The Trauma Audit & Research Network

An overview

The TRAUMA Audit & Research NETWORK

DEVELOPING EFFECTIVE CARE FOR INJURED PATIENTS THROUGH PROCESS AND OUTCOME ANALYSIS AND DISSEMINATION

The University of Manchester
“A National Trauma Audit and Research Network should collect data from all hospital Trusts that receive severely injured patients. The development, improvement and monitoring of the standards of care for severely injured patients would thus be assured.”

RCS/BOA Joint report 'Better Care for the Severely Injured'
June 2000

“Over the last decade, improvement in trauma services have made important contributions to the reduction in deaths, but there remains evidence of significant variation in UK performance.”

Trends in Trauma Care in England and Wales 1989-97
Lancet 2000; 355:1771-75

“Audit of the results (which is likely to depend on the severity of the case mix), treatments and the organisation pathway, is essential.”

Report of Working Party on Management of Patients with Head Injuries
June 1999 RCS

“The overall aims of TARN fit in well with the Clinical Governance agenda. In particular, trusts are required to put in place arrangements for monitoring and improving the quality of health care they provide. Continuous trauma audit is an integral part of this process. Currently participation in TARN runs at 49 per cent of trauma-receiving trusts. Chief Executives of those remaining trusts are urged to consider this very useful audit tool.”

Chief Executive Bulletin, Department of Health
August 2002
Trauma

A major problem

A profile of the Trauma Epidemic

- Worldwide injury is a major public health problem. In many countries this is unrecognised because of the paucity of available statistics.

- In the UK, injury is the commonest cause of death between the ages of one and forty.

- For every fatality there are at least two survivors with serious permanent disabilities.

- There is a strong relationship between social deprivation and the incidence of injury and some evidence that the disadvantaged are less likely to survive.

- The facilities for treating the injured and their effectiveness vary across the UK.

An expensive problem for the country…

At 1995 prices, every trauma death costs the nation in excess of £0.75 million and every major injury £50,000. Cost effectiveness analysis is routinely used by highway authorities to assess the potential effect of road safety measures. In contrast, there is no equivalent on-going financial analysis undertaken to measure the effectiveness of new developments in trauma care. This is, in part, because the apportionment of costs would be difficult, but also because there is no culture of economic appraisal of emergency health care systems at the point of delivery. Yet the potential savings are huge.
The Trauma Audit & Research Network

Summary of Work

The Trauma Audit & Research Network (TARN) is a group of hospitals from all over England, Wales, and other parts of Europe whose contributions employ a staff of 9 people on a non-profit basis. They are located at the University of Manchester, Hope Hospital in Greater Manchester. The Trauma Network (previously known as MTOS) has been operating for the past 14 years and in 1997 became self-funding.

Data Collection

Data is collected by staff of the member hospitals on dedicated data collection forms relating to the care and outcome of trauma patients. In most cases, a Clinical Auditor and Clinician from the Emergency Department complete these forms, using a combination of existing data collection systems and patient notes. They then send them to the TARN offices.

Data Coding, and Scanning

The injuries for each case are assigned AIS codes by our trained and experienced staff and subsequently an Injury Severity Score (ISS) is calculated. The cases are validated and scanned into the TARN database (which currently holds around 200,000 cases).

Analyses

Reports are distributed on a monthly and quarterly basis to the member hospitals and they are encouraged to request additional customised analysis to support trauma audit, specialist meetings and improvements in care. The monthly clinical case report contains detailed information about each case including the expected versus actual outcome, this enables certain cases to be highlighted for multidisciplinary review and discussion.

Quarterly reports are far more comprehensive and while they follow a routine of core analyses, it is supplemented with other analysis themed on head injury, orthopaedic injury, thoracic injury and efficiency systems. The reports are comparative and based on the standards set out in the RCS/BOA report ‘Better Care for the Severely Injured’.

Aims

~ to collect and analyse clinical and epidemiological data and thereby to provide a statistical base to support clinical audit, to aid the development of trauma services and to inform the research agenda.

Objectives

~ Support multidisciplinary clinical audit by analysis of individual case management
~ Provide confidential comparative statistics to clinicians about institutional performance
~ Provide summative information to local health commissioners about the trauma workload and its management
~ Provide population based statistics on the epidemiology of trauma
~ Identify areas of potential research interest

Analysis includes anonymous comparison of the performance of each system of care against others in the database. This statistical analysis is called the ‘Ws’ and the data is adjusted to account for the confounding factors of age, injury severity (ISS), physiological change (Revised Trauma Score [RTS]) and method of injury. The turnaround from receipt to report is one month.
TARN Reports

**Clinical Case Reports**

Clinical Reports are produced on a monthly basis and identify the outcome of all patients submitted to TARN the previous month who have received emergency care and highlights suggested cases for review. The reports can be used for discussion at clinical audit meetings, which in the long term will improve patient care locally, as well as contributing to staff development.

**Transferred Cases**

Patients who are transferred, frequently need immediate care such as specialist surgery or Intensive Care. It is therefore imperative that TARN track the process of care between both hospitals to ensure that final outcomes can be compared across sites and improvements are achieved. Hospitals are given a monthly transfer report, listing unmatched cases that have been transferred from/to participating sites.

**Quarterly Reports**

Reports are produced every three months with process and outcome measures for each site compared against the database. The report includes Charts (see below), which indicate overall hospital performance against other participating sites (anonymised). The report is sent to authorised Trauma Network Clinicians and Data Coordinators.

![COMPARATIVE OUTCOME ANALYSES (Ws graph)](chart)

**Ad Hoc Analyses**

Ad Hoc Reports and Analyses can be produced for any participating hospital and can contribute towards both local studies and national comparisons, which can then be used at specialist meetings. The Ad Hoc analyses and reports are provided on disc, or on overheads for presentation.

Examples include:
- Analysis of pre-hospital times and interventions at scene
- Specific analysis of patients with head injuries
- Mechanism of injury/age groups/severity (ISS) compared with regional or national participating hospitals
TARN Responses

A response to Clinical Governance

The Trauma Network positively responds to many of the needs of Clinical Governance. TARN facilitates links between trauma care providers and auditors at local, regional and national levels with the intention of fostering good practice and wide based multidisciplinary audit. TARN measures a wide range of aspects of trauma care from the scene of injury to discharge and compares and contrasts the results against other systems of care. Focus is drawn to specific process of care issues and data are combined to provide an overview of the performance of a hospital or region. Thus comparisons between institutions, or over time, become increasingly valuable.

Customised reports to meet specific audit needs are available on request. We advocate wide dissemination of the reports, which works to support a no-blame culture and an ethos of evidence based change.

A response to the RCS/BOA Recommendations

KEY STATEMENTS FROM THE REPORT RELATING TO THE WORK OF TARN:

- The Royal College of Surgeons of England and the British Orthopaedic Association recommend that standards of care for the severely injured should be nationally coordinated and systematically audited.

- The National Trauma Audit & Research Network should collect data from ALL hospital Trusts that receive severely injured patients. The development, improvement and monitoring of the standards of care for severely injured patients would thus be assured.

- The achievement of audited standards of care with satisfactory outcomes should determine a hospital's future reception of severe injuries rather than its size or apparent catchment population.

A response by the Department of Health – Chief Executive’s Bulletin Sept 02

“The overall aims of TARN fit in well with the Clinical Governance agenda. In particular, trusts are required to put in place arrangements for monitoring and improving the quality of health care they provide. Continuous trauma audit is an integral part of this process. Currently participation in TARN runs at 49 per cent of trauma-receiving trusts. Chief Executives of those remaining trusts are urged to consider this very useful audit tool.”
Past Publications

**Preliminary analysis of the care of injured patients in 33 British Hospitals: first report of the United Kingdom major trauma study**

The effectiveness of management of major trauma in the United Kingdom was measured by reviewing the care of all seriously injured patients seen over two years in 33 hospitals, which received patients who had sustained major trauma.

14,684 injured patients admitted for more than three days, transferred or admitted into an intensive care bed, or dying from their injuries, were studied.

*British Medical Journal* 1992; 305; 737-740

**Standardised comparison of performance indicators in trauma: a new approach to case-mix variation**

The new Ws statistic, described in this paper is standardised with respect to injury severity mix and has produced more accurate comparisons between institutions. Confidence intervals have been used to illustrate graphically the magnitude of Ws, its direction, accuracy and statistical significance.

*Journal of Trauma* 1997; 38; 763-766

**Trends in Trauma care in England and Wales 1989-1997**

This paper describes an analysis of case-severity, treatment and outcome variables from 91,602 patients’ records on the database at the end of 1997, collected from 97 (49% of trauma receiving) hospitals in England, Wales and two in Ireland. Longitudinal analyses were undertaken of odds of death, process variables and individual hospitals’ performance.

The severity-adjusted odds of death after trauma declined gradually from 1989 (odds ratio 1997/1989 0.63 [95% CI 0.49-0.82]). In 1997, the reduction in odds of death was significant even after adjustment for missing data (ratio 1997/1989 0.72 [0.55-0.92]) and recruitment of new hospitals (0.64 [0.44-0.93]).

There was significant variability in the proportion of survivors (adjusted for severity of injury and age) between the highest and lowest 10% of UK hospitals. The time between the call to the emergency services and arrival at hospital increased from 32 min in 1989 to 45 min in 1997, irrespective of injury severity. The proportion of severely injured patients seen first by senior doctors increased from 32% to 60%.

*Lancet* 2000; 355: 1771-75

**Lack of change in trauma care in England and Wales since 1994**

An important paper displaying the trends in trauma care between 1989 and 2000. To measure trends in outcome, severity adjusted odds of death per year of admission to hospital were calculated for all hospitals (adjustments are for Injury Severity Score, age and Revised Trauma Score). The grade of Doctor initially seeing the injured patient in accident and emergency and median prehospital times per year of admission were calculated to demonstrate trends in the process of care.

The results showed that there was a significant reduction on the severity adjusted odds of death of 3% per year over the 1989-2000 time period. During the period of 1989-1994 the odds of death declined most steeply (on average 6% per year p=0.004). Between 1994 to 2000 no significant change occurred (p=0.35). The percentage of severely injured patients (ISS>15) seen by a consultant increased from 29 to 40 from 1989-1994 but has remained static subsequently. Median prehospital times for severely injured patients have not changed significantly since 1994 (51 to 45 minutes).

*Emergency Medicine Journal* 2002; 19: 0-3

_for a complete research portfolio, please contact TARN on 44 (0) 161 206 4397_
Trauma Research

Current and Future Projects

Spinal Injuries

A specific example of our current work is to review over 9000 spinal injuries – initiated due to concerns about current strategies of immediate care

The TRISS Methodology

The best to date. A review of logistical regression model is currently being undertaken.

Disability Feasibility Study

Data collected by the Trauma Network has to date measured only death and survival after trauma. For every person who dies after major trauma, at least two survive with major permanent disability and many more are disabled to a varying extent over a prolonged period. The current pilot study is investigating the effects of traumatic injury 12 month post incident as well as developing both a suitable and efficient procedure for data collection on a national scale.

EuroTARN: Developing a European Core Trauma Dataset

One of the main objectives of the development of a European Trauma Registry is to promote high standards of care for the injured in Europe and thereby reduce the associated burden of death and disability. The comparison of different practices throughout Europe is central to the process. The Initiative began in December 2002 with the creation of the ‘EuroTARN’ website. A European Core Trauma Dataset and Inclusion Criteria is due for completion by Autumn 2003 by the means of the Delphi Technique. This will in the long term allow the use of the dataset to promote the development of clinical guidelines and associated performance indicators. The development is being carried out at relatively little cost or resources.

Influence of Neurosurgical centre on head injury outcome

To determine whether treatment of patients in Neurosurgical centres (vs non-neurosurgical centres) impacts on mortality after head injury. All patients with GCS <9 or those requiring intubation after head injury were identified and patients grouped into whether they were treated in neurological centres or non neurological centres. The results showed that crude mortality increased in patients treated in NNC. Data suggests that all patients with a severe head injury should be treated in a neurological centre.

Current research also includes: Pelvic Fracture patterns of injury care, and Fluid Resuscitation – influence on Mortality.

Future Research includes Influence on Deprivation and Patterns of trauma outcome according to hour presentation.

For an updated research timetable, please refer to our website: www.tarn.ac.uk/research
“Children are different” but, remarkably, very little work has been published which permits an analysis of paediatric trauma care. The main TARN database contains information on 19,632 children under the age of sixteen and has been a valuable asset. For example it has been used to demonstrate improvements in outcome during the 1990s. However many aspects of paediatric trauma assessment and management differ significantly from adult trauma care and it has been recognised that the data collection form, designed for adults, requires some changes for children.

‘TARNLET’ was established in 2000 to address these and other questions relating to paediatric trauma care. A discrete paediatric group has been formed and a separate data collection form will be evaluated. A focused paediatric element to the database with more detailed information, particularly about the characteristics of the trauma service, will undoubtedly provide a valuable statistical platform on which to debate the future provision of paediatric services.

Reducing accident rates in children and young adults: the contribution of hospital care. I Roberts, F Campbell, S Hollis, D Yates on behalf of the Steering Committee of the Major Trauma Outcome Study Group (now TARN): BMJ 313 1239-1241.
Evidence of improvements healthcare and changes in practice

Evidence of improvements in healthcare

- Improvements in the standardised W score in some participating hospitals
- Increase in the odds of survival of injured patients throughout one region of England
- National increase in Senior Doctors treating seriously injured patients

Evidence of changes in practice

- Improved documentation of clinical notes
- Increases in multi disciplinary meetings
- Improved communications between specialities
The Future

Other Outcome Measures
At present, there is no measure for disability post injury and the need for assessing quality of survival is currently being addressed by TARN.

Continued Statistical and Reporting Improvements

Engage a wider audience
The monitoring of traumatic injury is essential for the improvement in care and overall outcome. Currently, only 50% of trauma receiving hospitals in England & Wales participate in TARN. To ensure that improvement in trauma care is achieved nationwide, it is essential for all trauma receiving hospitals to consider the long term benefits.

Improved TARN System
TARN’s objective in 2002 was to initiate plans for the design and implementation of a potential web based system, which in the future could replace the current method of ‘paper form’ data submission and address the needs of the RCS/BOA report ‘Better Care for the Severely Injured’. It is intended that an online system would improve the efficiency of data collection, reduce overall validation time and ensure an effective means of data output in the form of immediate reports.

Consultation and project planning is now complete. Funding is now being sought.

Changing practice Improving trauma care
TARN Membership 2005

North West
- Arrowe Park Hospital
- Blackpool Victoria Hospital
- Booth Hall Childrens Hospital
- Burnley General Hospital
- Calderdale Hospital
- Chorley District General Hospital
- Countess of Chester Hospital
- Cumberland Infirmary
- Fairfield General Hospital
- Furness General Hospital
- Hope Hospital
- Manchester Royal Infirmary
- North Manchester General Hospital
- Rochdale Infirmary
- Royal Albert Edward Infirmary
- Royal Lancaster Infirmary
- Royal Liverpool Childrens Hospital (Alder Hey)
- Royal Liverpool University Hospital
- Royal Manchester Children's Hospital
- Royal Oldham Hospital
- Royal Preston Hospital
- Stepping Hill Hospital
- Tameside General Hospital
- Trafford General Hospital
- University Hospital, Aintree
- Walton Centre for Neurology
- Warrington Hospital
- West Cumberland Hospital
- Whiston Hospital
- Wythenshawe Hospital

Wales
- Glan Clwyd District General Hospital
- Morriston Hospital
- Nevill Hall Hospital
- Prince Charles Hospital, Merthyr Tydfil
- Princess of Wales Hospital, Bridgend
- Royal Gwent Hospital
- University Hospital of Wales, Cardiff
- West Wales General Hospital
- Withybush General Hospital
- Wrexham Maelor Hospital
- Ysbyty Gwynedd, Bangor

West Midlands
- Birmingham Childrens Hospital
- Birmingham Heartlands Hospital
- City Hospital Birmingham
- County Hospital, Hereford
- Coventry & Warwickshire Hospital
- Hereford County Hospital
- North Staffordshire Royal Infirmary
- Sandwell District General Hospital
- Selly Oak Hospital

Republic of Ireland
- Waterford Regional Hospital

South East
- Bristol Royal Infirmary
- Bristol Royal Infirmary
- Derriford Hospital
- Jersey General Hospital
- Poole Hospital
- Royal Cornwall Hospital
- Royal Devon & Exeter Hospital
- Torbay Hospital
- Dorset County Hospital

South West
- Broomfield Hospital
- Crawley Hospital
- East Surrey Hospital
- Epsom Hospital
- John Radcliffe Hospital, Oxford
- Kent & Sussex Hospital
- Maidstone General
- Northampton General Hospital
- Queen Alexandra Hospital
- St Helier Hospital
- Stoke Mandeville Hospital
- Worthing Hospital

Northern & Yorkshire
- Airedale General Hospital
- Bradford Royal Infirmary
- Burnley General Hospital
- Cumberland Infirmary
- Dewsbury District Hospital
- Furmage Hospital
- Harrogate District Hospital
- Huddersfield Royal Infirmary
- Hull Royal Infirmary
- Leeds General Infirmary
- James Cook University Hospital
- Pinderfields General Hospital
- Pontefract General Infirmary
- Scarborough Hospital
- South Tyneside District Hospital
- St James' University Hospital
- Sunderland Royal Hospital
- University Hospital of Hartlepool
- University Hospital of North Tees
- Wansbeck General Hospital
- West Cumberland Hospital
- York District Hospital

Trent
- Derbyshire Royal Infirmary
- Diana, Princess of Wales Hospital
- Grantham & District Hospital
- Kings Mill Hospital
- Leicester Royal Infirmary
- Lincoln County Hospital
- Northern General Hospital
- Nottingham University Hospital
- Pilgrim Hospital
- Royal Hallamshire Hospital
- Scunthorpe General Hospital
- Sheffield Children's Hospital

Eastern
- Addenbrookes Hospital
- Basildon Hospital
- Colchester General Hospital
- Hinchingbrooke Hospital
- Ipswich Hospital
- James Paget Hospital
- Norfolk & Norwich General Hospital
- Peterborough District Hospital
- Queen Elizabeth Hospital
- West Suffolk Hospital

London
- Atkinson Morley's Hospital
- Hillingdon Hospital
- King College Hospital
- Royal London Hospital
- St Georges Hospital
- University Hospital Lewisham

Other European Countries
- University Hospital of Copenhagen
- Lison Teaching Hospital, Portugal
- Meilahti Hospital, Helsinki
- Republic of Ireland
- Waterford Regional Hospital

Other European Countries
- University Hospital of Copenhagen
- Lison Teaching Hospital, Portugal
- Meilahti Hospital, Helsinki

Other European Countries
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- Lison Teaching Hospital, Portugal
- Meilahti Hospital, Helsinki
Board & Executive Members 2004

Mr Nigel Zoltie* Consultant in Emergency Medicine, Leeds General Infirmary
Dr Kathy Rowan Director of Intensive Care National Audit and Research Centre (ICNARC)
Professor Jon Nicoll Director SCHARR
Ms Gaby Lomas Emergency Medicine Nurse, Hope Hospital
Professor Sir Miles Irving Chairman, Newcastle Hospitals NHS Trust
Dr Peter Oakley* Consultant Intensivist, North Staffordshire Royal Infirmary
Professor Tim Coats* Consultant in Emergency Medicine, Leicester Royal Infirmary
Mrs Maralyn Woodford* Executive Director, TARN
Professor David Yates* Chairman, TARN
Dr Fiona Lecky* Research Director, TARN
Mrs Marion Waters* Consultant in Emergency Medicine, Countess of Chester Hospital
Professor Keith Willett* Trauma Consultant, John Radcliffe Hospital, Oxford
Mr Ken Dunn Burns/Plastic Surgeon, South Manchester University Hospital
Mr Andy Volans* Consultant in Emergency Medicine, Scarborough Hospital
Mr David Dalton Chief Executive, Hope Hospital, Salford
Mr David Mendelow* Professor and Head of the Department of Neurosurgery, Newcastle General Hospital
Ms Sally Hollis Medical Statistician, Medical Statistics Unit, Lancaster University
Professor David Lloyd* Chair, Royal College of Surgeons of England Trauma Committee
Mr Martin Smith* Consultant in Emergency Medicine, Hope Hospital
Mr Brian Clingan Northwest Development Officer, Headway
Dr Jan Jones* Health Audit Manager, Queen’s Medical Centre, Nottingham
Dr Ian Maconochie* Consultant in Paediatric Emergency Medicine, St Mary’s Hospital, London
Professor Ian Roberts Professor of Epidemiology, London School of Hygiene and Tropical Medicine

* Members of the 2005 Executive Committee

TARNnet

Mr Derek Burke Consultant Paediatrician, Sheffield Children’s Hospital
Miss Elizabeth Symonds Consultant in Emergency Medicine, Hereford General Hospital
Mr Lorcan Duane Consultant in Emergency Medicine, Booth Hall Hospital
Ms Julie Flaherty Paediatric Emergency care Consultant, Booth Hall Hospital
Mr Ian Maconochie Consultant in Paediatric Emergency Medicine, St Mary’s Hospital, London
Mrs Yvonne Murray Chair, Clinical Audit Committee, Royal Manchester Children’s Hospital
Mr Stephen Playfor Intensivist, Royal Manchester Children’s Hospital
Professor David Lloyd Consultant Orthopaedic Surgeon, Department of Child Health, Alder Hey
Mrs Maralyn Woodford Executive Director, TARN
Professor David Yates Chairman, TARN
Dr Fiona Lecky Research Director, TARN
Mr John Thorne Consultant Paediatric Neurosurgeon, Hope Hospital

International Advisors

The following experts in trauma scoring, audit and research support the international work of TARN

Mr H Champion Trauma Surgeon, Washington USA
Professor H Delooz President, European Society for Emergency Medicine, Leuven, Belgium
Ms E Woodzin Co-Chair International Injury Scaling Committee
Further Information

<table>
<thead>
<tr>
<th>Our Address</th>
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<tbody>
<tr>
<td>The Trauma Audit &amp; Research Network</td>
<td></td>
</tr>
<tr>
<td>Clinical Sciences Building</td>
<td></td>
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<tr>
<td>Hope Hospital</td>
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<tr>
<td>Stott Lane</td>
<td></td>
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<td>Salford</td>
<td></td>
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<td>M6 8HD</td>
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<tr>
<td>United Kingdom</td>
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<table>
<thead>
<tr>
<th>Useful Contact Numbers</th>
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</tr>
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<tbody>
<tr>
<td>Phone: 44 (0) 161 206 4397</td>
<td></td>
</tr>
<tr>
<td>Fax: 44 (0) 161 206 4345</td>
<td></td>
</tr>
</tbody>
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<thead>
<tr>
<th>Web &amp; Email</th>
<th></th>
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<tbody>
<tr>
<td>web: <a href="http://www.tarn.ac.uk/">http://www.tarn.ac.uk/</a></td>
<td></td>
</tr>
<tr>
<td>email: <a href="mailto:tarn@tarn.ac.uk">tarn@tarn.ac.uk</a></td>
<td></td>
</tr>
</tbody>
</table>

**TARN Staff 2004**

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mo Adamopoulos</td>
<td>Quality Assurance &amp; Data Validation</td>
<td><a href="mailto:mo.adamopoulos@tarn.ac.uk">mo.adamopoulos@tarn.ac.uk</a></td>
<td>44 (0) 161 206 4337</td>
</tr>
<tr>
<td>Omar Bouamra</td>
<td>Medical Statistics</td>
<td><a href="mailto:omar.bouamra@tarn.ac.uk">omar.bouamra@tarn.ac.uk</a></td>
<td>44 (0) 161 206 4210</td>
</tr>
<tr>
<td>Antoinette Edwards</td>
<td>Projects</td>
<td><a href="mailto:antoinette.edwards@tarn.ac.uk">antoinette.edwards@tarn.ac.uk</a></td>
<td>44 (0) 161 206 5911</td>
</tr>
<tr>
<td>Phil Hammond</td>
<td>Data Validation</td>
<td><a href="mailto:phil.hammond@tarn.ac.uk">phil.hammond@tarn.ac.uk</a></td>
<td>44 (0) 161 206 1273</td>
</tr>
<tr>
<td>Jean Hodkinson</td>
<td>Accounts</td>
<td><a href="mailto:jean.hodkinson@tarn.ac.uk">jean.hodkinson@tarn.ac.uk</a></td>
<td>44 (0) 161 206 1350</td>
</tr>
<tr>
<td>Dr Fiona Lecky</td>
<td>Research Director</td>
<td><a href="mailto:fiona.lecky@tarn.ac.uk">fiona.lecky@tarn.ac.uk</a></td>
<td>44 (0) 161 206 4845</td>
</tr>
<tr>
<td>Kate Waterhouse</td>
<td>Administration</td>
<td><a href="mailto:kate.waterhouse@tarn.ac.uk">kate.waterhouse@tarn.ac.uk</a></td>
<td>44 (0) 161 206 4397</td>
</tr>
<tr>
<td>Laura White</td>
<td>Training &amp; Support</td>
<td><a href="mailto:laura.white@tarn.ac.uk">laura.white@tarn.ac.uk</a></td>
<td>44 (0) 161 206 5909</td>
</tr>
<tr>
<td>Maralyn Woodford</td>
<td>Executive Director</td>
<td><a href="mailto:maralyn.woodford@tarn.ac.uk">maralyn.woodford@tarn.ac.uk</a></td>
<td>44 (0) 161 206 5952</td>
</tr>
<tr>
<td>Alan Wrotchford</td>
<td>Database Management</td>
<td><a href="mailto:alan.wrotchford@tarn.ac.uk">alan.wrotchford@tarn.ac.uk</a></td>
<td>44 (0) 161 206 1148</td>
</tr>
<tr>
<td>Professor David Yates</td>
<td>Chairman</td>
<td><a href="mailto:david.yates@tarn.ac.uk">david.yates@tarn.ac.uk</a></td>
<td>44 (0) 161 206 4843</td>
</tr>
<tr>
<td>Clinical Research Fellow</td>
<td>Rotational Appointment</td>
<td><a href="mailto:tarn@tarn.ac.uk">tarn@tarn.ac.uk</a></td>
<td>44 (0) 161 206 4397</td>
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