

# New developments in Statistics and Clinical Audit in NHSBT

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 and clinical audit.

To meet the demand for the design and analysis of quantitative studies in all these areas and to strengthen clinical audit activity, a new Statistics and Clinical Audit service has been established by NHSBT.

Service evaluation and clinical audit can lead to improvements in organ, blood and tissue services. Because much statistical work is focussed on organ donation and transplantation, some examples from this area are given to illustrate the breadth of activity. Opportunities in other areas are then highlighted.

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## Studies in organ donation and transplantation

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.

## Antibody incompatible transplantation

Data associated with the introduction of novel transplant procedures

enables their advantage to be quantified. To this end, 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. Initial results have shown that unadjusted three year graft survival rates are similar for both ABO and HLA incompatible transplantation, and are close to the 88% survival rate for deceased donor kidney transplantation. As the size of this patient group increases, more detailed analysis that incorporate risk adjustment will become possible.

## Pancreas allocation

Inorganallocation, 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 has now been agreed with the pancreas transplant community and the IT infrastructure needed for its implementation is under development. The merits of a universal liver allocation scheme based on either clinical need or transplant benefit are now being investigated.

## Potential Donor Audit

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, the audit has shown that when approached, only 60% 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.

## Studies in transfusion medicine, stem cell and tissue transplantation

One of the main drivers for the establishment of NHSBT's Statistics and Clinical Audit service was to provide increased support for observational studies designed for service evaluation in all areas. This has led to our involvement in a number of major projects. These include a multi centre observational study on the use of blood components in paediatric cardiac surgery, a study funded by the National Institute of Health Research on traumatic coagulopathy and massive transfusion, and a study of bleeding tendency in children in Intensive Care Units. An important issue in many of these studies is how the need for blood products, or the incidence of coagulopathy, depends on demographic characteristics, the clinical management of a patient, and other factors, and this in turn requires the development and validation of statistical models.

There is a long history of following up recipients of solid organ and corneal transplants, and the quality and completeness of data in the UK Transplant Registry is of a standard comparable to that of many clinical trials. The need for outcome data following stem cell transplantation, and the transplantation of tissues is now recognised, and we are looking forward to contributing to the development of a process that will enable clinical practice in these areas to be informed by an evidence base built on outcome analyses.

## Clinical Audit

Clinical audit is essential for quality improvement in all areas of NHSBT activity and real improvements in service result from aligning clinical audit to the clinical risks associated with the donation and transplantation of blood, tissues and organs. Plans for future audits are likely to be stimulated by the specification of appropriate triggers for an audit, and the audit cycle used to promote quality and clinical effectiveness. New partnerships between clinical audit staff and statisticians will mean that audits are based on sound sampling strategies, with sufficient numbers of individuals to ensure that the results are meaningful. The audit results will then provide a sound basis for subsequent action.

The Care Quality Commission now requires all NHS organisations

to comply with standards for clinical audit. For NHSBT, these include the formulation of an audit programme to facilitate improvements in the service that we provide to both donors and patients. In addition, the establishment of the National Clinical Audit Advisory Group demonstrates an increasing emphasis on the importance of clinical audit within the NHS.

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## The future

We all welcome the opportunity to collaborate with scientists and clinicians in services related to blood, tissues and organs, who are developing observational studies designed to evaluate service provision, as studies in their own right or as a prelude to a clinical trial. We also encourage early discussion of proposals for clinical audit. More substantive engagement on project work will generally be through funded projects, and we are particularly keen to be involved at an early stage in the development of grant proposals where statistical input is anticipated.

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## More information

This article also appears in *Blood and Transplant Matters*, available on request from [carol.griffin@nhsbt.nhs.uk](mailto:carol.griffin@nhsbt.nhs.uk)

# Quality of life following paediatric cardiothoracic transplantation

Dr Amy McNaughton, Chartered Clinical Psychologist at the Freeman Hospital, Newcastle Upon Tyne looks at the quality of life following heart and lung transplants in children.

The first paediatric cardiac transplant at Freeman Hospital was in 1987 and the first paediatric lung transplant in 1990. Since then there have been over 200 heart or lung transplants. It is now estimated that over 80% of children receiving a solid organ transplant will survive into adolescence and adulthood (Kelly, 2006). Whilst there have been many, significant medical and surgical advances documented during this time, there has been little systematic, rigorous research into the quality of life of children following transplantation.

There are many benefits for children following transplantation: extended life expectancy and the potential to participate in more

activities at school and at home. Children are able to take part in simple childhood pastimes which are often taken for granted. For example: riding a bike with friends, managing full days at school, and taking part in PE lessons. Moreover, it would appear that, overall, developmental and cognitive functioning post transplant is within the normal range for these children (Wray et al, 1992) and therefore participation in such activities is not disadvantaged. Another study (Petroski et al, 2009) showed that, despite serious, late complications, a cohort of adult transplant patients at least ten years out from paediatric cardiac transplantation, reported physical and mental health similar to that of the general population.

The life saving and dramatic changes brought about by a paediatric organ transplant are significant and far-reaching. In the main, children



Dr Amy McNaughton

and families are offered a life-line during an extremely distressing time, by another (the donor) family for whom all hope is gone. This precious gift can bring about immense physical, psychological and social change for the transplanted child and their loved ones. These changes go on throughout the weeks, months and years following transplant surgery and usually result in great joy and increasing quality of life for all involved.

### Psychological adjustment

However, whilst a transplanted organ is an amazing gift, a transplant can bring difficulties for some children and families. Uncertainty, loss of role (e.g. student, sportsperson, healthy child), adjustment to new situation, traumatic reactions, difficulties adhering to a lifelong medication regimen, changing appearance with medication, regular hospital visits, changing future and shorter life expectancy are all possible consequences of transplantation which can interrupt a child's social, psychological and physical development and, therefore have a negative impact on quality of life. Children do not exist in isolation; they are part of families, schools and communities and there are changes in quality of life for those in their wider systems, particularly parents and siblings. For example: the potential to get back to a 'normal' family life following a period of critical illness and great uncertainty, and, at times, a new perspective on life.

Not surprisingly most families can benefit from professional assistance in making the tremendous adjustments necessary to cope with life-threatening illness and subsequent post transplant care. Thankfully most families and children make that adjustment and go on to have rewarding and extended lives.

**Acknowledgments:** The children and families we work with and The Paediatric Cardiothoracic team at Freeman Hospital, in particular, Dr Richard Kirk, Julie Flett, Terry Hewitt and Laura Lane, Angela Nicholson.

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### More information

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If you would like to see a copy of our sister publication *Blood and Transplant Matters*, email [carol.griffin@nhsbt.nhs.uk](mailto:carol.griffin@nhsbt.nhs.uk)

# A new era in intestinal transplantation

Dr Girish Gupte,  
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Hepatologist at  
Birmingham Children's  
Hospital looks at the  
progress being made  
with intestinal  
transplantation.

Intestinal transplantation is being offered for children and adults with life threatening complications related to intestinal failure defined as: critical reduction of functional gut mass below the minimal amount necessary for adequate digestion and absorption to satisfy body nutrient and fluid requirements for maintenance in adults and children.

Most of the children and adults with intestinal failure (Table 1) can survive on long term home parenteral nutrition (PN). There is no doubt that

home PN is an effective treatment that has improved survival of adults and children with irreversible intestinal failure in the last three decades. However, some develop severe complications such as liver disease, impaired venous access and recurrent life threatening complications and would benefit from timely referral for intestinal transplantation.

The current criteria for intestinal transplantation are as outlined in Table 2. There are certain exclusion criteria for intestinal transplantation which are outlined in Table 3. The type of transplant is decided by the severity of the liver disease. In children and adults with mild or no liver disease, isolated intestinal transplantation is an option while in children and adults with moderate to severe liver disease, combined liver and bowel transplantation can be performed.

## The operation

The operation can last from seven to 13 hours depending on the complexity of the case. The median hospital stay following an intestinal transplant may vary from one to three months depending on the complications in the post-transplant period. In the majority of children and adults, PN is discontinued within a few weeks after intestinal transplantation and they are discharged home on a combination of tube feeds and normal diet.

In the last decade, increasing numbers of intestinal transplantation are being carried out in 71 centres across the world. To date more than 2000 intestinal transplants have been performed. The results of small bowel transplantation have improved dramatically in recent years with an 90% one year survival reported from the intestinal transplant registry ([www.intestinaltransplantregistry.org](http://www.intestinaltransplantregistry.org)) and some individual centres around the world reporting similar figures for three year survival.

The focus of the intestinal transplant community has shifted from short term survival to long-term survival with issues related to quality of life. Quality of life is a difficult domain to assess as it is a broad-ranging concept affected in a complex way by health, psychological state and social status and can vary from individual to individual. The lack of a standardised quality of life instrument means that it is difficult to compare the quality of life reported from different studies. There have been few studies made in adults and children following intestinal transplantation and there is a need for a larger multicenter study.

## Survival rates

O'Keefe<sup>5</sup> reported on quality of life in a cohort of 46 adult patients 12 to 36 months after intestinal transplant. This group of adult patients were found to have significant improvements in 13 out of 26 domains assessed after transplant. There have been few studies comparing quality of life of home PN and intestinal transplant recipients. Pironi<sup>2</sup> compared quality of life in adults on home PN and following successful intestinal transplantation. The subjective health feeling in adults following intestinal transplantation was better than in adults on home PN, whereas vitality and mental domains were comparable in intestinal transplant and home PN adults.

## Impact on parents

Children's ill health can have an

adverse impact on quality of life of the parents. Sudan<sup>3</sup> reported on quality of life in 10 to 16 year old small bowel transplant recipients. The recipients rated their quality of life as equivalent to healthy children of the same age, although their parents remained more anxious than the parents of healthy children.

Our group (unpublished work) has compared the quality of life in parents of children on home PN or pre-intestinal transplantation, and to examine the changes in parental quality of life in the first year post intestinal transplantation. Our results showed that both home parenteral nutrition and pre-intestinal transplantation had significant impact on parental mental health, with all areas of mental health affected.

Parents of children on home PN reported worse mental health in all domains than parents of children awaiting intestinal transplantation. Some parents with children on home PN even reported severe depression. It was reassuring that intestinal transplantation had a positive impact on parental mental health, with all domains improving with time post transplantation. Impact on parental emotions also improved over time following intestinal transplantation.

In summary, not only are the results of intestinal transplantation improving over the last few years, but children and adults following intestinal transplantation can expect to live longer and lead a good quality of life.

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## More information

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### Surgical

- **Surgical SB secondary to neonatal disease:**
  - Necrotising enterocolitis
  - Volvulus
  - Gastroschisis,
  - Intestinal atresia.
- **Surgical SB secondary to**
  - trauma
  - mesenteric vessels disease (ischaemia, volvulus),
  - extensive IBD or radiation enteritis
  - Gardner's syndrome and desmoid

### Non-surgical

- **Primary enterocyte disease:**
  - Microvillous inclusion disease
  - Tufting enteropathy
  - Protracted diarrhea
- **Malabsorption secondary to**
  - Crohn's disease
  - radiation enteritis
  - lymphangectasia
- **Gut motility disorders:**
  - Chronic primary pseudo-obstruction
  - Hirschprung's disease

Table 1 : The common causes of Intestinal Failure in paediatrics and adults

- **Irreversible intestinal failure with major complications**
  - Recurrent or life threatening sepsis
  - Loss of 50% or more central venous access sites
  - Recurrent and intractable fluid balance issues
  - Liver disease with portal hypertension

Table 2: International criteria for intestinal transplantation

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>■ <b>Absolute</b> <ul style="list-style-type: none"> <li>• Profound or progressive neurological dysfunction</li> <li>• Non-correctable disease in organs outside GI tract</li> <li>• Active systemic sepsis</li> <li>• Malignancy</li> <li>• Psychosocial problems – severe and irreconcilable</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>■ <b>Relative</b> <ul style="list-style-type: none"> <li>• ITU care</li> <li>• Immunodeficiency</li> <li>• Drug dependency</li> <li>• Loss of conventional venous access</li> <li>• Neoplasia benign or of uncertain prognosis</li> <li>• (<i>per se</i> age is not a contraindication)</li> </ul> </li> </ul> |
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Table 3 : Contra-indications for intestinal transplantation

# Launching a professional development programme for clinical leads

An exclusively designed professional development programme intended to introduce UK wide Clinical Leads and Non-Clinical Champions to the complexities of organ donation will be launched on 1st February 2011. The programme has been designed by NHSBT in association with Deloitte, the professional services firm. Deloitte have expertise in the design and delivery of leadership programmes and organisational change and extensive experience of working with leaders in the health sector.

A range of national and regional events are planned throughout 2010 and will meet a wide range of learning needs. Delivery will include clinical master classes with real life scenarios focused on strategic improvement areas. 'Pod casts,' and an on-line self assessment tool together with regional peer consulting groups to support best practice learning, however remote the participants happen to be.



Bruce Keogh

“ This exciting, innovative programme will not only give you skills to increase organ donation in your hospital but will support leadership to the benefit of the whole NHS. ”

Bruce Keogh

The programme has gained the support of many professional bodies including:

- The Department of Health
- The NHSBT Donation Advisory Group
- The Royal College of Anaesthetists (including lay individuals)
- The Intensive Care Society
- The College of Emergency Medicine
- The Royal College of Paediatrics and Child Health
- The British Association of Critical Care Nurses

The Professional Development Programme will:

- Build participants knowledge, skills and experience and enable them to facilitate behavioural and attitudinal change including:
  - 11 clinical expert areas
  - Initiating change and developing change management strategies
  - Overcoming resistance and behavioural analysis
  - Dealing with stakeholders
  - Leading and managing change
  - Changing organisational culture
  - Business planning cycle
- Deliver a sense of community and networks and encourage sharing of ideas and developing of best practice
- Be aligned to the needs of the organisation and its stakeholders
- Be based on expert input - from NHSBT and NHS organisations (Clinical / Non-Clinical Donation Champion and Donor Transplant Co-ordinators and clinical Subject Matter Experts).
- Facilitate events offering access to leading thinkers to inspire and challenge participants.
- Be based on real issues and challenges that matter to Clinical and Non-Clinical Leaders and their organisations, focusing on benefits aligned to improving Organ Donation
- Be supported by robust governance - A group comprising NHSBT, Deloitte, NHS organisations and key participants will steer the programme, allowing clear accountability and measurable, aligned results
- Focus on outcomes – increasing Organ Donation whilst respecting the need of the patient, the family and society
- Focus on collaboration between Clinical Leads, Non-Clinical Champions and Donor Transplant

Co-ordinators

- Enable individuals to undertake self assessment to understand priority development areas to focus on
- Integrate seamlessly with any clinical education tool/programme developed by DH
- Meet “standards” for a clinical education programme
- Minimise time away from patients for clinicians
- Utilise blended and tailored delivery methods; including discussion, debate and reflection
- Support regular communication of programme progress - success stories for the programme
- Provide a sustainable element to the programme and support continuous improvement

**Boost knowledge levels**

Curriculum materials are currently being developed by Clinical Leads with specific expertise (Subject Matter Experts). Topic materials are designed to increase both knowledge and confidence of Clinical Leads and Non-Clinical Donation Champions to identify, lead, initiate and deliver changes within their organisations, including the start up of new donation programmes from scratch for example, donation in emergency medicine or initiating a new non-heartbeating donation programme.

The programme will boost the Clinical Leads' level of clinical knowledge, expertise and confidence around a core curriculum of donation and transplantation subjects to maximise their performance within their leadership roles. It will also identify best practice for donation, retrieval and transplantation and maintain awareness of emerging practice and trends from other legal, ethical and professional bodies.

**Clinical topics to be covered include:**

- Law and ethics
- Referral, consent and authorisation
- Donor management, physiology and assessment
- Non-heartbeating donation
- Diagnosing brain stem death
- Emergency medicine donation
- Paediatric organ donation
- Tissue donation
- Eye donation

In addition to the clinical components of the course a range of senior



Paul Murphy

“ For people working in this field, this programme offers a great introduction into the many different skills required and will give them a real understanding of how organ donation can be improved. We are delighted to be working with Deloitte on this project and anticipate it being a very lively and popular course. ”

Paul Murphy

management consultants and facilitators drawn from Deloitte will be designing and leading courses to enable Clinical Leads and Non-Clinical Donation Champions to influence and manage behaviours and beliefs of colleagues, as well as overcoming barriers to change.

Attention will also be given to develop Clinical Leads' confidence and skills to address and proactively manage local, regional and national press enquiries and to publicly