

NHSBT Board
January 28 2016

National Organ Retrieval Service Review Implementation

1. Status – Public

Executive Summary

This paper provides an update on implementation of the National Organ Retrieval Service (NORS) Review Recommendations, in particular establishment of a new cardiothoracic retrieval team rota.

2. Action Requested

The Board is asked to:

- **note that the process being followed to implement the NORS review ;**
- **agree the reduction in on call cardiothoracic retrieval team capacity and short term cost pressure.**

3. Purpose of the paper

This paper provides an update on implementation of the recommendations from the NORS Review with particular emphasis on implementation of the revised cardiothoracic NORS team on call service provision. The purpose of the paper is to provide assurance to the Board that the recommendations are being implemented, that appropriate processes are being followed and to ask the Board to approve the recommendation to commission reduced cardiothoracic retrieval team capacity from 1 July 2016.

4. Background

- 4.1 The fifteen NORS Review recommendations were approved by the Board in March 2015 and an Implementation Board was established.
- 4.2 Detailed implementation planning has been undertaken by four Working Groups and a summary of progress against all recommendations can be found at Annex A. Of the fifteen recommendations, thirteen are on track to be completed by April 2016. Recommendations Two and Six are linked: NORS team structures and their contractual arrangements.
- 4.3 The Co Chairs of all Working Groups have been chosen to ensure a fair representation across all clinical areas and UK countries.
- 4.4 In addition, there were two areas of concern for the NORS teams (paediatric and multi-visceral retrieval) that fell outside the scope of the review. These

services were not commissioned by NHSBT when NORS was established. We have agreed a review of these arrangements in 2016/17 with the four UK transplantation commissioners.

- 4.5 Recommendation Two proposed a change from the current 24/7 availability of every NORS team to an annual NORS rota. Modelling undertaken for the review demonstrated that the current capacity within the abdominal teams was sufficient and that there was over-capacity within the cardiothoracic teams.
- 4.6 Working Group One took lead responsibility for the development of a new rota for cardiothoracic teams. Representatives from each of the cardiothoracic NORS teams were members of this group along with abdominal NORS representatives.

5. Proposal

- 5.1 Working Group One considered six different rota simulations, including the proposal to reduce to three teams (Simulation One) see appendix B. All simulations were scored by members of the Group and then ranked. This process indicated a preference were for four teams to be on call at any time.
- 5.2 The outcome from the working group were considered by the ODT Change Programme Board (CPB) as part of agreed the governance process. CPB noted that the process was thorough but that it was difficult to evidence the scoring presented.
- 5.3 It was noted that the working group's preferred option did not match the review recommendation and would incur £1 million costs. It was noted that Simulation One demonstrated that activity with three teams would still be significantly lower than current abdominal team activity and one of the aims of the Review had been to ensure equity
- 5.4 CPB recommended that Simulation 1 be reconsidered with the proviso that additional capacity would be sought once activity increased to match the 70% threshold. This option was presented to Working Group One, where there was strong resistance.
- 5.5 The risks raised by the Group are outlined below with planned mitigation:

Risk	Comment/ Mitigation
Clinical Governance risk of working with multiple teams	Teams will need to work with multiple teams regardless of on call rota
Loss of surgical expertise	Opportunities to maintain expertise will be greater as teams will be busier
Sustainability and difficulty to recruit retrieval surgeons and other staff to part time role	There may be loss of staff resulting in teams deciding to no longer provide retrieval services, however this has not

	been the case for abdominal teams providing split rotas
Loss of organs due to delays in team availability	Modelling for the review and implementation does not substantiate this but it will be monitored and remedial action taken if required
Increased flights (risks to team, logistic issues and cost)	There is a risk of more frequent flights but the despatch function in the Duty Office will mitigate this. Costs would be monitored and are unlikely to be as much as the cost of additional team
Increased time for donation and retrieval process overall	There is no evidence that this would be the case and it will be monitored
Reliance upon implementation of the Hub	The despatch function within the Duty Office is not dependant upon the Hub
Increased family refusal due to delays in travel time	Travel is not the only limiting factor; overall improvements to the pathway will mitigate this and refusal rates will be monitored
Extended period in ITU	There is no evidence for this
Hidden costs due to increase in transport and impact on transplanting teams	Transport costs directly reimbursed by NHSBT. Transplant service is commissioned independently of retrieval with an expectation of no cross subsidy.
Increased frequency of 'back to back' retrievals	Modelling suggests that on 12 days a year CT teams might attend more than one donor in a day with the new rota. This is less frequent that for the abdominal teams.
May not support Novel Technologies eg DCD Heart Retrieval	A separate business case will be developed if the evaluation is successful with provision for extra retrieval capacity if needed
Cardio thoracic retrieval teams are more likely to implant if they retrieve their own organs.	NORS promotes a national approach and teams should be working to the same standards. There is no evidence that hearts implanted by another retrieval team have worse outcomes

- 5.6 Detailed modelling showed that there would be sufficient capacity to meet TOT 2020 activity projections with three teams on call. If the service evaluation of DCD heart retrieval indicates that workload will increase to take the cardiothoracic service to 70% capacity, additional funding will be sought..
- 5.7 At the current rate of retrieval, even with three teams on call, no cardiothoracic team would be as busy as the least busy abdominal NORS team. The NORS Review recommended that teams should be undertaking retrieval 70% of days consistently before any increase in capacity be

considered; the busiest cardiothoracic team would be undertaking retrieval activity between 37% and 52% of days on call.

- 5.8 The NORS Review recommended that three to four teams be on call at any one time. Savings projections were made on the basis that there would be three teams. This and costings for all other simulations are shown in Table 1 below:

Table 1

	Simulation Saving £ FYE	Original proposal saving £ FYE	Variance – decrease in saving (increase in saving)
Simulation 1 (Recommended)	(1,748,894)	(1,748, 894)	0
Simulation 2	(566,780)	(1,748, 894)	1,182,114
Simulation 3	(563,018)	(1,748, 894)	1,185,877
Simulation 4	(609, 537)	(1,748,894)	1,139,357
Simulation 5	(596,309)	(1,748, 894)	1,152,586
Simulation 6	(590,040)	(1,748,894)	1,158,854
Original proposal to reduce each team to 50%	(1,748,894)		

- 5.9 In order to give six months notice and allow the teams to run the rota in shadow form, teams were advised that their funding would be reduced as of 1 July 2016. Whilst this reduces the overall projected savings by £514, 711 in year one this will give the opportunity to test the rota and change if necessary.
- 5.10 This proposal was presented to the NORS Implementation Board; there was support from the Implementation Board to continue with the implementation of Simulation One, noting that there was assurance from ODT that additional funding would be sought if justified by increased activity levels. It was also agreed that an additional review of progress of the new rota should be set up with Working Group One in May.
- 5.11 There remain residual risks that some hospitals may seek to claim redundancy costs, but legal advice has indicated that this would not be successful.
- 5.12 There have been delays in the training of shared scrub nurses until this configuration has been agreed, however plans are in place to have on the job training undertaken by 1 July with a fully costed e-learning package to follow.

- 5.13 The current proposal has been supported by representatives from abdominal NORS teams, Commissioners and Health Departments and is in line with the NORS Review recommendations.

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APPENDIX A - Summary of Responsibilities for Recommendations and linked work streams

Recommendation/ Area for improvement	Responsible Working Group	Linked Work streams/ Co-dependencies	Comments	Completed by April 2106
R1. NHSBT make modelling of the retrieval service part of its core business, to ensure that capacity is better aligned to demand in the future	Working Group 1	SMT, NRG, Commissioning Team meeting, Contract review meetings	Modelling to be reviewed by NRG on a bi-annual basis. NRG will make recommendations on changes to NORS team capacity to ODT Commissioning.	Yes
R2. A change to the current 24/7 NORS into an annual rota, which does not necessarily mean that every NORS team will need to be available 365 days a year	Working Group 1		No immediate change to abdominal NORS team configuration. Proposals worked through WG1, not unanimously supported, to implement 3 wte cardiothoracic teams in shadow from April 1 st and in full from July 1 st 2016.	Phased implementation from April 1 st , to be completed by July 1st
R3. The call-out and despatch of NORS teams is co-ordinated centrally	Working Group 3	Review of potential use of Transport Management System, longer term part of Hub development	TMS not a viable option short term. See comment below.	No further action required
R4. The current first on call rota is changed, so that the closest available team is despatched, to ensure the available capacity is best utilised to meet demand	Working Group 3	Review of potential use of Transport Management System, longer term part of Hub development	Rapid Improvement Event Jan 28 th to plan implementation of improved support from April 1 st 2016	Yes

R5. NORS moves to joint working arrangements, where there is provision for Standard (abdominal) retrieval and Extended (cardiothoracic) retrieval	Working Group 1		Abdominal and Cardiothoracic teams to work together in shadow from April 1 st 2016	Yes
R6. Commissioning arrangements are based on the provider's participation in an annual NORS rota	Working Group 4		All NORS teams were advised by letter in July 2015 of new contract values from April 1 st 2016	Phased implementation from April 1 st to be completed by July 1 st
R7. Reimbursement for consumables, instruments and disposables is moved to an annual block contract	Working Group 3		Block payments will start from April 2016, but this will be done quarterly (rather than annually) for 2016/17, so that activity can be accurately assessed.	Yes
R8. 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	Working Group 3	SMT/Joint Commissioners Meeting	Flight Policy to be implemented from February 2016	Yes
R9. The focus of the Future Service Requirements be on achieving a high quality service, and the quality of organs retrieved, to support an increase in the number of patients successfully transplanted	Working Group 3	WG 4 to review from Commissioning view. Clinical Leads for Organ Utilisation	On-going monitoring through NRG Draft organ quality KPIs have been written (see Schedule 6 of contract) but will need considerable development before they can be implemented as a tool to improve quality – to take place throughout 2016/17	Yes

R10. 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	Working Group 3	WG 4 to review from Commissioning view	Clinical Governance Forum to be established to share Lessons Learned – R Cacciola	Yes
R11. The Future service Requirements are flexible and adaptable to ensure that NHSBT is able to look at further development of the NORS in future	Working Group 4	Link to RINTAG and NOR Implementation Board	All future service requirements to be considered through NRG and RINTAG	Yes
R12. 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	Working group 2	Link to KPI work undertaken by WG 3		Yes
R13. 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	NORS Implementation Board	Chairs of the Solid Organ Advisory Groups	Discussed at Working Group 1: NORS teams should mobilise when requested by SN-OD.	To be agreed at NRG in March

R14. 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	NORS Implementation Board		RINTAG established; first meeting October 13 th .	Yes
R15. A biannual Audit of a representative number of procedures is conducted, to ask stakeholders to comment on their perceptions of how the system works	Working Group 3		Stakeholder satisfaction questions have been written. Method of sharing questionnaire to be agreed (e.g. survey monkey)	Yes
Paediatric retrieval process	Working Group 4		Agreement with NSD and NHS E to develop proposal to be taken back to next Joint Commissioner's Meeting in April 2016	Business case required to be implemented through NRG post April 1st
Multi visceral retrieval process	Working Group 4		Agreement with NSD and NHS E to develop proposal to be taken back to next Joint Commissioner's Meeting in April 2016	Business case to be implemented through NRG post April 1st
Tariff for non-core NORS retrievals	Working Group 4		Tariff being developed for implementation from July 1 st 2016 or earlier if required.	Yes

APPENDIX B

NORS Review Implementation

Cardiothoracic team capacity – investigations into different team rotas

Summary

This paper presents some investigations into different possible cardiothoracic team rotas. All six teams were assumed to have some contribution to the NORS, but with varying weeks on call. The NORS Capacity Model (see below) was used to simulate six scenarios, as described in Table 1.

Table 1 Summary of simulations

Simulation	No. teams on call at any given time	Description (note: week 1 is w/c 1 April 2013)	No. attendances per team and no. donors where no team immediately available	% of days busy when on call	% of journeys > 3 hours and no. journeys > 5 hours	Summary of findings
1	3	Birm, Hare and Newc on call odd weeks; Pap, Manc and Scot on call even weeks	Ranges from 64 (Scot) to 106 (Hare) 5 donors 'missed'	Ranges from 31% (Scot) to 54% (Pap) Average of 44%	14% overall Ranges from 5% (Pap) to 25% (Manc) 11 journeys exceed 5 hours	Only one team available in the South at any given time means northern teams occasionally experience long travel times to cover donors in the South
2	4	Hare and Pap full time; Birm and Newc on call odd weeks; Manc and Scot on call even weeks	Ranges from 59 (Scot) to 186 (Hare) 1 donor 'missed'	Ranges from 22% (Pap) to 46% (Birm) Average of 36%	9% overall Ranges from 4% (Hare) to 15% (Newc) 4 journeys exceed 5 hours	Two full time teams in the South means northern teams are largely contained in the North Pap activity low compared with Hare because Hare are geographically closer to donors
3	4	Hare and Scot full time; Birm and Newc on call odd weeks; Manc and Pap on call even weeks	Ranges from 45 (Newc) to 196 (Hare) 0 donors 'missed'	Ranges from 22% (Newc) to 46% (Hare) Average of 34%	7% overall Ranges from 4% (Hare and Pap) to 13% (Newc) 6 journeys exceed 5 hours	Long travel times when lots of activity in the South and Pap are not on call
4	4	Birm and Scot full time; Pap and Newc on call odd weeks; Hare and Manc on call even weeks	Ranges from 48 (Newc) to 172 (Birm) 0 donors 'missed'	Ranges from 23% (Newc) to 47% (Hare) Average of 35%	9% overall Ranges from 0% (Hare) to 19% (Newc) 8 journeys exceed 5 hours	Long travel times when lots of activity in the South and Hare are not on call
5	4	Birm, Hare and Pap share a rota where two teams on call at once; same for Manc, Newc and Scot	Ranges from 60 (Scot) to 137 (Hare) 0 donors 'missed'	Ranges from 28% (Scot) to 46% (Hare) Average of 34%	7% overall Ranges from 2% (Pap) to 15% (Manc) 6 journeys exceed 5 hours	Long travel times when lots of activity in the South and Hare and Pap are not on call at the same time
6	4	Newc and Scot share a rota where one team on call at once; Birm, Manc, Hare and Pap share a rota where three teams on call at once	Ranges from 59 (Scot) to 145 (Hare) 1 donor 'missed'	Ranges from 22% (Scot) to 47% (Hare) Average of 34%	9% overall Ranges from 3% (Pap and Hare) to 17% (Newc) 5 journeys exceed 5 hours	Long travel times when lots of activity and Scotland are not on call

Data and methods

There were 565 potential donors attended by a cardiothoracic NORS team between 1 April 2013 and 31 March 2014. There were slightly fewer in the more recent financial year, 2014/15, so for that reason the modelling data were not updated. The locations of these potential donors are shown in Figure 1 and the arrival pattern is shown in Figure 2 in the form of a heatmap. These show that the busiest areas for cardiothoracic potential are around London and the time of day and day of the week with the most demand are between 11pm and 5am and Wednesdays and Thursdays.

Figure 1 Location and density of proceeding and non-proceeding cardiothoracic donors 2013/14

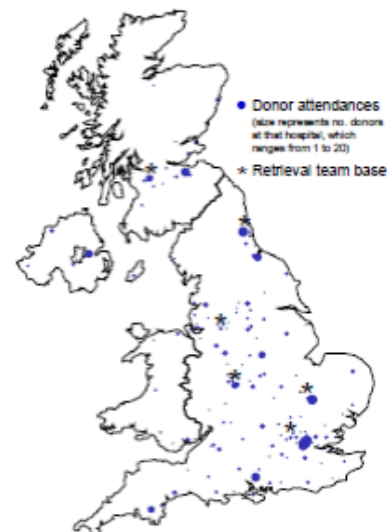


Figure 2 Heatmap of time of the day and day of the week that cardiothoracic NORS teams and were asked to leave base during 2013/14

Weekday	Hour																								Total
Monday	7	5	4	1	3	6	3	3	4	4	2	1	2	2	2	2	0	1	0	3	2	1	6	6	70
Tuesday	0	8	7	7	4	5	9	4	7	1	4	0	2	0	1	1	3	2	5	1	3	3	2	5	84
Wednesday	6	7	6	6	9	9	7	3	7	4	3	4	1	2	1	2	1	0	2	1	2	2	6	4	96
Thursday	9	5	8	8	6	5	4	2	5	6	3	4	2	1	0	1	1	0	3	2	3	5	3	10	96
Friday	9	11	8	7	4	6	3	5	2	3	2	0	1	1	2	0	2	0	1	3	1	2	2	2	77
Saturday	5	1	5	4	8	4	3	5	8	3	1	4	1	0	1	0	3	2	0	4	2	3	2	7	76
Sunday	4	3	9	6	2	6	5	5	0	4	2	1	2	0	0	0	1	1	1	1	2	4	6	67	
Total	40	40	47	39	36	41	34	27	33	25	17	14	11	6	7	6	11	6	12	15	15	18	25	40	565

The NORS Capacity Model

A mathematical simulation model was built in Microsoft Excel 2010 to inform the NORS Review. The model works by allocating donors as they arise to the closest retrieval team by travel time. If the closest team is busy with another retrieval, the model allocates the second closest team and so on. If all teams are busy then the model indicates that for that donor there is no team available. The model allows the selection of different combinations of teams to contribute to the NORS at any given time.

Results

Simulation 1 Birmingham, Harefield and Newcastle on call odd weeks and Papworth, Manchester and Scotland on call even weeks, where week 1 is w/c 1 April 2013. Three teams on call at any given time.

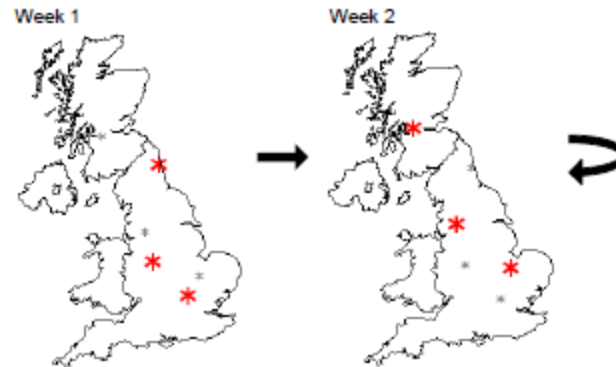


Fig 1.1 Expected number of attendances per team

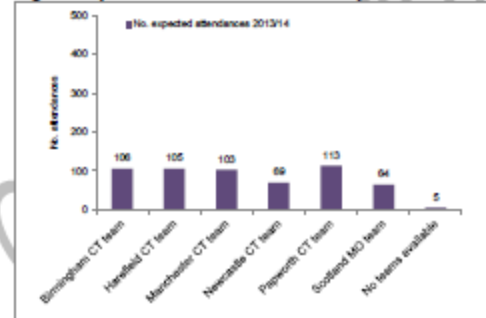


Fig 1.2 Expected proportion of days attending donors

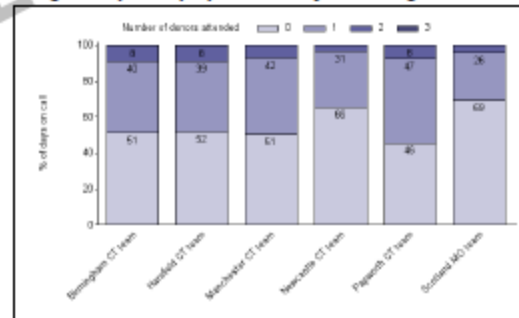


Fig 1.3 Expected proportion of extended travel times (one way)

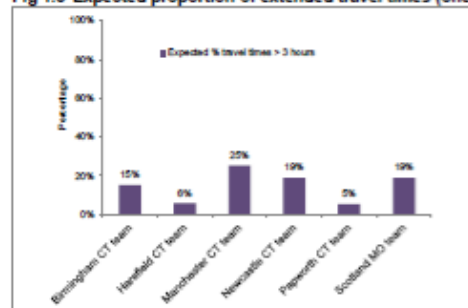


Fig 1.4 Expected distribution of travel times (one way)

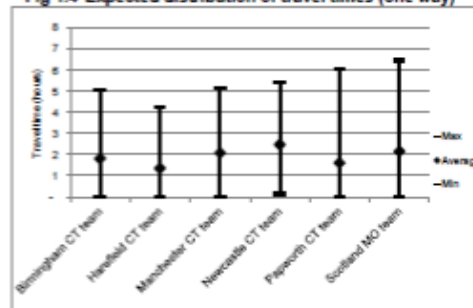
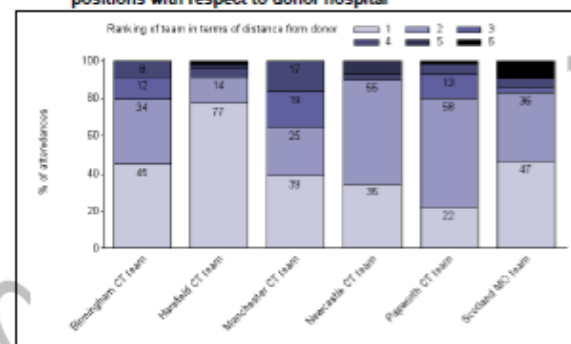


Fig 1.5 Expected proportion of attendances with different team positions with respect to donor hospital



Activity reasonably balanced but with the northern teams attending fewer donors (Fig 1.1). Five potential donors where no team immediately available (Fig 1.1). Teams are active roughly 50% days they are on call (northern teams less busy) (Fig 1.2). High proportion of extended travel times for several teams, in particular Manchester (Fig 1.3) (these are mainly cases where Manchester were sent to the far South or far North due to other teams being busy or not on call). Overall, 14% of one-way journeys exceed 3 hours (slightly higher proportion during week 2 and lower during week 1). Scotland and Papworth have some particularly extreme travel times (Fig 1.4) (Scotland travelling to London and Papworth travelling to Scotland). Harefield have the highest proportion of attendances where they are the closest team to that donor (Fig 1.5) while Papworth have the lowest (out of all teams, not just those on call) – this is because Papworth are not particularly well positioned with respect to areas with high donor activity so are picking up the donors that other teams are unable to attend. Scotland are sent to a numbers of donors where they are the furthest team away from the donor – these are areas such as London and Oxfordshire because Papworth and Manchester, who are on call at the same time as Scotland, are unavailable.

Simulation 2 Harefield and Papworth full time, Birmingham and Newcastle on call odd weeks and Manchester and Scotland on call even weeks, where week 1 is w/c 1 April 2013. Four teams on call at any given time.

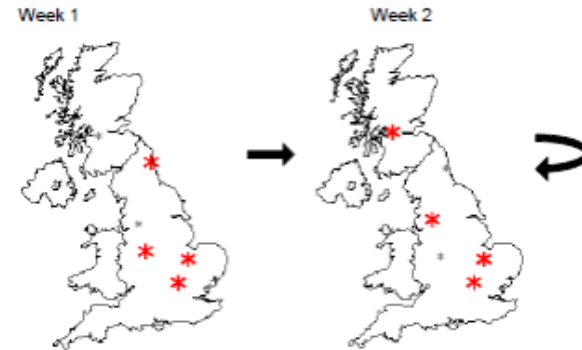


Fig 2.1 Expected number of attendances per team

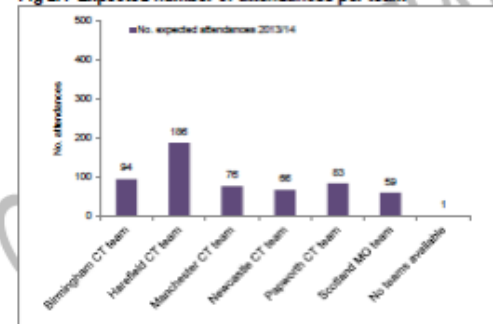


Fig 2.2 Expected proportion of days attending donors

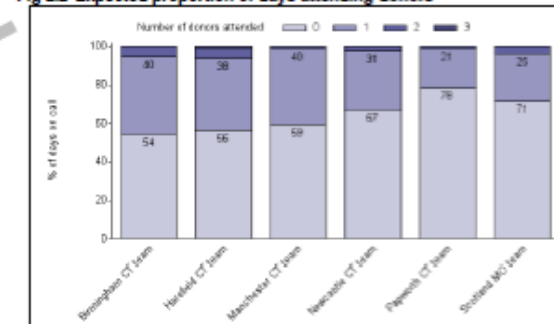


Fig 2.3 Expected proportion of extended travel times (one way)

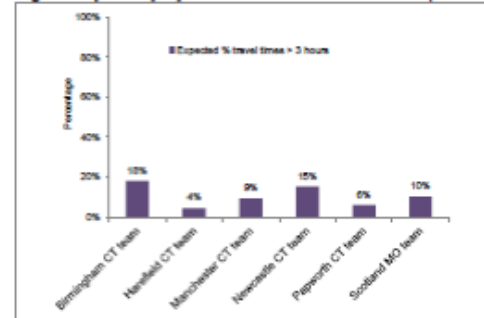


Fig 2.4 Expected distribution of travel times (one way)

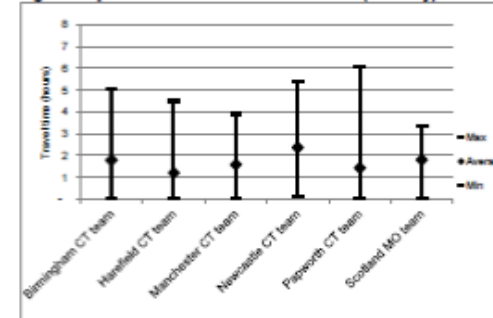
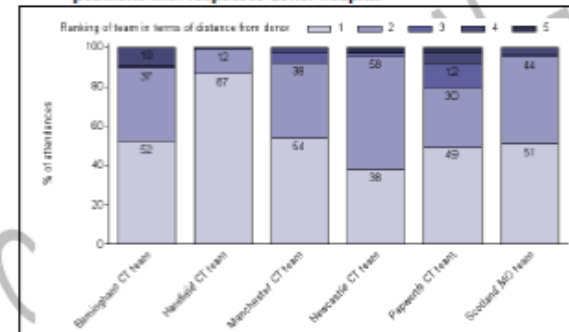


Fig 2.5 Expected proportion of attendances with different team positions with respect to donor hospital



Expect Harefield's activity to be high as they are on call full time (Fig 2.1). The same is true for Papworth, but their activity is actually similar to other teams. Only one potential donor where no team immediately available. Birmingham and Harefield are active the highest proportion of days that they are on call (~45%) while Papworth and Scotland are active the lowest (~25%) (Fig 2.2). Relatively high proportion of extended travel times for Birmingham and Newcastle (Fig 2.3). Overall, 9% of one-way journeys exceed 3 hours (slightly higher proportion during week 1 and lower during week 2). Papworth, Newcastle and Birmingham have some extreme travel times (> 5 hours) while Scotland have the smallest range of travel times (Fig 2.4). Fig 2.5 corresponds with this, showing that Birmingham, Newcastle and Papworth have the highest proportion of attendances where they are the 4th or 5th closest team to the donor (out of all teams, not just those one call). There are no cases where the 6th closest team is sent.

Simulation 3 Harefield and Scotland full time, Birmingham and Newcastle on call odd weeks, Manchester and Papworth on call even weeks, where week 1 is w/c 1 April 2013. Four teams on call at any given time.

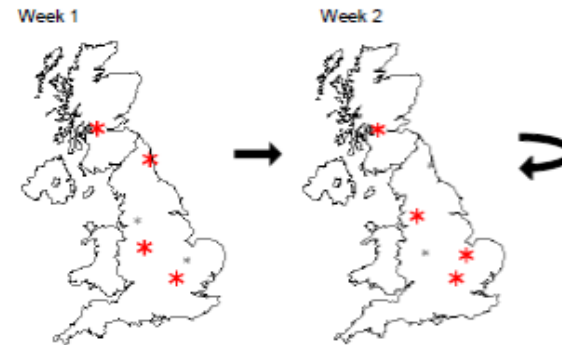


Fig 3.1 Expected number of attendances per team

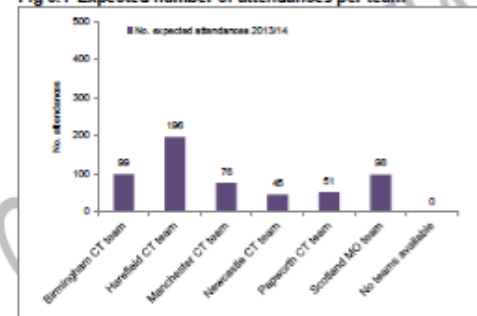


Fig 3.2 Expected proportion of days attending donors

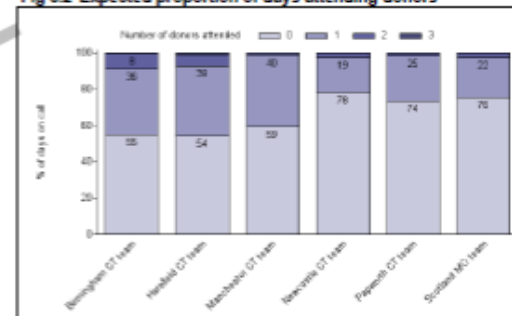


Fig 3.3 Expected proportion of extended travel times (one way)

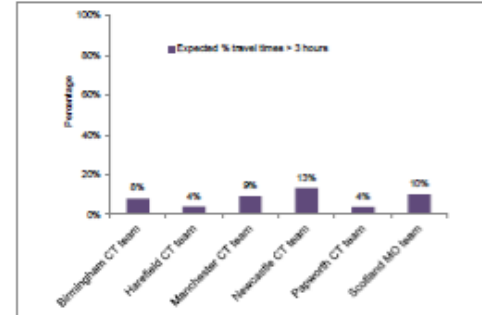


Fig 3.4 Expected distribution of travel times (one way)

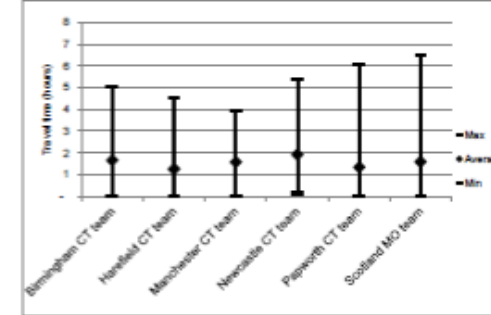
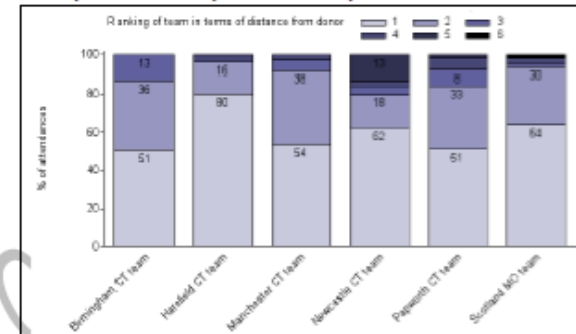


Fig 3.5 Expected proportion of attendances with different team positions with respect to donor hospital



Very high activity for Harefield compared with other teams, as they are on call full time (Fig 3.1). Newcastle and Papworth have very low activity. No potential donors where no team immediately available. Birmingham, Harefield and Manchester are busier than Newcastle, Papworth and Scotland when on call (Fig 3.2). Newcastle have the highest expected proportion of extended travel times (Fig 3.3) but overall, only 7% of one-way journeys exceed 3 hours (no difference between week 1 and week 2 in this respect). There are some extreme estimated travel times for some teams (Fig 3.4), including six instances where a team was sent to a donor more than 5 hours away; these include Scotland to London and Gloucestershire, Newcastle to Southampton and Cardiff, Papworth to Edinburgh and Birmingham to the Isle of Mann. Newcastle were sent to the highest proportion of donors where they were the 5th or 6th closest team from the donor hospital (out of all teams, not just those on call) (Fig 3.5).

Simulation 4 Birmingham and Scotland full time, Papworth and Newcastle on call odd weeks, Harefield and Manchester on call even weeks, where week 1 is w/c 1 April 2013. Four teams on call at any given point.

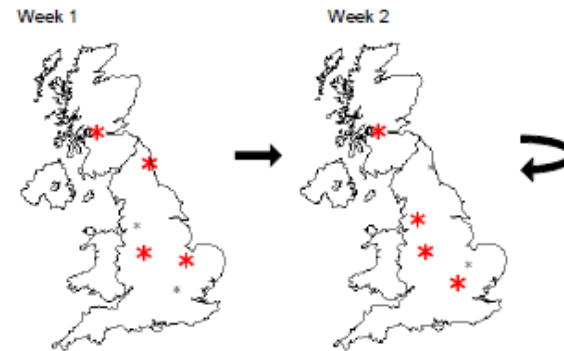


Fig 4.1 Expected number of attendances per team

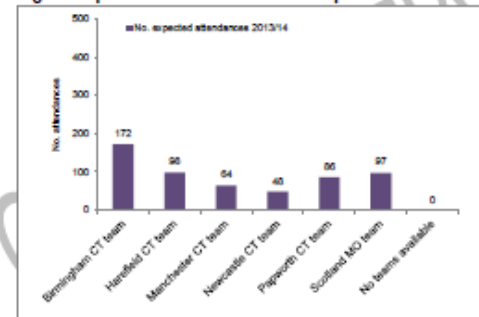


Fig 4.2 Expected proportion of days attending donors

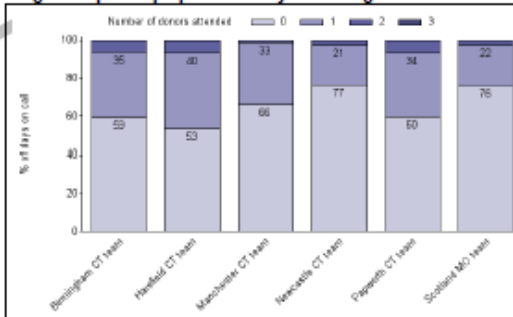


Fig 4.3 Expected proportion of extended travel times (one way)

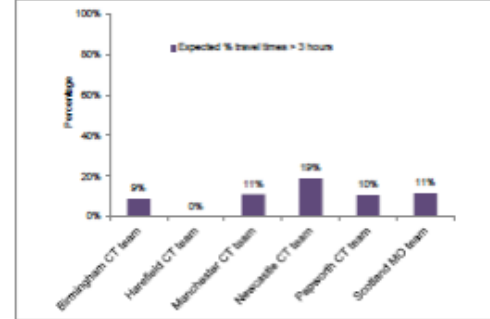


Fig 4.4 Expected distribution of travel times (one way)

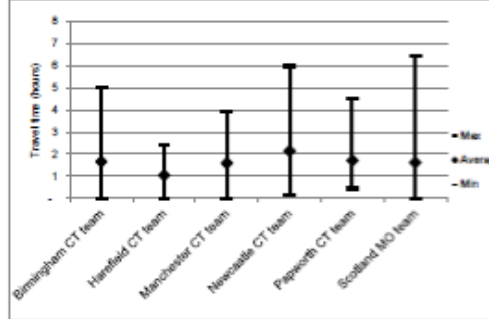
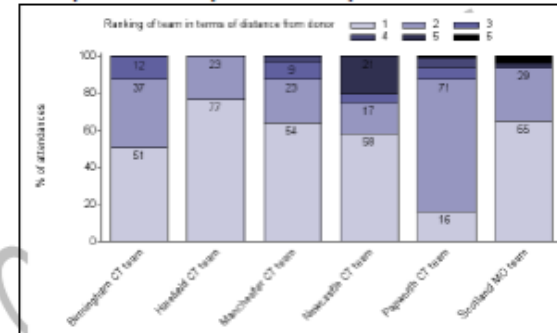


Fig 4.5 Expected proportion of attendances with different team positions with respect to donor hospital



High activity for Birmingham compared with other teams as they are on call full time (Fig 4.1). Particularly low activity for Newcastle. No potential donors where no team immediately available. When on call, Harefield are busiest (47% of days attending at least one donor) and Newcastle are least busy (23%) (Fig 4.2). Newcastle have the highest proportion of extended travel times and all of Harefield's journeys are under 3 hours (Fig 4.3). Overall, 9% of one-way journeys exceed 3 hours (slightly higher proportion during week 1 and lower during week 2). Newcastle and Scotland have the most extreme expected travel times (Fig 4.4). There are eight instances where a team was sent to a donor more than 5 hours away; these mainly include cases where Newcastle or Scotland are sent to the South because Papworth and Birmingham are busy. Newcastle and Scotland have the highest proportion of attendances where they are the 5th or 6th closest team to the donor hospital (Fig 4.5).

Simulation 5 Birmingham, Harefield and Papworth share a rota where two teams on call at once; the same for Manchester, Newcastle and Scotland, i.e. four teams on call at any given time, where week 1 is B, H, S, N, week 2 is B, P, S, M and week 3 is P, H, M, N, on rotation.

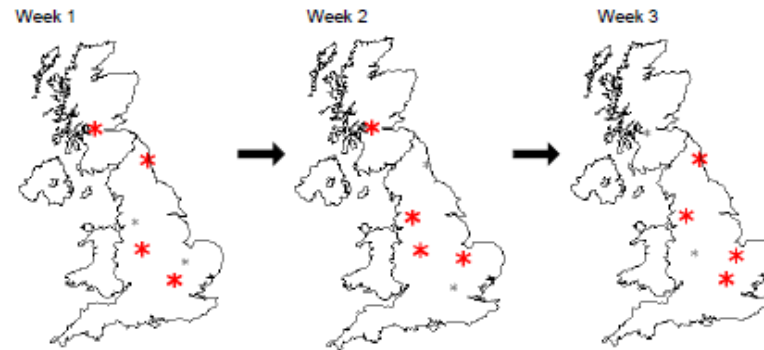


Fig 5.1 Expected number of attendances per team

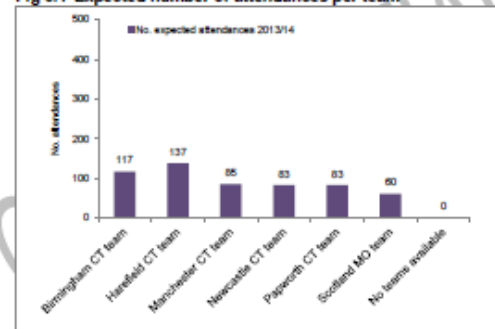


Fig 5.2 Expected proportion of days attending donors

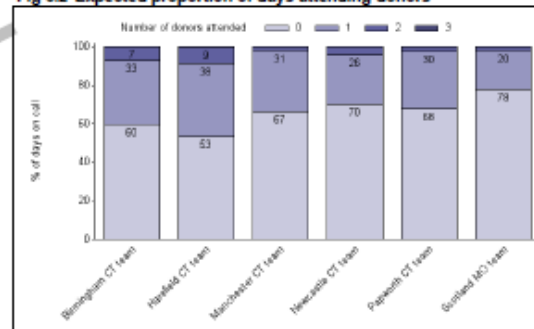


Fig 5.3 Expected proportion of extended travel times (one way)

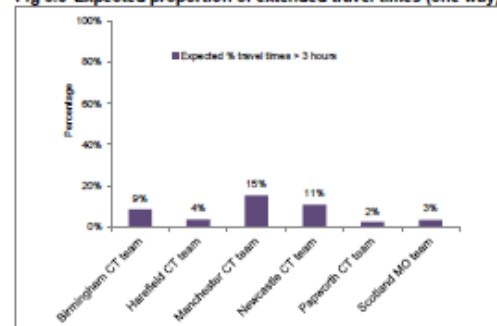


Fig 5.4 Expected distribution of travel times (one way)

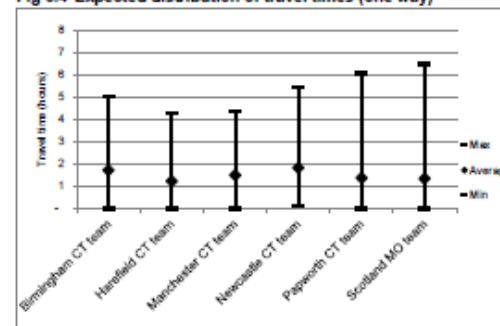
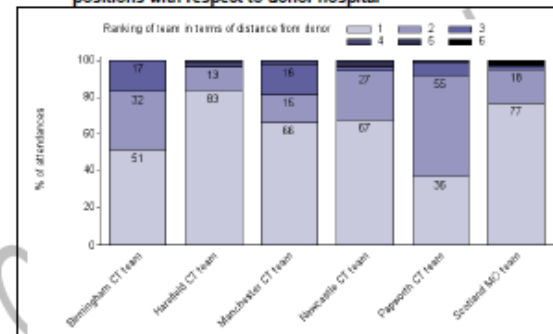


Fig 5.5 Expected proportion of attendances with different team positions with respect to donor hospital



Activity is similar for Manchester, Newcastle and Papworth, higher for Birmingham and Harefield and lower for Scotland (Fig 5.1). No potential donors where no team immediately available. Each team is on call for two thirds of the year; during this time they are out attending at least one donor 22% (Scotland) - 47% (Harefield) of days (Fig 5.2). Manchester have the highest expected proportion of extended travel times (Fig 5.3) (includes instances where they are sent to the South West or South Wales because Birmingham or Harefield are busy and only one of them are on call, or they are sent to Scotland or Northern Ireland because Scotland or Newcastle are busy). The highest proportion of extended travel times occurs during week 3 (10% of all journeys > 3 hours compared with the overall proportion of 7%). Papworth and Scotland have the most extreme expected travel times (Fig 5.4). There are six instances where a team was sent to a donor more than 5 hours away; examples include Papworth being sent to Edinburgh, taking them an estimated 6 hours, because Newcastle and Manchester were busy and Scotland being sent to London, estimated to take more than 6 hours, because Harefield, Birmingham and Newcastle were all busy. Scotland were sent to two donors when they were the furthest away team; one in London and one in Gloucestershire (Fig 5.5).

Simulation 6 Newcastle and Scotland share a rota where one team on call at once, Birmingham, Manchester, Harefield and Papworth share a rota where three teams on call at once, i.e. four teams on call at any given time, where week 1 is B, H, M, N, week 2 is H, P, S, M and week 3 is P, H, B, N and week 4 is S, B, M, P, on rotation.

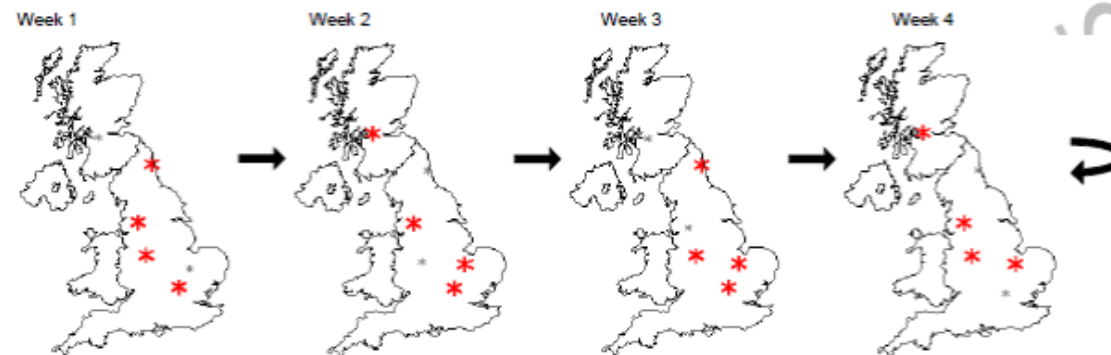


Fig 6.1 Expected number of attendances per team

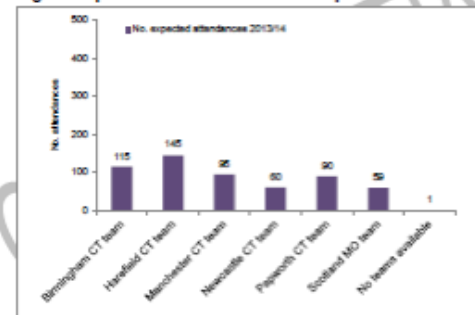


Fig 6.2 Expected proportion of days attending donors

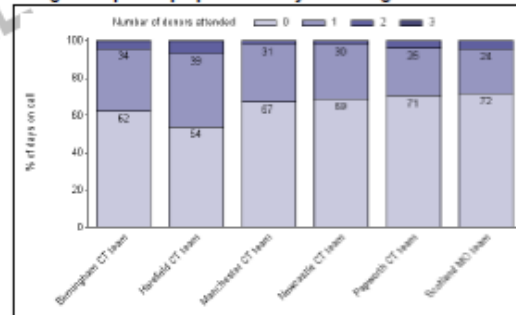


Fig 6.3 Expected proportion of extended travel times (one way)

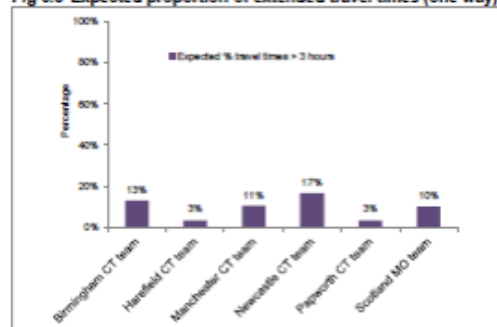


Fig 6.4 Expected distribution of travel times (one way)

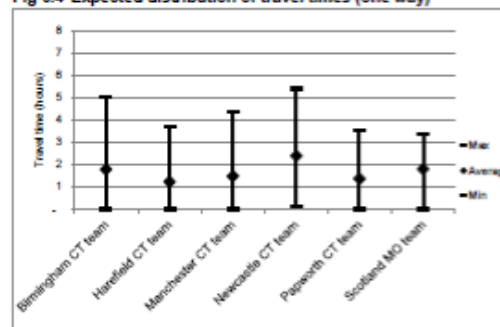
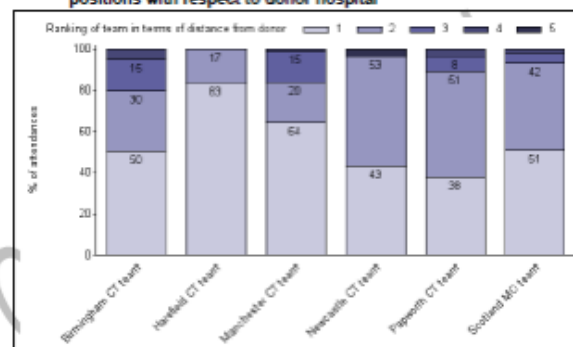


Fig 6.5 Expected proportion of attendances with different team positions with respect to donor hospital



Activity is similar for Manchester, Birmingham and Papworth, higher for Harefield and lower for Scotland and Newcastle (Fig 6.1). One potential donor where no team immediately available. The two northern teams are on call for half of the year and they are the least busy when on call (~30% of days attending at least one donor); the remaining teams are on call three quarters of the year and are busy 31% (Newcastle) - 46% (Harefield) of days (Fig 6.2). Newcastle have the highest expected proportion of extended travel times (Fig 6.3) (mostly cases where they are sent up to Scotland when Scotland are not on call). The highest proportion of extended travel times occurs during week 3 (11% of all journeys > 3 hours compared with 0% over the entire year). Newcastle and Birmingham have the most extreme expected travel times (Fig 6.4). There are five instances where a team was sent to a donor more than 5 hours away; examples include Newcastle sent to Southampton, taking them an estimated 5.4 hours, because Harefield, Papworth and Manchester were all busy and Birmingham sent to Edinburgh, estimated to take them just over 5 hours, because Scotland and Manchester were busy. Although there are no cases where the 6th closest team is sent, there were two cases where the 5th closest team is sent (of all teams, not just those on call) – these both correspond to Newcastle.