

## The Further Mathematics Support Programme

### How mathematics is used in deciding policy in the Blood and Transplant services.



NHSBT is a Special Health Authority with responsibility for coordinating the UK organ donation and transplantation service as well as managing the national blood and tissue services in England and Wales. The development of an evidence base for the furtherance of organ donation and transplantation, blood and tissue services, haematology and transfusion medicine relies heavily on sound statistical underpinning. NHSBT therefore has a strong team of statisticians in its Statistics and Clinical Studies department who carry out projects in a wide range of fields, some of which are described below.

ACTIVE TRANSPLANT LIST					
	Current at 05.02.15		Previous year	% Change	End of last year
	Total	(Paediatric <18yrs)	at 28.02.14		31.03.14
Kidney	5397	(71)	5680	-5	5660
Pancreas	19	(0)	35	-45.7	35
Kidney/pancreas	221	(0)	201	10	203
Pancreas islets	38	(0)	36	5.6	33
Heart	267	(36)	239	11.7	244
Lung	304	(13)	257	18.3	269
Heart/lung	16	(1)	18	-11.1	16
Liver	526	(32)	503	4.6	505
Intestinal	4	(2)	13		13
Other (multi-organ)	56	(7)	48	16.7	48
<b>TOTAL</b>	<b>6848</b>	<b>(162)</b>	<b>7030</b>	<b>-2.6</b>	<b>7026</b>

**Note: These figures are subject to change as information is updated**

Source: nhsbt media services. February 2015

The identification of factors that affect waiting time to transplantation, and graft and patient survival time following transplantation, is important for a number of applications. In particular, this information indicates the factors that need to be accounted for in an organ allocation scheme,

enables estimates of survival rates to be obtained for patients with particular characteristics, and facilitates the monitoring of centre specific outcomes. For example, an analysis of factors associated with death on the liver transplant list has led to the development of an index of the severity of liver disease in patients registered for a transplant. The index is now being used to ensure that the condition of patients being registered is comparable between the liver transplant centres, so that there is equity of access to transplantation.

Data associated with the introduction of novel transplant procedures and new technologies enables their advantages to be quantified. For example, a national registry of antibody incompatible kidney transplants has been established to enable outcomes following ABO and HLA incompatible transplantation to be defined, as well as establishing permissive levels of antibody. Another example is the development of a Ventricular Assisting Device (VAD) database. VADs can be implanted in patients with weakened hearts as a bridge to transplant or to support patients whose graft has failed. Work is now commencing to analyse outcomes post implant and post transplantation if the patient goes on to receive a heart transplant. As the size of these patient groups increases, more detailed analyses that incorporate risk adjustment become possible.

In organ allocation, a national allocation scheme for both pancreas and islets has been developed. Following the identification of key factors associated with outcome, namely waiting time, level of sensitisation, cold ischaemic time and donor body mass index, over 40 different allocation algorithms were compared using a simulation process. A particular scheme was agreed with the pancreas transplant community and implemented in 2010. A similar process is now underway for liver allocation and the merits of a national lung allocation scheme for the most sickest patient on the lung recipient waiting list are now being investigated.

Much information about the potential for donation in the UK, and statistics such as the proportion of potential donors who actually donate, known as the conversion rate, has been obtained from the Potential Donor Audit (PDA). This study of whether patients who die in intensive care units across the UK become organ donors has shown that there are three obstacles to the supply of deceased donor organs for transplantation. These are the identification of potential donors, referral of potential donors to donor transplant coordinators and obtaining the consent of relatives; for example, in 2013/14 the audit has shown that when approached, 59.4% of relatives give consent for solid organ donation to proceed. Procedures that are designed to improve these aspects of the donation pathway are now being introduced.

The department is also involved in clinical trials and studies in transfusion medicine. The NHSBT Clinical Trials Unit was established in April 2013 to support NHSBT's programme of clinical trials

with aims to assist with the design, conduct, analysis and publication of clinical trials and other prospective studies. In transfusion medicine, their involvement ranges from laboratory based experiments to large scale observational studies of patients who have received blood transfusions.

Statistical support is provided throughout the life cycle of a study, from advising on study design and sample size requirements through to the final analysis and papers for publication. Current work includes a two-stage randomised superiority trial, comparing platelet transfusion practice in stable non-bleeding babies, and a large multicentre observational study concerning the national incidence of massive transfusion for trauma.

The role of statisticians at NHSBT involves;

- Reporting transplant activity to commissioners
- Providing statistical evidence to assist in policy changes (e.g. organ allocation schemes)
- Producing and presenting papers for national organ advisory group meetings held twice yearly
- Carrying out statistical modelling studies in collaboration with surgeons which are published in medical journals and presented at conferences.

There is much to learn as the science evolves in order to reduce the substantial gap between the number of patients waiting for a transplant and the much lower number of donated organs.

Everyone plays a part in saving lives and there is a real sense of team effort: clinicians, nurses, NHSBT data teams, the Duty Office (where donations and transplant patients are registered) as well as statisticians.

[How to become a donor](#)

## **References**

<http://www.organdonation.nhs.uk/> [accessed 6/2/15]

Based on an article written for FMSP by Dr Jenny Lannon, Principal Statistician, NHS Blood and Transplant (Bristol).