could get to a particular donor hospital much quicker than the Google Maps time suggested (i.e. by flying to Northern Ireland and the Channel Islands). A team is classed as busy if they had been assigned to a previous donor and they are still attending that donor. However, a team can be assigned to a new donor within the last hour of any previous donor attendance that overlaps with the arrival of the new donor. This does not affect the time involved in either attendance, i.e. both durations are counted in full. The model does not consider whether time can be saved by the team doing back-to-back attendances.

The time involved in an attendance is made up of three parts:

- a 10 minute muster time (the median duration between a team's agreed departure time and their actual departure time as observed in the 2013/14 data)
- 2. the travel time there and back and
- 3. the theatre time.

When modelling the 2013/14 activity the actual theatre time is used, that is, the observed time between the team arriving at the donor theatre and the team leaving the donor theatre (regardless of whether organ retrieval occurred). It is possible that the theatre time is dependent on the team that attends, however it is assumed that it is more heavily dependent on the type of team (abdominal/cardiothoracic), the type of donor (DBD/DCD) and whether the team retrieved any organs or not (proceeding/non-proceeding). For the 2019/20 projected activity the theatre times were sampled from two years' worth of historic NORS data where the sampling process was dependent on these three key factors.

It was also necessary to simulate arrival dates and times of PNP donors in 2019/20. This was done by sampling from historic date/times over the last two years of NORS activity. The date/times were adjusted so that they fell within the window 1 April 2019 to 31 March 2020, while maintaining the day of the week. **Appendix VII** presents heatmaps of donor arrivals during 2013/14 and during 2019/20. The heatmaps are similar which suggests that the sampling was appropriate. The model does not consider any restrictions on which team can attend which donor, so in this sense it assumes all abdominal teams can retrieve kidneys, livers and pancreases and all cardiothoracic teams can retrieve lungs and hearts, from both DBD and DCD donors. It also does not consider the small number of small bowel donors and special paediatric donor retrievals per year.

The model allows retrieval teams to be presents or not present when running a simulation. Teams A-G represent the six current abdominal teams that are on call at any given moment, plus the Scottish multi-organ team, where A, D and F are 'joint teams' that each comprise more than one individual centre. When the 10 teams, A-J, are used, this represents a scenario in which the three 'joint teams' have each been separated out to operate as independent 24 hours a day/365 days a year on call teams. Teams K-P represent the five current cardiothoracic teams, plus the Scottish multi-organ team. Note that the Scottish multi-organ team is considered to comprise two independent teams, one for abdominal retrieval and one for cardiothoracic retrieval.

An idea of the level of scouting activity required is reflected in the model. For every DBD cardiothoracic team attendance it was assumed that a scout attended 33% additional proceeding/non-proceeding donors, as it was observed in the Phase I Scout Pilot data that 75% of scout attendances were attended by the complete NORS team. Every scout attendance was assumed to last 11 hours as this was the median duration between time of arrival of scout at ICU and time of departure of scout from donor hospital back to NORS base, as reported via the Phase I Scout Pilot Data Collection Form. The scout was assumed to work independently of the NORS teams and vice versa.

Results

The model allows some of the assumptions described above, such as the muster time and the one hour permissible overlap, to be altered when running different model configurations, but for the purposes of the results below they were fixed as described above.

The model was run initially with the configuration that is currently in place, i.e. with abdominal teams A-G and cardiothoracic teams K-P. and with both current and future donor activity. Comparisons with 'control data' were made by comparing 2013/14 simulated results with what actually occurred in that year and by comparing 2019/20 simulated results with what we might expect to occur if the current on-call attendance sequence is used rather than allocating teams based on shortest travel times according to Google Maps. For all other configurations, e.g. the 10 abdominal team scenario and scenarios where teams have been removed, there is no comparison with control data. Teams with low activity were removed from the model, sequentially, and the effects of these changes on key metrics were observed. The keys metrics were:

- Number of attendances
- Proportion of days in the year with at least one attendance
- Proportion of times travel exceeds 3 hours (one way)
- Distribution of travel times (one way)
- Distribution of number of attendances per day

The remainder of this section looks at different model configurations for both 2013/14 and 2019/20 activity. The results based on 2013/14 activity are summarised in **Table 2** and shown in more detail on pages 11 to 19 and the results based on 2019/20 activity are summarised in **Table 3** and shown in more detail on pages 21 to 29. There are many different possible model configurations and these results just represent a small proportion of these.

The results of the scout simulation showed that the number of whole time equivalents required to carry out the estimated scouting activity in 2013/14 and 2019/20 was 3.80 and 5.2, respectively.

odel
Ĕ
4
7
\sim
5
3
from
lts.
resu
of
Summary
ä
Table :

				Summary across teams		
Activity type and page reference	Number of teams	Number of attendances	Number of donors missed	Proportion of days in the year with at least one attendance	Proportion of times travel exceeds 3 hours	Distribution of number of attendances per day
<u>2013/14</u> ABDOMINAL activity PAGE 44	7 (3 of which joint)	Ranges between 135 and 339 Actual team activity in 2013/14 is generally similar but Team C's activity was substantially lower and Team F's activity substantially higher in reality (due to their geodraphical locations)	2 0 in actual team activity	33%-69% 34%-67% in actual team activity	1%-9% 3%-12% in actual team activity	<22% days teams attend more than one donor <21% days teams attend more than one donor in actual activity (not shown below)
<u>2013/14</u> ABDOMINAL activity PAGE 45	6 (3 of which joint)	Ranges between 217 and 343	0	49%-70%	2%-12%	<23% days teams attend more than one donor
2013/14 ABDOMINAL activity PAGE 46	10	Ranges between 122 and 266	0	31%-60%	0%-5%	<14% days teams attend more than one donor
2013/14 ABDOMINAL activity PAGE 47	ω	Ranges between 158 and 319	0	37%-68%	1%-13%	<19% days teams attend more than one donor
2013/14 ABDOMINAL activity PAGE 48	7	Ranges between 187 and 341		42%-71%	1%-14%	<22% days teams attend more than one donor
2013/14 ABDOMINAL activity PAGE 49	9	Ranges between 203 and 349	7	47%-72%	2%-13%	<23% days teams attend more than one donor
2013/14 CARDIOTHORACIC activity PAGE 50	٥	Ranges between 57 and 170 Actual team activity in 2013/14 is generally similar but Team O's activity was substantially higher in reality	0 <i>0 in actual</i> team activity	15%-41% <i>15%-36% in actual</i> team activity	1%-12% 4%-15% in actual team activity	 <5% days teams attend more than one donor <6% days teams attend more than one donor in actual activity (not shown below)
2013/14 CARDIOTHORACIC activity PAGE 51	m	Ranges between 149 and 212	5	36%-50%	6%-16%	<9% days teams attend more than one donor
2013/14 CARDIOTHORACIC activity PAGE 52	3 (alternative)	Ranges between 132 and 222	7	32%-52%	9%-27%	<10% days teams attend more than one donor



2013/14 ABDOMINAL activity, 7 teams (where A, D and F are 'joint teams')

44







2013/14 ABDOMINAL activity, 10 teams

46







2013/14 ABDOMINAL activity, 6 teams



2013/14 CARDIOTHORACIC activity, 6 teams

50





2013/14 CARDIOTHORACIC activity, 3 teams (alternative)

model.
20
6
201
from
ults
resi
q
Summary
ö
Table

				Summary across teams		
Activity type and page reference	Number of teams	Number of attendances	Number of donors missed	Proportion of days in the year with at least one attendance	Proportion of times travel exceeds 3 hours	Distribution of number of attendances per day
2019/20 ABDOMINAL activity	7 (3 of which	Ranges between 161 and 468	24	39%-84%	3%-9%	<40% days teams attend more
PAGE 54	Joint)	Control data for 2019/20 (see page reference for explanation) are generally similar with the largest difference seen in Team F, whose activity is higher when teams are allocation via the current attendance sequence	27 in control data	34%-84% in control data	3%-11% in control data	than one donor <41% days teams attend more than one donor in control data (not shown below)
2019/20 ABDOMINAL activity PAGE 55	10	Ranges between 135 and 360	1	33%-70%	0%-5%	<27% days teams attend more than one donor
<u>2019/20</u> ABDOMINAL activity PAGF 56	<u>б</u>	Ranges between 181 and 360	m	41%-70%	0%-12%	<27% days teams attend more than one donor
2019/20 ABDOMINAL activity PAGE 57	œ	Ranges between 242 and 380	10	54%-73%	2%-12%	<29% days teams attend more than one donor
<u>2019/20</u> ABDOMINAL activity PAGE 58	7	Ranges between 301 and 419	27	65%-81%	1%-13%	<31% days teams attend more than one donor
<u>2019/20</u> CARDIOTHORACIC activity PAGE 59	۵	Ranges between 46 and 242 Control data for 2019/20 (see page reference for explanation) are similar except for Team L and O whose activity is quite different when teams are allocation via the current attendance sequence	0 <i>0 in control</i> data	12%-52% 12%-46% in control data	0%-7% in control data	 <15% days teams attend more than one donor <8% days teams attend more than one donor in control data (not shown below)
2019/20 CARDIOTHORACIC activity PAGE 60	4	Ranges between 119 and 277	4	28%-57%	0%-15%	<19% days teams attend more than one donor
2019/20 CARDIOTHORACIC activity PAGE 61	ſ	Ranges between 174 and 306	25	41%-64%	4%-28%	<20% days teams attend more than one donor
2019/20 CARDIOTHORACIC activity PAGE 62	3 (alternative)	Ranges between 157 and 329	18	36%-68%	5%-47%	<21% days teams attend more than one donor



2019/20 ABDOMINAL activity, 7 teams (where A, D and F are 'joint teams')







2019/20 ABDOMINAL activity, 9 teams







2019/20 ABDOMINAL activity, 7 teams



2019/20 CARDIOTHORACIC activity, 6 teams









2019/20 CARDIOTHORACIC activity, 3 teams (alternative)

62

Appendix

Appendix I: Key assumptions used for 2019/20 dataset.

- Consent rate targets of 82.0% for DBD donors and 78.0% for DCD donors are achieved, in line with the NHSBT TOT2020 Strategy.
- Conversion from consented to NORS attended is 94.5% for DBDs and 90.0% for DCDs.
- Proportion of NORS attended that were attended by an abdominal team is 99.9% for DBDs and 99.7% for DCDs.
- Proportion of NORS attended that were attended by a cardiothoracic team is 54.1% for DBDs and 14.3% for DCDs.
- Conversion rate from abdominal team attended to proceeding is 97.7% for DBDs and 57.0% for DCDs.
- Conversion rate from cardiothoracic team attended to proceeding is 69.7% for DBDs and 29.6% for DCDs.
- The distribution of donors across trusts/boards remains the same in 2019/20 as in 2013/14.
- Within trusts/boards comprising more than one hospital, the distribution of donor attendances across hospitals in 2019/20 is reflective of that observed over the history of NORS (since 1 April 2010).
- Future theatre durations for each attendance will follow the same distribution as those seen historically, depending on the type of team (abdominal/cardiothoracic), type of donor (DBD/DCD) and whether organs are retrieved or not.
- Future arrivals of proceeding/non-proceeding donors will follow the same distribution as those seen historically.

Appendix II: Trust/board example: Projected numbers of NORS attended donors at Hull and East Yorkshire Hospitals NHS Trust.

	DBD	DCD
No. consented 2013/14	3	4
No. actual donors 2013/14	2	3
No. consented 2019/20	6	12
No. actual donors 2019/20	5	6
No. NORS attended 2019/20	5	11
No. NORS attended that proceeded 2019/20	5	6
No. abdominal team attended 2019/20	5	11
No. cardiothoracic team attended 2019/20	3	2
No. abdominal team attended that proceeded 2019/20	5	6
No. cardiothoracic team attended that proceeded 2019/20	2	1

Appendix III

Appendix III shows the raw 2019/20 data that were input into the model for Hull and East Yorkshire Hospitals NHS Trust. There were 5 DBD and 11 DCD donors, all were attended by an abdominal team, five were attended by a cardiothoracic team, 11 were proceeding in terms of abdominal retrieval and 3 were proceeding in terms of cardiothoracic retrieval.

Hull and East Yorkshire Hospitals NHS Trust contains two hospitals; The Hull Royal Infirmary and Cottingham Castle Hill Hospital. In order to assign the 5 DBD and 11 DCD donors to these two hospitals the distribution of past donors across these two hospitals was observed. It was found that 91% and 87% of DBDs and DCDs, respectively, that were attended by a retrieval team in Hull and East Yorkshire Hospitals NHS Trust over the history of NORS, were at The Hull Royal Infirmary. Therefore, all of the 5 DBDs and 10 of the 11 DCDs were assigned to The Hull Royal Infirmary, as shown in **Appendix III**. This was the method that was used for all trusts/boards that contained more than one hospital, which was 77 out of 178. The sampled date/time that the team is asked to leave base and the sampled theatre times are also shown in **Appendix III** for the projected donors at Hull and East Yorkshire Hospitals NHS Trust.

st.
Ľ
S
Ŧ
S
tal
pi
ů,
<u>ـــ</u>
ire
<u>k</u>
õ
ţ
as
an (
=
Ę
at l
Ś
ē
p
0
qe
en (
Įţ
Ś
R
ž
g
Ct
Эe
Рто
lα
an
éX
2
Dal
ą
JSt
Ц
÷.
×
di
eu
d
Ā

Trust/board	Donor type	Hospital	Date/time team asked to leave base	Attended by an abdominal team (0=No, 1=Yes)	Attended by a cardiothoracic team (0=No, 1=Yes)	Donor proceeding (0=No, 1=Yes)	Abdominal organs retrieved (0=No, 1=Yes)	Cardiothoracic organs retrieved (0=No, 1=Yes)	Abdominal team theatre time (hours)	Carwdiothoracic team theatre time (hours)
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	03APR2019:09:00:00	٢	0	1	1	0	3.417	I
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	23APR2019:02:00:00	-	0	0	0	0	4.333	I
Hull and East Yorkshire Hospitals NHS Trust	DBD	HULL, THE HULL ROYAL INFIRMARY	24APR2019:19:00:00	-	0	1	-	0	8.000	I
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	04MAY2019:08:00:00	-	0	0	0	0	4.000	I
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	18MAY2019:23:45:00	-	0	0	0	0	2.167	I
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	22JUN2019:02:30:00	1	0	1	-	0	4.000	I
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	08JUL2019:01:30:00	1	0	0	0	0	4.667	I
Hull and East Yorkshire Hospitals NHS Trust	DBD	HULL, THE HULL ROYAL INFIRMARY	09AUG2019:14:00:00	1	-	1	-	0	8.750	1.917
Hull and East Yorkshire Hospitals NHS Trust	DBD	HULL, THE HULL ROYAL INFIRMARY	17AUG2019:04:00:00	1	1	1	L	L	7.583	7.000
Hull and East Yorkshire Hospitals NHS Trust	DBD	HULL, THE HULL ROYAL INFIRMARY	21AUG2019:02:45:00	-	0	1	-	0	6.000	
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	03SEP2019:01:15:00	1	1	1	L	0	3.083	1.750
Hull and East Yorkshire Hospitals NHS Trust	DBD	HULL, THE HULL ROYAL INFIRMARY	03NOV2019:22:00:00	1	1	1	1	L	3.083	6.000
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	05DEC2019:18:00:00	1	0	1	1	0	4.933	
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	07DEC2019:18:30:00	1	0	1	1	0	3.250	
Hull and East Yorkshire Hospitals NHS Trust	DCD	HULL, THE HULL ROYAL INFIRMARY	17JAN2020:02:00:00	1	0	0	0	0	4.217	
Hull and East Yorkshire Hospitals NHS Trust	DCD	COTTINGHAM, CASTLE HILL HOSPITAL	06MAR2020:12:00:00	1	1	1	1	L	3.533	4.167



Appendix IV: Location and density of proceeding and non-proceeding donors attended by a NORS team in 2013/14 and projected for 2019/20.

Appendix V: Location and density of abdominal NORS team attendances in 2013/14 and projected for 2019/20.



Appendix VI: Location and density of cardiothoracic NORS team attendances in 2013/14 and projected for 2019/20.



Appendix VII: Heatmaps of time of the day and day of the week that NORS teams were asked to leave base during 2013/14 and projected for 2019/20.

2013/14:

												но	bur												
Weekday	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
Monday	13	16	11	10	6	16	11	8	7	8	3	2	2	3	5	2	2	3	3	8	12	14	14	20	199
Tuesday	18	26	17	14	9	15	18	14	5	5	5	0	6	1	3	1	8	7	10	11	11	14	14	31	263
Wednesday	13	23	23	24	20	15	17	9	14	5	8	8	1	2	3	4	4	6	11	7	13	19	22	29	300
Thursday	21	14	23	17	11	13	13	10	10	9	3	9	1	1	0	6	7	7	9	8	15	12	13	31	263
Friday	28	31	16	11	9	20	11	14	8	7	6	1	2	2	3	2	2	8	10	7	10	10	17	22	257
Saturday	22	18	19	15	20	18	9	7	16	9	6	6	1	4	4	4	3	3	7	10	13	7	15	26	262
Sunday	9	16	17	9	10	11	9	9	2	10	5	3	4	2	1	1	4	2	6	8	14	15	16	14	197
TOTAL	124	144	126	100	85	108	88	71	62	53	36	29	17	15	19	20	30	36	56	59	88	91	111	173	1741

2019/20:

													Hour												
Weekday	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	TOTAL
Monday	19	25	20	16	7	17	14	7	8	10	6	6	4	2	5	2	4	8	14	16	14	26	23	36	309
Tuesday	27	37	23	25	15	24	22	20	9	8	6	2	7	3	4	5	7	10	8	12	20	19	34	43	390
Wednesday	20	36	29	29	29	20	20	11	18	5	9	8	2	3	2	5	7	10	17	9	24	23	27	36	399
Thursday	28	26	27	26	20	19	22	13	11	7	3	5	1	2	1	8	9	11	9	16	23	26	23	39	375
Friday	42	38	25	16	17	21	11	17	10	14	9	3	5	3	5	5	7	12	17	13	16	20	25	34	385
Saturday	27	26	31	21	24	22	16	14	19	10	5	5	5	5	3	7	8	7	10	12	23	16	20	27	363
Sunday	18	18	22	13	18	15	13	14	6	12	5	4	5	4	1	1	4	4	6	15	13	25	27	23	286
TOTAL	181	206	177	146	130	138	118	96	81	66	43	33	29	22	21	33	46	62	81	93	133	155	179	238	2507

NORS REVIEW CAPACITY WORKSTREAM

Further model results – accounting for use of novel technologies

Introduction

This report presents further results from the mathematical simulation model that was built to inform the NORS Review. Full details of this model can been found in the report **'Modelling different configurations of the National Organ Retrieval Service with current and projected retrieval activity'**. The results in this report give an indication of the impact that the use of novel technologies (NT) for Donors after Circulatory Death (DCD) would have on NORS team capacity in 2019/20.

Methods

2,500 abdominal team attendances and 808 cardiothoracic team attendances have been projected for the 2019/20 financial year (see 'Modelling different configurations of the National Organ **Retrieval Service with current and projected retrieval activity**' for full details of projections). 800 (32%) of the abdominal team attendances and 67 (8%) of the cardiothoracic attendances are estimated to be at DCD donors who proceed to donation. The impact of the use of NT was estimated by assuming that approximately 50% of these proceeding DCD donor attendances will use NT. The use of NT was assumed to increase the time involved in that retrieval attendance by two hours, where two hours is a rough estimate of the time taken to warm perfuse the donor. Selecting 50% of DCD donor attendances to have NT was done randomly and it was done separately for abdominal team attendances and cardiothoracic team attendances. Therefore, if a donor was attended by both types of team, two hours may have been added to both teams' times, one team's time or neither team's time.

Results

Table 1 below summarises the findings from nine different simulated NORS configurations (five abdominal and four cardiothoracic) using 2019/20 projected activity and accounting for the use of NT in 50% of proceeding DCD donor attendances. These findings were very similar to those shown in Table 3 of *'Modelling different configurations of the National Organ Retrieval Service with current and projected retrieval activity'*. The most noticeable difference is a slight increase in the number of donors missed in configurations where fewer teams are available (e.g. where 7 abdominal teams (3 of which joint) are available the number of missed donors increases from 24 to 32 when the use of NT is accounted for).

el technologies.	
use of nove	
l – accounting for	
2019/20 model	
esults from	
: Summary of re	
Table 1	

				Summary across teams		
Activity type	Number of teams	Number of attendances	Number of donors missed	Proportion of days in the year with at least one attendance	Proportion of times travel exceeds 3 hours	Distribution of number of attendances per day
<u>2019/20</u> ABDOMINAL activity	7 (3 of which joint)	Ranges between 162 and 465	32	40%-84%	4%-10%	<41% days teams attend more than one donor
<u>2019/20</u> ABDOMINAL activity	10	Ranges between 134 and 357	1	33%-70%	0%-5%	<27% days teams attend more than one donor
<u>2019/20</u> ABDOMINAL activity	б	Ranges between 185 and 357	m	42%-70%	0%-12%	<27% days teams attend more than one donor
<u>2019/20</u> ABDOMINAL activity	∞	Ranges between 240 and 379	11	55%-73%	1%-12%	<29% days teams attend more than one donor
<u>2019/20</u> ABDOMINAL activity	7	Ranges between 301 and 419	33	65%-80%	2%-13%	<32% days teams attend more than one donor
2019/20 CARDIOTHORACIC activity	9	Ranges between 46 and 242	0	12%-52%	%2-%0	<15% days teams attend more than one donor
2019/20 CARDIOTHORACIC activity	4	Ranges between 120 and 277	4	29%-57%	0%-15%	<19% days teams attend more than one donor
2019/20 CARDIOTHORACIC activity	C	Ranges between 174 and 306	27	41%-64%	4%-28%	<20% days teams attend more than one donor
2019/20 CARDIOTHORACIC activity	3 (alternative)	Ranges between 157 and 330	19	36%-68%	5%-47%	<21% days teams attend more than one donor
Annex D: Example Rota

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1	0800-0800	off	0800-1700	0800-1700	off		
2	0800-1700	0800-0800	off	off	0800-1700	0800-0800	
3	0800-1700	0800-1700	0800-0800	off	0800-1700		
4	0800-1700	off	0800-1700	0800-1700	0800-0800	off	0800-0800
5	off	0800-1700	0800-1700	0800-0800	off		

Template example of an on-call rota

Template example of a full shift rota

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1	off	off	off	0800-1700	0800-1700		
2	0800-2030	0800-2030	0800-2030	0800-2030			
3	0800-1700	0800-1700			0800-2030	0800-2030	0800-2030
4	2000-0830	2000-1830	2000-0830	2000-0830			
5		0800-1700	0800-1700		2000-0830	2000-0830	2000-0830

The above rotas both consist of 5 WTE surgeons, represented by numbers 1 to 5 on the left hand side.

The highlighted shifts show cover for 24 hours, either on an on-call basis, or a full shift. Both rotas include full prospective cover for annual leave, study leave and bank holidays.

Full shift Template

A full shift rota will divide the total working week into definitive time blocks, with doctors rotating around the shift pattern. Within the template the shifts are either 8 or 12 hours in duration, with the highlighted shifts being the ones covering the NORS. The 8 hour shifts allow training, education and other service needs to be covered. So in the example above, the NORS shift on a Monday would be covered by surgeon 2 working 0800-2030 and surgeon 4 working 2000-0830. In the meantime, surgeons 1 and 5 are off (rest/leave) and surgeon 3 covers a day shift (0800-1700).

This style of rota requires the doctor to have a 30 min break for each 4 hours worked; this is the same for every shift type within the template.

A Full shift pattern of work is more suited in areas where rest within an On Call work pattern is not achievable.

On Call Template

Within this example the periods of NORS cover is provided by one surgeon covering one 24 hour period and then another surgeon covering the following 24 hours and so on. In the example given surgeon 1 covers NORS, while surgeons 2, 3 and 4 cover day shifts (for example ward/theatre work) and surgeon 5 is off.

The rest requirements for an On Call rota are 50% out of hour, 5 hours or which are required to be continuous. Therefore the following rest is required:

Weekdays

7.5hrs between 1700 – 0800, 5hrs to be continuous between the hours of 2200 – 0800.

Weekends & Bank Holidays

12hrs rest in total, 5hrs to be continuous between the hours of 2200 - 0800.

Both examples are New Deal (applicable to trainees only) and European Working Time Directive compliant and ensure staff have sufficient rest periods between shifts.

On Call shifts, when compared with full shifts, can be better for training, as they do not require a week of nights and may allow more weekends off. For a retrieval rota, where most activity happens over night, a full shift might be preferable.

National Organ Retrieval Service (NORS) Review