National Clinical Audit of Specialist Rehabilitation following major Injury (NCASRI)

Analysis plan

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To be read in conjunction with the first year report published October 2016

Last update: 5.9.2017.

Signed off by The NCASRI Programme Board: 7.9.2017

1 Background

The **National Clinical Audit for Specialist Rehabilitation following major Injury (NCASRI)** is part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP), funded by NHS England, but overseen by the Healthcare Quality Improvement Partnership (HQIP). NCAPOP is a set of centrally-funded national clinical audit projects that collect data on compliance with evidence based standards, and provide benchmarked reports on the compliance and performance. They also measure and report patient outcomes.

This national audit project is undertaken against a background of continuing development of the Major Trauma Networks (MTNs). Regional trauma networks are now well-established in England, and 23 Major Trauma Centres (MTCs) treat adults with major traumatic injuries. Major trauma describes serious injuries that are life changing and could result in death or serious disability, including head injuries, severe wounds and multiple fractures. Major trauma centres are set up to provide specialised trauma care. They are hubs that work closely with local trauma units (TUs). The audit project specifically focuses on the rehabilitation needs of patients with traumatic injuries.

Following major trauma, the majority of patients will make a good recovery and return home with the support of their local services. However a small number will have complex rehabilitation needs requiring the skills and facilities of a specialist in-patient rehabilitation unit to make the transition from hospital to the community and to maximise their recovery of physical, psychological and social function. Specialist rehabilitation services form a critical component of the trauma pathway by moving patients to the most appropriate care setting, thus relieving pressure on acute care beds and enabling the Major Trauma Networks to function efficiently.

There is strong evidence for the effectiveness and cost-efficiency of specialist rehabilitation, especially when delivered from an early stage in the recovery pathway. However, this has not necessarily been implemented in many MTCs in England. To date the main focus for development of the MTNs has been on the acute and frontline services. There is wide variation in provision for specialist rehabilitation in different parts of the country, resulting in long waits and bed-blocking in some areas.

Many patients who still have complex rehabilitation needs at the point of discharge from the MTCs are currently repatriated to their local district general hospitals or trauma units to wait for a specialist rehabilitation bed to become available. We know that many never actually get to those services, but we do not know why.

A prescription for rehabilitation

The National Health Service England (NHSE) Service Specification for MTCs mandates use of a 'Rehabilitation Prescription' (RP) as a condition for best practice tariffs to support early identification of rehabilitation needs in patients with Injury Severity Scores (ISS) ≥9. It is not yet known what proportion of these will have complex needs.

The NHSE Service Specification for Specialist Rehabilitation defines four categories of rehabilitation needs (A,B, C and D). The majority of patients have category C and D needs which may be met by local (Level 3) rehabilitation services. Some will have more complex (category B) needs requiring further in-patient rehabilitation in a Level 2 specialist rehabilitation unit, and a small number will have highly complex (category A) needs) requiring more intense rehabilitation or the specialist skills, equipment and facilities of a tertiary Level 1 rehabilitation service.

The British Society of Rehabilitation Medicine recommends that patients who are likely to have category A or B needs should be assessed by a consultant in Rehabilitation Medicine (RM). If confirmed, they should receive a specialist rehabilitation prescription (SpRP) documenting their requirements for treatment in a Level 1 or 2 rehabilitation service, ensuring a timely referral to a rehabilitation centre according to their individual needs.

The SpRP does not replace the RP, but builds on it through the addition of four validated standardised tools to identify patients with complex needs and to describe and justify the requirement for specialist rehabilitation. These are:

- The Neurological Impairment Set for Trauma (NIS-Trauma) details the type and severity of impairment,
- The Patient Categorisation Tool (PCAT) details the types of rehabilitation need
- The Rehabilitation Complexity Scale (RCS-ET) describes and quantifies the rehabilitation resource requirements for medical, nursing and therapy inputs
- The Northwick Park Dependency Score and Care Needs Assessment (NPDS/NPCNA) details nursing and care needs and ongoing estimated the costs of care in the community

As highlighted in our first year report, however, implementation of the RP and SpRP is highly variable across England. (http://www.kcl.ac.uk/lsm/research/divisions/cicelysaunders/about/rehabilitation/NCASRI-Audit-Report.pdf)

Current data collection in trauma and rehabilitation

In general NHS information systems gather little or no information about rehabilitation following trauma making it very difficult to describe and evaluate rehabilitation needs and outcomes of seriously injured people. However, there are now well-established specialist national databases that systematically collect a wide range of clinical data on patients following major trauma.

- The **Trauma Audit and Research Network (TARN)** database collects patient level data on the acute care phase (including rehabilitation prescriptions) for all severely injured patients admitted to the major trauma centres (MTCs) across England.
- The **UK Rehabilitation Outcomes Collaborative (UKROC)** database collects and analyses clinical information on needs, input and outcomes for all episodes of in-patient specialist rehabilitation in England.

To date there has been no linkage between these datasets to track patients from the acute care centres into specialist rehabilitation. Thus we have no way of knowing whether patients who are identified as requiring specialist rehabilitation as they leave the MTCs actually receive it, and if they do what the outcomes are.

The National Clinical Audit of Specialist Rehabilitation following major Injury (NCASRI) audit

NCASRI was commissioned by the HQIP on behalf of NHS England to examine current provision of specialist rehabilitation services for patients with major traumatic injuries.

The contract for the provision of the NCASRI was awarded to the London North West Healthcare NHS Trust (NWLHT) in 2015. It is undertaken in a tripartite collaboration between:

- The UK Rehabilitation Outcomes Collaborative (UKROC) at Northwick Park Hospital,
- The Trauma Audit and Research Network (TARN) at Manchester University
- The Cicely Saunders Institute of Palliative Care, Policy and Rehabilitation at King's College London (KCL).

2 Overview of NCASRI

NCASRI will determine the scope, provision, accessibility, outcomes and efficiency of specialist rehabilitation services across England to improve the quality of care for adults with complex rehabilitation needs following major trauma.

Outcomes and quality of care will be evaluated in accordance with standards and recommendations laid out in national documents from the Department of Health and NHS England (NHSE), the British Society of Rehabilitation Medicine (BSRM) and the National Institute for Health and Care Excellence (NICE) – see **Appendix 1.**

2.1 NCASRI has 3 main elements:

Element	Description
1	An *organisational audit* to identify the current provision of specialist rehabilitation for trauma patients, and to map the pathways of care into and out of these services. *(Completed October 2016)*
2	A *prospective clinical audit* of new patients presenting within NHS Major Trauma Centres (MTCs) and who have complex rehabilitation needs and receive specialist rehabilitation. *(Commenced July 2016-complete analysis March 2018)*
3	A *feasibility study* for identifying the pathway and outcomes from existing data sources for patients who require specialist rehabilitation on discharge from MTCs, but do not subsequently attend. *(Exploration June 201 5- June 2017 – analysis of linked data April 2018)*

A key component of NCASRI will be to link the national clinical databases for acute trauma (TARN) and for specialist rehabilitation (UKROC) to track patients in their journey from the MTCs to the specialist rehabilitation services (see **Appendix 2**)

NCASRI is currently contracted for 3 years (with the potential of a further 2 year extension subject to agreement). The Organisational Audit was completed in Year 1. Elements 2 and 3 (involving individual prospective patient data collection, linkage and analysis) are underway for completion in Years 2 and 3.

Key dates and milestones are set out in **Table 1**.

Table 1: Key Dates and milestones for this audit cycle

Dates	Milestones
Organisational audit (Element 1)	
July 2015 –June 2016 (Month 1-12)	Complete organisational audit
October 2016 (Month 16)	1st Formal Report published (organisational audit)
July 2017 (Month 25)	Draft second report submitted to HQIP
Prospective audit (Elements 2, 3)	
July 2016 - End June 2017 (Month 13-24)	Prospective audit data collection: Recruitment in Major Trauma Centres (MTCs) – (*NB full dataset collection has been extended to Aug 2017 in hope of extension granted – see highlighted below)*
Sept 2017 onwards	Collection of reduced dataset in MTCs for second round audit *(NB Enrolment will continue until outcome of extension request is known – or until August 2018 if extension to year 4-5 granted)*
Feb 2017 – August 2017 (Month 20-26)	Data quality checks and data linkage trials with different collection systems (paper, TARN and IRMA (Orion)) and UKROC
April 2017- Dec 2017 (Month 22–36)	Analysis of MTC data and preliminary results of case ascertainment, Data linkage between TARN, UKROC and IRMA (Orion)) Assembly of linked dataset and testing of analysis plan
Dec 2017 to Jan-2018	Final linkage and cleaning of dataset
March 2018	Complete analysis of UKROC and MTC data
April 2018	Linkage with Hospital Episode Statistics (HES) and Office of National Statistics (ONS)-Mortality – analysis of linked dataset to find out where else people have been admitted
June 2018	Submit draft 3rd year report
NB: There is an expected lag between MTC data collection and data appearing in UKROC for patients that are admitted to rehabilitation. Patients with very complex needs may require 2-3 months of acute hospital treatment followed by 6 months or more of rehabilitation. UKROC data is only uploaded and verified after discharge from rehabilitation so the last MTC patient may therefore only appear in UKROC database 12 months after recruitment. ***Linkage in December 2017 to comply with the planned time line for the audit is likely to underestimate the number of patients getting through to Level1 and 2 rehabilitation services***	
Sept 2017	Contract extension request will be submitted for a) further round of audit data collection and linkage in year 4-5 using a more manageable dataset and to capture more patients b) deferring the 3rd year report until Dec 2018 to allow a longer period for the patients to come through for the first audit round report.

2.2 Analysis plan

This document sets out the analysis plan for Elements 2 and 3 of the project

2.3 List of Appendices

1. Summary of audit standards with data source and outline analysis
2. Data linkages
3. NCASRI TARN dataset and descriptive analysis
4. NCASRI UKROC dataset and descriptive analysis
5. HES and ONS-Mortality dataset.

3 Reference standards and performance indicators

Performance indicators are intended to provide a valid measure of a provider's quality of care.
The NCASRI audit will examine the quality of specialist rehabilitation received by patients with complex needs following major injury, including:

- At service level: structure, organisation and pathways
- At patient level: needs, inputs, processes and outcome.

Reference standards and indicators are drawn from the following national clinical guidelines and standards documents shown in Table 2

Table 2: Key standards and Guidelines

Year	Standards document	Source
2005	The National Service Framework (NSF) for Long term neurological conditions (LTNC)	Department of Health
2009	NICE guidelines for Rehabilitation after Critical Illness	NICE*
2009	Standards for Rehabilitation Services mapped on the NSF for LTNC	BSRM**
2015	Specialisation in Neurorehabilitation Services	BSRM
2013	Core Standards for Rehabilitation following Major Trauma	BSRN
2010	The NHS Clinical Advisory Group Report on Regional Networks for Major Trauma	NHS England
2014	Service specification for Major Trauma	NHS England
2014	Service specification for Specialist Rehabilitation for patents with Highly Complex Needs	NHS England

*National Institute for Health and Care Excellence; ** British Society of Rehabilitation Medicine

The performance indicators will include:

- Process of care, including the identification of rehabilitation needs while in the MTCs
- Assessment and transfer to Level 1 and 2 specialist rehabilitation units
- Quality of care, including outcomes and cost-efficiency within the specialist rehabilitation services.

3.1 Expected performance

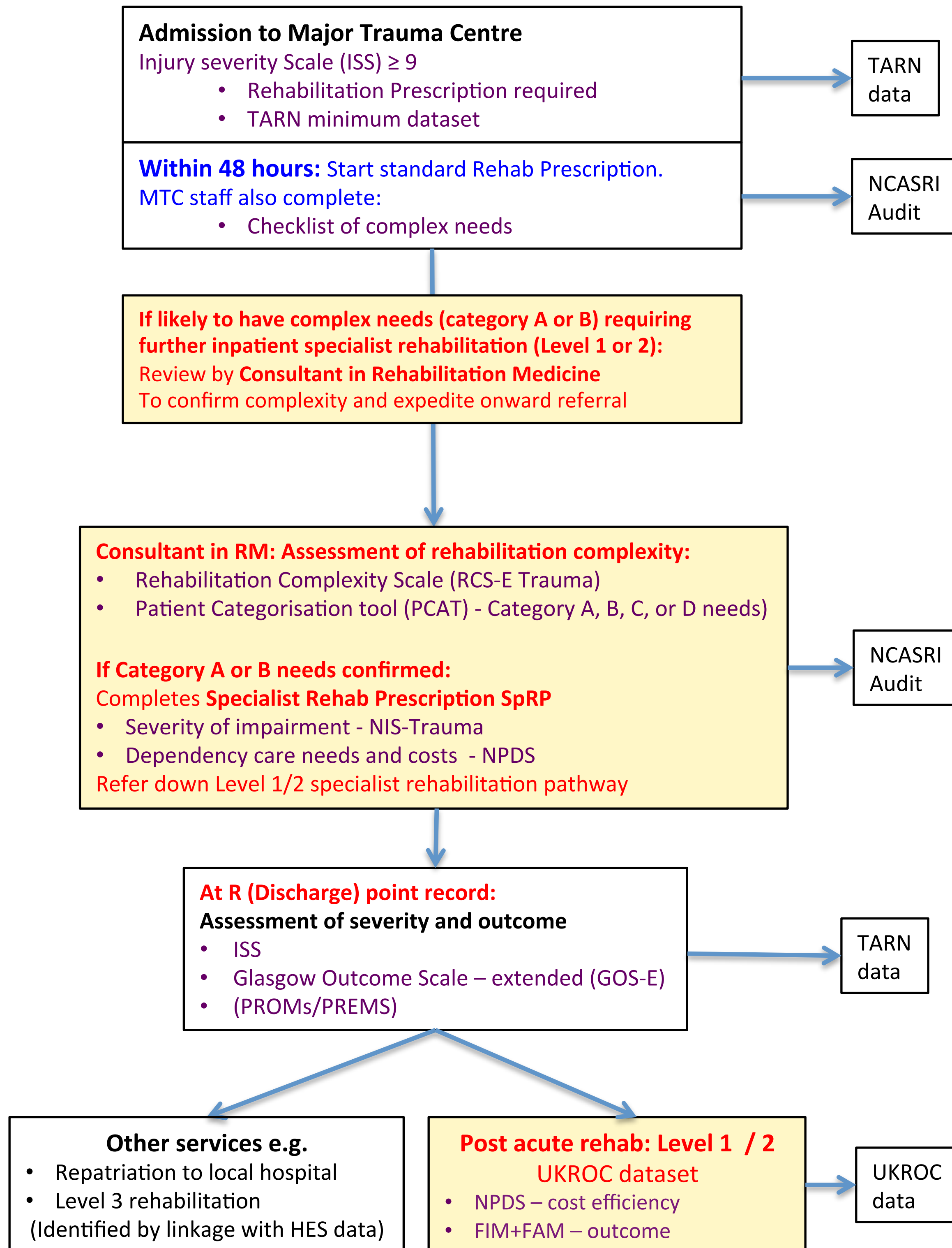
Expected performance will be judged against pre-determined standards, and MTCs / specialist rehabilitation units will be compared against their peers.

A summary of audit standards with data source and outline analysis is given in **Appendix 1**.

3.2 Overview of patient pathway according to the BSRM core standards

Figure 1 summarises the patient pathway and data collection according to the standards as originally proposed in the BSRM Core Standards for Rehabilitation following Major Trauma

Figure 1: Patient pathway and data collection according to the BSRM standards



The NCASRI audit builds on the existing mandated data collection within the TARN and UKROC datasets, but adds a limited set of tools to identify and describe patients with complex rehabilitation needs in the MTCs.

This data collection is operationalised within the actual patient pathway for NCASRI in brief:

- Patients admitted to the MTCs with severe injury (Injury Severity Score ISS ≥9) require a Rehabilitation Prescription (RP) which is recorded on TARN as part of the minimum dataset to receive Best Practice Tariff as a major trauma centre
- The RP should be commenced within the first 48 hours, but it is often completed once the rehabilitation needs of the patient has been assessed and defined to enable referrals to appropriate rehabilitation units
- MTC staff complete the Complex Needs (CN) Checklist and the Rehabilitation Complexity Scale for Trauma (RCS-ET) for patients whom they consider to have complex rehabilitation needs.
- If the CN checklist indicates that the patient is likely to have category A or B needs, then they request that the patient is assessed by a Consultant in Rehabilitation Medicine (RM).
- The Consultant in RM (or designated deputy) uses the Patient Categorisation Tool (PCAT) to confirm whether or not the patient has complex needs requiring further in-patient rehabilitation in a Level 1 (category A needs) or Level 2 (category B needs) specialist rehabilitation unit.
- Subsequently the rest of the specialist rehabilitation prescription (SpRP) is completed for patients with category A or B needs. It describes and quantifies their impairments, level of dependency and their types of need for rehabilitation their requirements for medical nursing and therapy input, which are collected using validated standardised tools:
    - The Neurological Impairment Set for Trauma (NIS-Trauma) details the severity of impairment,
    - The Northwick Park Dependency Score and Care needs assessment (NPDS/NPCNA) details nursing and care needs and ongoing costs of care in the community
- At the end of the patient's acute care episode, they should ideally either be transferred to rehabilitation, discharged home. In practice, they are frequently repatriated to their local hospital or TU to relieve pressure on MTC beds whilst they wait to be admitted for inpatient rehabilitation.
- At the time of discharge from the MTC, a crude assessment of outcome is recorded using the Glasgow Outcome scale (GOSE) and recorded through TARN. (TARN is also piloting patient reported outcomes (PROMS and PREMS) six months after discharge. These data are not formally part of the audit but will be included in the analysis if available).
- Patients who are subsequently admitted to a specialist Level 1 or 2 rehabilitation service have the UKROC dataset completed on admission and discharge, which is a commissioning requirement for these services. This includes evaluation of their outcome from rehabilitation in terms of change in their levels of functional independence and reduction in the ongoing costs of caring for them in the community (measured using the UK Functional Assessment Measure (UK FIM+FAM) and NPDS/NPCNA) respectively. Cost efficiency is measured in terms of the time taken for savings in going care to offset the cost of the rehabilitation episode.

4 Key aims of the prospective audit in NCASRI

NCASRI aims to enrol all adult patients in England who require specialist inpatient rehabilitation to maximise their recovery from severe injury following acute treatment in a major trauma centre.

- Eligible patents are severely injured adults (16+ years with ISS ≥9) who require specialist in-patient rehabilitation at discharge from an MTC (category A or B needs).
- We wish to determine the proportion of eligible patients who are subsequently admitted to a Level 1 or 2 specialist rehabilitation service. We will examine how well their needs are met and the outcomes from rehabilitation in terms of functional gain and cost-efficiency.
- Unfortunately it is beyond the scope of the audit, as currently commissioned, to determine what happens to those patients who require specialist rehabilitation but do not subsequently receive it. However, we will explore the feasibility of gleaning information from existing datasets (eg Hospital Episode Statistics (HES) data)

5 Methods

5.1 Inclusion / Exclusion criteria for recruitment

Patients will be recruited if:

- They are aged 16 years and over
- They are admitted to a Major Trauma Centre in England with an Injury Severity Score (ISS) of 9 or above.
- They are identified as having (or possibly having) complex (category A or B) needs requiring further in-patient rehabilitation in a level 1 or 2 specialist rehabilitation unit.
- All conditions are eligible, including musculoskeletal, vascular, neurological and non-neurological conditions including amputation.
- The complexity of rehabilitation need is identified with the Complex Needs Checklist and further confirmed with the Patient Categorisation Tool (PCAT) score where available.

Recruitment within the MTCs will run from July 2016 to the end of June 2017
(NB first round audit data collection extended to end August 2017 in the hope of extension being granted).

5.2 Data collection

5.2.1 MTC data:

The data items collected for NCASRI within the MTCs are detailed in **Appendix 3.**

The survey in Element 1 revealed wide variation in the implementation of rehabilitation prescriptions and the methods used to collect and collate data within the MTCs. In order to maximise response rates NCASRI supports data collection using a range of methods including:

- Electronic data collection using the TARN database
- Electronic data collection using the Integrated Rehabilitation Management Application (IRMA) platform
- Paper forms which are then entered into the UKROC database by the NCASRI staff.

Staff at each MTC upload data onto TARN or IRMA via a secure web-based data entry portal. A courier collects anonymised paper copies containing only the NHS number every six weeks from the centres that collects audit data on paper.

5.2.2 UKROC data:

Registration with UKROC and submission of the UKROC dataset are mandated as a commissioning requirement for all specialist level 1 and 2 units. The dataset records needs, inputs and outcomes from rehabilitation using a standard set of measurement tools as detailed in **Appendix 4**.

Data are entered into the dedicated UKROC software by staff at each unit and extracts are transmitted securely through NHS mail to the central UKROC database at Northwick Park Hospital.

5.3 Data linkages – permissions and timing

Linkage of the UKROC and TARN datasets will enable tracking of patients with complex needs from the MTCs to the Specialist Level 1 and 2 services and examine their outcomes.

Patients who are identified as requiring level 1 or 2 in-patient rehabilitation but do not receive this may receive alternative treatment in their local acute hospital, trauma unit (TU) or level 3 services. Although it will not be possible ascertain their outcomes in the first 3 years of this audit we will explore the feasibility of data linkage through the HES and Office of National Statistics (ONS)-Mortality datasets to identify where patients (who survive their initial injuries) are admitted.

The NCASRI audit has been granted section 251 (s251) permission by the Health Research Authority (HRA) Clinical Advisory Group, which enables the use of identifiable data (the NHS number and date of birth) for the purpose of this linkage.

A Data Access Request will be submitted to NHS Digital for linkage with HES and ONS-mortality data.
The data linkages are summarised in **Appendix 2.**

5.3.1 Timing of data linkage within this audit cycle

As noted in Table 1 above, there is an expected lag between MTC data collection and data appearing in UKROC for patients that are admitted to rehabilitation, so the last MTC patient may therefore only appear in UKROC database 12 months after recruitment.

This means that if the final data linkage between TARN and UKROC is completed in December 2017 as planned, a significant number of patients who have not yet come though to UKROC and the proportion of patients receiving specialist rehabilitation will be under estimated

The Programme Board has recommended deferring data linkage until September 2018, to produce the 3rd year report in Dec 2018. This has implications for the end of the study requiring a request for contract extension (see Section 5.11). If the extension is not granted the linkage and analyses will occur as planned.

5.4 Data extraction, linkage and cleaning to form the NCASRI database for analysis

The NCASRI audit will include data collected on the TARN/IRMA and the UKROC databases. Data will be extracted, linked and assimilated into a single dataset for analysis.

Data will be extracted as follows:

5.4.1 TARN and ORION datasets collected between 1.7.2016 and 30.6.2017* (31.8.17 if extension approved)

- All adult patients (16+ years) admitted to MTC with ISS ≥9, identified as having (or possibly having) complex needs for rehabilitation through
  - Completion of checklist suggesting category A or B needs *or*
  - Completion of SpRP or PCAT tool by a consultant in RM or experienced therapist *or*
  - Recommendation for Level 1 or 2 rehabilitation on discharge.

5.4.2 UKROC dataset collected between 1.7.2016 and 31.12.2017* (30.6.2018 if extension approved)

- All adult patients (16+ years) admitted to Specialist Level 1 and 2 Rehabilitation units.

5.4.3 Data linkage between UKROC and TARN:

Linkage will be achieved by matching of NHS numbers and date of birth between the datasets for the two periods where an admission to an MTC pre-dates an episode of specialist rehabilitation. Matching will be conducted both forwards and backwards to pick up:

a) patients with complex rehabilitation needs identified in the MTCs who do and do not subsequently receive specialist rehabilitation
b) patients who receive specialist rehabilitation who may or may not have had their needs identified in the MTC.

5.4.4 Other data linkage (for patients identified as having complex needs who did not enter rehabilitation)

Linkage will also be conducted with HES and ONS-mortality data by matching of NHS numbers from either data source to identify:

a) those patients who did not survive
b) in-patient episodes (with dates of admission, discharge and HRG codes) during this period in order to track patient journeys through other hospital facilities.

The list of data fields included from the TARN/IRMA, UKROC and HES datasets, together with their purpose within the analysis is given in **Appendices 3-5.**

Data from the three sources will be assimilated into a custom made database, and once the linkages have been made the database will be pseudonymised and the identifiable data deleted. Data will be exported into Microsoft Excel and SPSS for analysis.

5.5 Data quality

Overall data quality will be examined in terms of case ascertainment, completeness and accuracy.

Interim analysis will take place between February – July 2017 to allow feedback to MTCs in terms of the completeness and the quality of their data. This will help to identify any issues that need to be addressed to ensure full data sets for subsequent analysis and linking. Identification of the % of tools completed at this stage will also support further plans for analysis.

5.5.1 Case ascertainment

This is the number of patients recruited into the NCASRI audit compared to the number eligible. Examination of case ascertainment will help to inform the generalisability of the reported outcomes and will be approached as follows:

Definitions of the patient groups for case ascertainment

- Patients eligible for the NCASRI audit are adults (16+ years) and over who are admitted to an MTC in England following major injury (ISS >=9) (identified from the TARN database the TARN database)) and who have (or are likely to have) complex (Category A or B) needs requiring specialist in-patient rehabilitation on discharge from the MTCs.
- Patients recruited for the NCASRI audit are those of the above for whom data are collected and reported by the MTC, through any of the methods described in **5.2 Data collection**
- The rehabilitation patient group is the subset who are subsequently admitted to specialist rehabilitation services (Level 1 and Level 2), identified from the UKROC database.
- The non-rehabilitation patient group is the subset who were identified as having complex needs on discharge from the MTC, but who were not admitted to a specialist Level 1 or 2 rehabilitation service (and so did not appear on the UKROC database).

Eligibility and complex needs

According to the NHSE service specification, the need for specialist rehabilitation should be confirmed by a consultant in rehabilitation medicine (RM). However, first year report highlighted a shortage of RM consultants in the MTNs. In MTCs where there is little no RM consultant input, there was no established mechanism to confirm category A and B needs. In addition, the patient may only develop complex needs for rehabilitation after leaving the MTC (for example a patient who is discharged in coma, but subsequently emerges or who developed further complications after) repatriation to their local TU / hospital). This means that a proportion of eligible patients may not be recruited.

In order to maximise recruitment and case ascertainment:

- Patients may be included if the MTC team believes them to have category A or B needs on the basis of the Complex Needs (CN) Checklist and RCS-ET
- Where a consultant in RM is not available, experienced members of the MTC clinical team may complete the other SpRP tools if they feel able to do so.
- Data linkage between UKROC and TARN will be performed both forwards and backwards, to include any patients who may have developed complex needs only after leaving the MTC. This capture/recapture will support the identification of potentially eligible patients who were missed in the MTCs (although this group is no expected to have had the NCASRI tools collected in the MTC)

If is possible that inclusion of patients on the basis of the CN Checklist alone may lower the threshold for inclusion in comparison to centres recruiting on the basis of the PCAT tool. In order to explore this, where both tools are completed for the same patients, we will examine agreement between them in terms of the % of patients thought to have complex needs (using the CN Checklist) who were subsequently confirmed as category A/B using the PCAT tool.

5.5.2 Data completeness and accuracy:

This refers to the completeness of the data submitted by hospitals for each patient.
Complete data are required for accurate analysis and reporting. Without complete data, indicator values for units may be unrepresentative of actual practice.

The % completeness of data items will be reported for each participating centre, and present with a RAG (Red Amber Green) rating for visual impact.

The following colour-codes, similar to those used in the Sentinel Stroke National Audit Programme (SSNAP)

will be used in tables to report the percentage of episodes meeting the standards:

Colour-code	<65%	65–74%	75–79%	80–89%	90–100%

Outliers in terms of data quality and completeness will be identified by named service provider.

5.6 Data analysis and reporting

The demographics of the patient groups will be described in terms of age, gender ratio, trauma diagnosis etc. They will be reported for recruited patients, and separately for the rehabilitation and non-rehabilitation groups

Descriptive statistics for quantitative parameters will be presented as mean, standard deviation (SD) and range; or median and Inter-quartile range (IQR – ie 25th-75th percentile) for skewed data.

Percentage (%) achievement of performance indicators against the pre-defined standards (see Appendix 1) will be presented for each participating service with a RAG rating as described above. Colour coding for the percentages may be adjusted where relevant to reflect expected performance.

Data will be reported for each service / provider on a named basis. Care will be taken to ensure that no individual patients are recognisable save with their specific written consent

As this is an audit programme, statistical comparisons are mainly not indicated, but they may be relevant in some instances (for example to demonstrate significant gains in independence or to compare different models of service). Where statistical comparisons are relevant:

- Categorical data will be compared using Chi-squared tests
- Within and between groups analyses will use parametric statistical techniques for interval or long-ordinal data where the distribution approximates to normal; and non-parametric methods for short-ordinal or skewed data – especially where the numbers are small

5.7 Case-mix adjustment and outliers

Any comparison of providers must take account of differences in the mix of patients between providers by adjusting for known, measurable factors that are associated with the process or outcome indicator.

Specialist rehabilitation covers a range of programme types with differing goals and activities including:

1. Restorative rehabilitation to improve independence
2. Complex disability management to support long term care
3. Assessment and diagnosis of Prolonged Disorders of Consciousness
4. Neuropalliative and end of life care

Case-mix adjustment will not allow the detection of outliers in this audit for the following reasons:

- There are few specialist rehabilitation centres, and those that exist are heterogeneous in terms of casemix and the types of programme offered.
- The number of patients with trauma in each centre is very small, and patients are heterogeneous both in terms of the trauma sustained and the nature and severity of their impairments (eg physical, cognitive, behavioural).
- Commissioning practices also vary between centres
- Even in larger datasets with good information adjustment is difficult in the face of this diversity.

Traditional quantitative statistical models for case-mix adjustment will not therefore be appropriate for identifying outliers in any robust sense.

Instead we will use descriptive statistics for each service, covering demographic and injury data, process data and outcome data. Where comparison seems reasonable, we will highlight similarities and differences. The data will draw attention to areas where further investigation to explore opportunities for service improvement may be required.

Although outliers will not be identified in relation to outcomes, they may still be identified in terms of quality of data reporting and process indicators. Detection and management of outliers are described separately in the **NCASRI Outlier Policy.**

5.8 Specific analyses within each stage of NCASRI.

Appendices 3 and 4 set out the key data fields within the TARN and UKROC datasets, and the descriptive analysis that will be conducted for within each dataset.

In addition to these descriptive analyses, performance against the pre-defined standards will be examined as set out in Appendix 1.

The results will be analysed and reported for the population of adults (16+ years) as a whole, and for services grouped by type and level of rehabilitation service, as well as for individual named service providers.

5.8.1 Process within the Major Trauma Centres

Within the MTCs, the quality standards primarily concern the quality of assessment and identification of patients who have (or may have) complex needs requiring further in-patient specialist rehabilitation.

MTCs will be compared in respect of:

- The total number of adult patients (16 + years)
    - Of those, the proportion with ISS scores ≥9
        - Of those who had:
            - A Rehabilitation Prescription (RP)
            - A Complex Needs Checklist (CNC)
            - A Rehabilitation Complex Scale (RCS-E or RCS-ET)
- The proportion of patients thought to have complex needs on the basis of the above who had:
    - Assessment by a consultant in RM or their designated deputy
    - The PCAT tool
    - The Northwick Park nursing Dependency Scale (NPDS)
    - The Neurological Impairment Set – Trauma (NIS-Trauma)
    - Details of referral to one or more named Level 1/2 service
    - Discharge destination.

MTCs will also be compared for:

- The number of patients with either:
    - Possible complex rehabilitation needs (identified by the CNC)
    - Confirmed complex rehabilitation needs by a PCAT – and whether completed by the MTC team or by a consultant in RM or their designated deputy.
- The % of recruited patients out of the total severely injured adult patients (16+ years ISS ≥9)

(Although ISS scores are in themselves a reliable indicator of rehabilitation needs, this latter comparison may help to identify variations between MTCs sin the threshold for identifying patients with complex needs)

5.8.2 Assessment and transfer to Level 1 and 2 rehabilitation services

So far as this can be ascertained either from the TARN or UKROC databases, MTCs MTCs will also be compared for the proportion of recruited patients who were:

- Referred to a Level 1 and/or 2 rehabilitation service
- Assessed by the Level 1 or 2 rehabilitation service within 10 days
- Discharged directly to a Level 1 or 2 a rehabilitation service on leaving the MTC
  - Or to other interim services (by type)
- Admitted to a Level 1 or 2 services within 6 weeks of being fit for transfer.

5.8.3 Recruited, rehabilitation and non-rehabilitation group analysis

We will report the proportion of recruited patients who complete a programme of in-patient rehabilitation in a Level 1 or 2 service within the year after discharge from an MTC (the rehabilitation group).
Comparative data will be presented for each MTN.

5.8.3.1 Non-rehabilitation group

For the non-rehabilitation group (who had complex needs but did not receive inpatient specialist rehabilitation) we will:

a) Identify any who have died in the period from the ONS-Mortality dataset – these will be excluded from the denominator of patients who should have received rehabilitation.
b) For the remainder, we will use the linked HES data to examine the proportion who were admitted to other in-patient services during the period, and using the Healthcare Resource group (HRG) codes we will determine
   a. The total number of episodes for acute care and the duration in hospital care.
   b. The number and duration of episodes in-patient treatment with (HRG) VC codes, indicating admission solely for rehabilitation related to trauma (VC06Z (brain injury), VC08Z (spinal injury), VC14Z (amputation), VC24Z (other musculoskeletal), VC30Z (burns), VC36Z (other trauma) in services not registered with and reporting to UKROC (eg Level 3 services).

We will report the proportion of eligible patients who, after discharge from the MTC:

a) appear to have received further acute care and/or rehabilitation in other services
b) appear to have had no further in-patient treatment.

We do not expect any meaningful outcome data within the HES dataset and so have not requested this.
Comparative data will again be presented for each MTN

5.8.3.2 Predictive modelling – whole population

Taking the recruited and rehabilitation populations as a whole we will examine the groups of recruited patients who did and did not receive inpatient rehabilitation, to identify any systematic differences in the characteristics of these groups including age, gender, severity of injury / impairment / dependency, category and complexity of rehabilitation needs etc.

If the dataset is sufficiently large, significant factors will be entered into a multiple regression analysis to determine whether there is an identifiable predictive model based on patient-related factors – or whether selection is largely determined by external factors, such as the 'post-code lottery'

5.8.4 Specialist Level 1 and 2 in-patient rehabilitation services

5.8.4.1 Comparison of rehabilitation services for process and data quality

The comparative analysis will be conducted on the rehabilitation group using UKROC data supplied.
Service providers will be compared for:

- Response times for
    - assessment (within 10 working days from referral)
    - admission (within 6 weeks of accepting)
- Data quality including assessment and reporting of:
    - Baseline function and category / complexity rehabilitation needs (within 10 days of admission)
    - Outcomes and discharge destination at the end of rehabilitation

5.8.4.2 Comparison of rehabilitation services for outcomes

Comparative analysis will be conducted on the rehabilitation group, taking into account the case-mix and programme types goals – so far as these are known and reported within the UKROC database

1. % episodes within each of the four programme types (see section 5.9)
2. % patients discharged to the community (home or other long-term placement, eg specialist nursing home, according to needs and dependency)
3. Gains in independence (or individual goal attainment where more appropriate) in relation complexity of rehabilitation needs as measured with the FIM/FAM or GAS
4. Reduction in care needs as measured by the NPDS/NPCNA
5. Cost efficiency - the time to offset the cost of rehabilitation through savings in ongoing care in the community, as estimated by the NPCNA.

Performance will be analysed and reported

- By service level
- By individual named service provider.

As previous analyses in Year 1 have demonstrated higher cost efficiency in the more dependent patients (see First Year Report), we will also analyse and present the results in three groups of dependency according to their NPDS scores on admission:

- Low dependency (NPDS <10) – largely independent for self care
- Medium Dependency (NPDS 10-15) – requiring assistance from one person for most self care tasks
- High Dependency (NPDS >=25) requiring assistance from two people for most self care tasks.

As noted above – in view of the heterogeneity of patients, programme types, and goals for rehabilitation / disability management / end of life care, we do not necessarily expect to be able to adjust statistically for case mix in a manner that would reliably identify outliers, other than in respect of data quality in this first prospective audit. However, we will explore the potential for case-mix adjustment and outlier identification, which could perhaps be used in future rounds of the audit.

5.9 Challenges for this audit and recommendations from the NCASRI Board

At baseline, there were no agreed datasets for determining rehabilitation needs or directing patients to the appropriate service at the interface between MTCs and rehabilitation services.

- Although the concept of a 'rehabilitation prescription' had been mooted, and a minimum RP data set was included in the TARN dataset as a mandated requirement for the Best Practice Tariff, little guidance had been issued regarding its form or content.
- Implementation of the RP as a clinical tool was variable, each MTC having adjusted this according to their local needs. However, a project was ongoing to develop a more consistent approach. This work was led by the Clinical Reference Group for Major Trauma, and there was no wish to duplicate it.

In the meantime service provision for specialist rehabilitation varied widely across the country due to differing levels of investment and development the lack of nationally agreed commissioning arrangements and tariffs. Patients with highly complex needs often remained in the MTCs for many months before transfer to rehabilitation, and this was where the main blockage was felt to be

- Therefore the first 3 years of NCASRI was focused on the specialist rehabilitation pathway.
- This is a low volume audit focussed on the needs of a small number of patients in a complex area of care that required a rich dataset.
- However, if successful it was anticipated that the two strands of work could come together in year 4-5 allowing roll out of a simpler core dataset to capture the needs for and provision of rehabilitation services to a larger number of patients, that is feasible to embed into clinical practice going forward.

Even within this first 3 years, a number of challenges are recognised for the NCASRI audit:

5.9.1 Recruitment within the MTCs

- Consultants in Rehabilitation Medicine (RM) are critical to this audit – both to provide local leadership for participation and data collection, and to confirm the complexity of rehabilitation needs. The organisational audit in year 1 revealed a lack of RM consultant involvement in MTCs (some having no input at all), which poses a significant threat to accurate case ascertainment in those centres as described in section 5.7 (Data Quality)
- The datasets and tools to support data collection within this audit have been developed from scratch within the first year, giving only a very short timescale in which to identify the data requirements, agree the data collection and train staff in the use of tools.
- For some MTCs, the tight timescale has proven too challenging, and despite their willingness in principle to participate, the logistics of doing so has defeated them. Some did not start data collection until more than 6 months after the start of the recruitment period in July 2016

Table 4 summarises the MTCs and their level of participation in recruitment as recorded in March 2017.

Recommendation

The NCASRI audit serves a vulnerable and disadvantaged patient group but has the potential to demonstrate significant benefits of effective practice (including cost-efficiency for the NHS). In view of the complexity of this audit, starting from a very low level of development and service provision; and in view of the tight timescale and the time lag for MTCs to come on board, the NCASRI Programme Board recommends that the first round period for enrolment within the MTCs should be extended from 12 to 14 months in this first round audit to enable MTCs that started late to collect a meaningful sample of data for comparison.

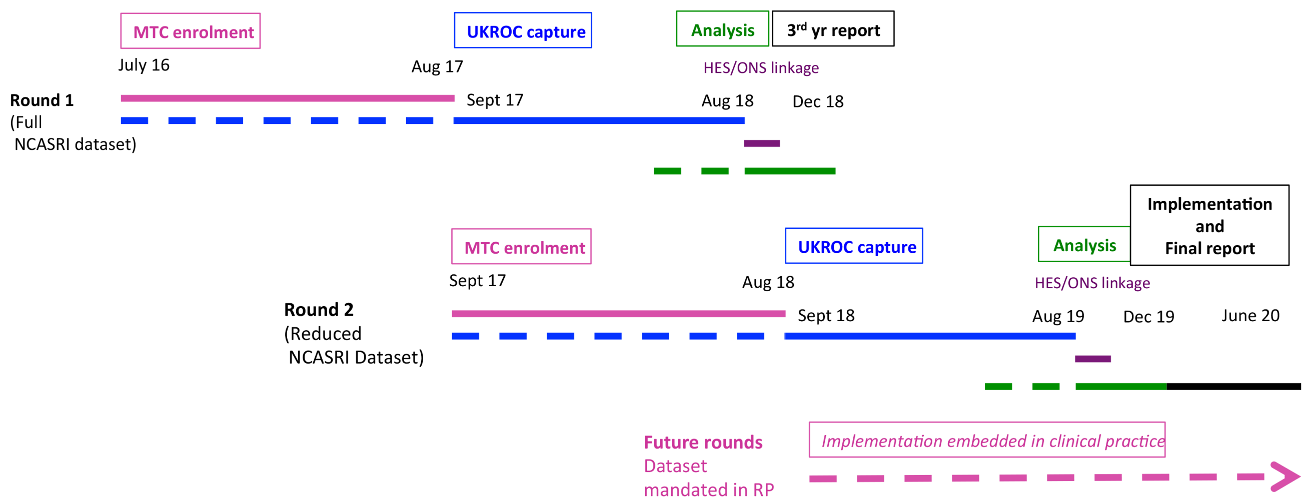
5.9.2 Time lag between injury and end of rehabilitation.

For reasons described in Table 1, data for patients who received rehabilitation may not come through to the UKROC data until up to 12 months after discharge from the MTCs. If the recruitment period is extended to end August 2017, this means that the final data linkage between TARN and UKROC cannot be completed until after the UKROC data submission in September 2018 for this first round.

Recommendation

The NCASRI Programme Board therefore recommends extension of the current project until 31st Dec 2018 at minimum, to ensure that outcome data for the recruited cohort can be included in the final analysis. Going forward, for full capture of linked data, the audit should have a two-year cycle, although successive audit rounds can overlap to sustain continuous data collection as per figure 2 below.

Figure 2: Overlapping 2 year audit cycles



5.9.3 Reporting

The second year report is due for submission in June 2017. The report will describe the various challenges that we have faced in the development of NCASRI and the steps that we have taken to overcome them. It will also report enrolment rates within the different MTCs; the engagement work we have done with stake holders and our proposals for continuation of NCASRI into years 4-5. This will provide useful background for our extension request. The report will be prepared as an informal internal report for sharing with HQIP, NHSE and stakeholders in the first instance. Depending on feedback we may request approval by HQIP to put it on our website for transparency's sale. As we plan to extend data collection up until the end of August 2017 for this first round of audit, our first analysis of MTC data will be done in October/November and will be included in the 3rd year report

Recommendation

The NCASRI Board recommends the preparation an internal 2nd year report. The first analysis of full MTC data will start in October 2017, presenting data for patients recruited from the MTCs, and running a test analysis from preliminary linkage with UKROC. If an extension is not granted, final linkage with UKROC will be conducted in Dec 2017 for analysis by March 2018, in time for the 3rd year report in June 2018.

5.10 Lessons learned in round 1 and plans going forward

A preliminary analysis of data collected in TARN up to March 2017 demonstrated that:

- 17 MTCs are now submitting data in one form or another (TARN, ORION, paper)
- 938 patients are enrolled to date and captured in TARN to date
    - 718 of these from one MTC (Severn) which is collecting Complex Needs Checklist (CNC) and Rehabilitation Complexity scale (RCS-ET) and clinical categorisation on all patients ISS >=9 (even if they have category C or D needs) but no SpRP tools
    - There were just 84 datasets – with most SpRP tools CNC RCS-ET, PCAT, NIS and NPDS
- Main findings
    - Even where there is a consultant in RM, the majority of data are recorded by the MDT
    - Data from Bristol suggest that approx. a third of patents have Category A/B needs
        i. Other units still only reporting about 5-10% as having complex needs at discharge – possibly due to data burden
    - There remains a concern that the audit may not identify patients with complex non neurological needs (eg polytrauma, complex pelvic fractures, visceral/vascular injury etc
        i. The further data analysis will show if these are being identified
    - Where CNC and PCAT recorded in parallel there is 95% agreement in the identification of needs category, confirming that the CNC provides valid identification of Category A/B needs.

A stakeholder workshop was held on 8th June 2017 and attended by 15 of the 17 participating MTCs. The principal conclusions and recommendations from that workshop were:

- Now that they have got going, the MTC teams on the ground would like to see it continue.
- The complete NCASRI toolset collected in this first round will be informative, but is too burdensome to embed into practice and may not be capturing all people with complex needs.
- Teams agreed it would be feasible to collect CNC and RCS-ET for all patients who require further in-patient rehabilitation, alongside clinical categorisation of needs (A, B C or D) at the TR point.
- On this basis, they were willing to continue data collection with this reduced dataset from 1.9.2017 towards a second round of NCASRI
- A recommendation was made to the NCD for Trauma to include this dataset (RCS-ET, CNC and category of need) as part of a mandated requirement for the standard RP as this would embed data collection into routine practice going forward.
- For future sustainability, all MTC data should be collated on a single database (TARN) in future as collation from multiple data sources is not sustainable in the long term
- Completion of the other SpRP tools at the TR point should be optional going forward, but is still encouraged in order to provide comparable information, especially patients with very complex (Category A) needs. (The small numbers should not create an excessive data collection burden)
    - Ideally a PCAT should be recorded for patients with category A needs at the TR point, but this may be completed by any experienced member of the rehabilitation / therapy team.
    - If teams wish to record data on impairment and/or dependency, the NIS-Trauma and NPDS/NPCNA should be used as a common language in order to support data comparison.

Recommendation

The NCASRI Programme Board recommends that audit should be extended to 5 years (June 2020) to enable a second round of audit with the following aims:

- *to enable full participation of MTCs in England (having learned the lessons of this first 3 years and improved the quality of assessment and data reporting)*
- *to extend collection of a simpler dataset to capture the rehabilitation needs and provision for a wider group of patients and so improve the capture of patients with category A and B needs*

In support of this, we note that the National Stroke audit faced similar problems when initiated some 20 years ago. Only after a decade did the system start to pay real dividends, both in terms of improving service quality and outcomes, and increasing knowledge.

Table 4: Recruitment by the 22 MTCs between July 2016 and March 2017

Network	Method	Participating	Submitting Full data set (F) or abridged (A)	Date participation commenced	Number of patients July 2016 - March 2017
Northern (Newcastle North East & Cumbria)	TARN	Yes	F	Jul-16	16
Northern (Middlesbrough& South)	TARN	Yes	A	Jul-16	20
West Yorkshire (Leeds)	N/A	No	N/A	n/a	0
North Yorkshire & Humberside	TARN	Yes	A	Jul-16	19
Lancashire & South Cumbria (Preston)	Paper	No	N/A	n/a	0
Greater Manchester	UKROC/ TARN	Yes	?	?	84
Cheshire and Merseyside (Aintree: paper; The Walton: TARN)	TARN/ PAPER	Yes	A	Feb-17	29
South Yorkshire (Northern General Hospital Sheffield)	Paper/TARN	Yes	A	Oct-16	30
NW Midlands & North Wales	Own system	Yes	F	Sep-16	0
Birmingham BC, Hereford&Worcs	TARN	Yes	F	Sep-16	34
Central England	TARN	Yes	A	Sep-16	23
East Midlands	TARN	Yes	A	Jul-16	24
East of England	ORION	Yes	F	Jul-16	67
Thames Valley	N/A	No	N/A	n/a	0
Severn	TARN	Yes	A	Sep-16	127
North West London	Paper	Yes	F	Jul-16	48
North East London and Essex	TARN	No	N/A	n/a	0
South West London and Surrey	Paper	Not currently	N/A	Nov-16	17
SE London Kent& Medway	Paper	No	N/A	n/a	0
Sussex	ORION	No	N/A	n/a	0
Wessex	TARN	Not currently	N/A	Dec-16	60
Peninsula	ORION	Yes	F	Jul-16	35
				Total	**633**

5.11 Appendix 1: NCASRI Reference standards – summary of standards, data sources and outline analysis

1	Process within the MTC	Element	Source	Analysis plan
1.1	All patients with ISS scores of ≥9 should have a Rehabilitation Prescription (RP).	2	TARN	**From TARN dataset : Descriptive analysis** Proportion of pts with ISS ≥9 /total trauma patients in the 14 months by MTC Proportion with RP
1.2*	Rehabilitation planning (including the commencement of the RP) should start within 48 hours of admission.	2	TARN /SURVEY	**From TARN dataset : Descriptive analysis** Proportion of patients with an RP (Within 48hours can only be obtained from the survey)
1.3*	A consultant in RM should be involved from an early stage in the patient's trauma pathway (within 3 calendar days) to assess patients with complex rehabilitation needs, to participate in their rehabilitation planning, and to expedite onward referral. This will normally involve a consultant in RM attending the MTC or TU at least 2–3 times per week.	1	SURVEY	Proportion of MTCs with paid RM consultant sessions sufficient to support 2-3 visits per week
1.4	Patients thought likely to have complex rehabilitation needs requiring specialist in-patient rehabilitation should have the following completed by the MTC team: Rehabilitation Complexity Score (RCS-E); Checklist of complex needs.	2	TARN	**From TARN dataset : Descriptive analysis** Proportion of pts with ISS ≥9 who have: • An RCS-E recorded • A checklist of complex needs Descriptive stats of those tools
1.5	If the checklist suggests the patient is likely to have Category A or B needs, they should be reviewed by a consultant in RM or their designated deputy.	2	TARN	**From NCASRI audit dataset in TARN: Descriptive analysis** Proportion of pts with ISS ≥9 who (+/- likely Category A needs from checklist) • Were seen by a consultant / deputy
1.6	The consultant in RM (or designated deputy) should complete: The PCAT tool – to confirm Category A or B needs.	2	TARN/ UKROC	**From TARN dataset : Descriptive analysis** Proportion of pts with ISS ≥9 (+/- likely Category A needs from checklist) who had a PCAT completed. Within the tool, Category A/B needs can be identified by a) Clinical impression or b) Total PCAT score ≥30
	If Category A or B needs are confirmed, a Specialist Rehabilitation Prescription (SpRP) should be completed before discharge from the MTC, including: • The Northwick Park nursing Dependency Scale (NPDS); • The Neurological Impairment Set – Trauma (NIS-Trauma); • Details of referral to one or more named Level 1/2 service; • Discharge destination.	2	TARN/ UKROC	Proportion of patients with PCAT A/B needs who had the following • The Northwick Park nursing Dependency Scale (NPDS); • The Neurological Impairment Set – Trauma (NIS-Trauma); • Details of referral to one or more named Level 1/2 service; • Discharge destination Descriptive statistics of those tools

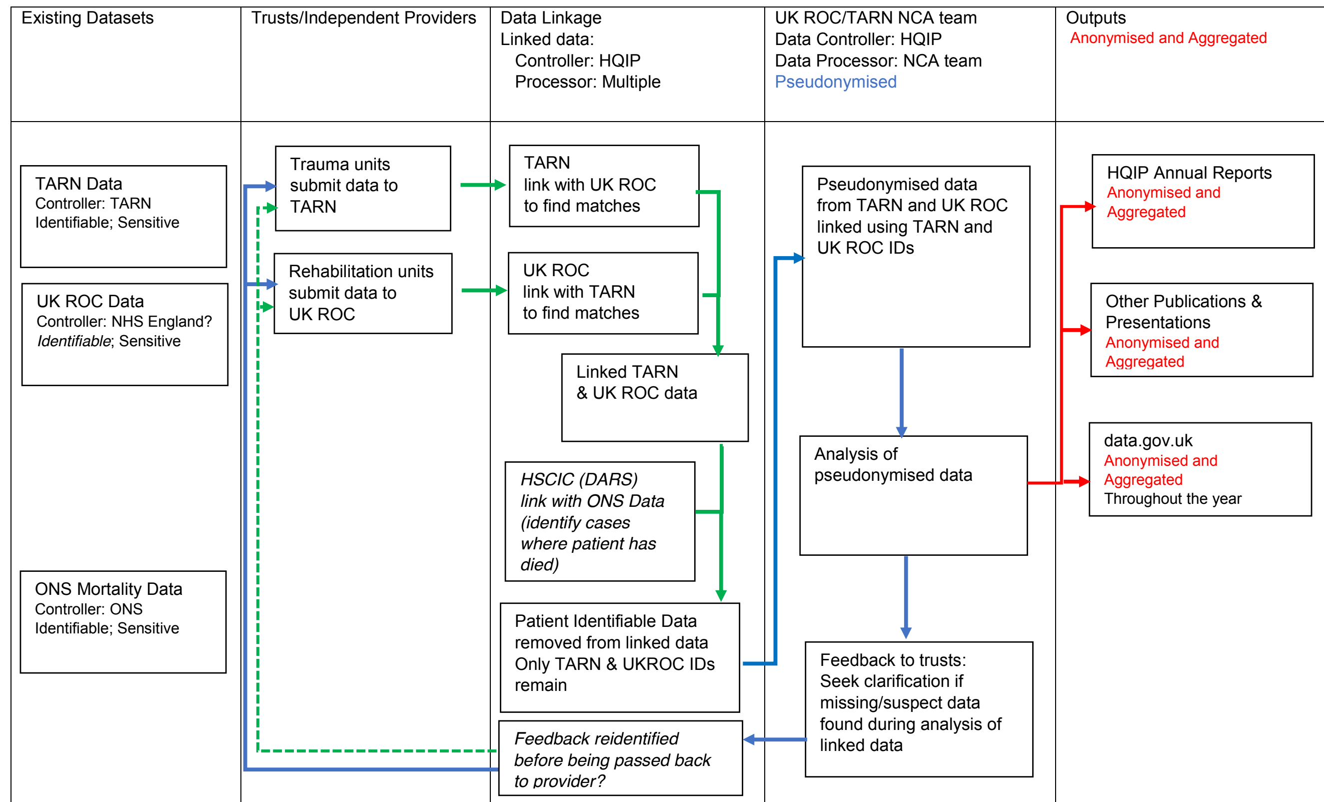
* - NB - whilst these are NHSE standards for the major trauma pathway, the time that a patient was first seen by the RM consultant or had an RP started is less important than whether they were seen and had their on-going needs assessed at or around discharge from the MTCs, as rehabilitation needs are known to change rapidly over time in the acute setting. We collected information from the services on their ability to meet these standards during the organisational audit, but will not attempt to analyse data in the prospective study to address these standards.

2	**Assessment and transfer to Level 1/2 service**	**Element**	**Source**	
2.1	Following referral, the patients should be assessed by the Level 1/2 service within 10 days.	2	UKROC*	**Descriptive analysis of UKROC data** Will include all trauma patients (whether from MTC or not) • Proportion of patients with Trauma who are assessed by Level 1/2 unit within 10 days of referral • (grouped by referral source: MTCs and non-MTCs)
2.2	A consultant in RM (or their designated deputy) should complete a Patient Categorisation Tool (PCAT) to confirm that the patient has complex (Category A or B) needs for rehabilitation.	2	UKROC	Proportion of Trauma patients who have a PCAT in UKROC Proportion with category A or B Needs (grouped by referral source: MTCs /non-MTCs)
2.3	If accepted in principle, but the patient is not yet fit for transfer, they may be placed on an inactive waiting list pending further review. Serial recordings of the RCS-ET Medical score may help to determine the 'R-point', at which the patient is Ready for transfer and placed on the active waiting list.	2	TARN	
2.4	Patients identified as requiring Level 1/2 in-patient rehabilitation should be transferred to specialist in-patient rehabilitation within six weeks of being fit for transfer.	2	UKROC	Proportion of Trauma patients who have a PCAT in UKROC who are admitted within 6 weeks of being fit for transfer (grouped by referral source: MTCs /non-MTCs)

3	**Specialist Level 1 and 2 in-patient rehabilitation services**	**Element**	**Source**	
3.1	All Level 1 and 2 services should be led by a consultant in RM and/or neuropsychiatry, depending on caseload.	1	Service profiles	**Descriptive analysis of UKROC data for Level 1 and 2 Rehab services (by Level)** Proportion of services with a consultant in RM/Neuropsychiatry Analysis of WTE in relation to No beds / activity
3.2	All Level 1 and 2 services should meet at least the minimum standards for safe and effective staffing levels as laid down in the BSRM standards.	1	Service profiles	Proportion of services meeting recommended staffing levels Analysis of WTE in relation to No beds / activity
3.3	All Level 1 and 2 services should be registered with UKROC and contribute the first full UKROC dataset for every patient enrolled under the NHSE-commissioned rehabilitation programme.	1	Service profiles	Proportion of patients with compete UKROC dataset
3.4	Assessment of function and rehabilitation needs should be documented within 10 days of admission and within the last 7 days before discharge, including RCS-E, NPDS and UK FIM+FAM.	2	UKROC	Proportion of patients with RCS-E, NPDS and UK FIM+FAM recorded on admission and discharge. Descriptive analysis for Trauma dataset
3.5	By discharge, all patients should have achieved some measurable gain or goal achievement, as measured by UK FIM+FAM, NPDS or GAS T-score (or other approved measure), or the reason for no gain is recorded. Discharge destination should also be recorded.	2	UKROC	Proportion of trauma patients have achieved some measurable gain or goal achievement, as measured by UK FIM+FAM, NPDS or GAS T-score In patients with no gain: • Were other measures recorded – if so, which and did they show gain • Was the reason for no gain recorded Analysis will be conducted both including and excluding those who were admitted and remained in PDOC
3.6	Cost-efficiency data* should be reported in all episodes. It was originally suggested that, excluding patients who remain in prolonged disorders of consciousness at discharge, cost-efficiency for trauma patients should be within two standard deviations of the mean within each service group for 85% of patients. As yet there is no robust data to inform whether this is an appropriate means to identify outliers	2	UKROC	Proportion of trauma patients with cost-efficiency recorded Analysis will be conducted both including and excluding those who were admitted and remained in PDOC. Reporting rates for cost efficiency will be compared between services using RAG rating. The mean and SD (or median and IQR) cost-efficiency will be recorded for each service and for each service level to explore whether this may be an appropriate way to identify outliers in the future.

5.12 Appendix 2: Data linkage for the National Clinical Audit of Specialist Rehabilitation following major Injury

Provisional Data flows - National Clinical Audit of Specialist Rehabilitation for Patients with Complex Needs Following Major Injury



5.13 Appendix 3: List of key data items from TARN to be linked to the UKROC database:

Data	Fields	Purpose
Identifiers	NHS number	Identification for linkage
	Date of birth	Confirming identification and age
	Age, Gender	Socio-demographic data
Process within TARN	Date of Admission	
	Date of Discharge	
	Length of stay in MTC (days)	
Injury severity	Injury severity score	Confirmation of eligibility for RP Clinical characteristics of injury
	Glasgow Coma Score on admission	
Rehabilitation Prescription	Presence of RP?	
	If yes: Types of rehabilitation need	
	• Physical needs	
	• Cognitive needs	
	• Psycho-social needs	
	Was a copy of RP given to patient?	
Rehabilitation Needs	Category of needs	Confirming category A or B needs requiring referral to Level1 or 2 rehabilitation service
	Complex needs check list*	
	Patient Categorisation Tool (PCAT)*	
	Rehabilitation Complexity Scale (RCS-ET)*	
	Seen by consultant in RM? If not, reason	To identify consultant in RM input
If category A or B needs: Specialist rehabilitation Prescription	**NIS-Trauma***	Severity of impairments
	Northwick Park Dependency Scale (NPDS/NPCNA)*	Nursing dependency and care needs for calculation of on-going costs of care
Discharge planning on leaving the MTC	Recommended service level	Type of service required
	Service(s) referred to and date	Intended discharge destination
	Recommended discharge destination	
	Actual discharge destination	
	Reason for variance	
Extended RP (optional)	Descriptive information about needs and recommendations for rehabilitation	Will be used where necessary to supplement missing data
Outcomes	Glasgow Outcome scale **(**PROMs/PREMs may be explored if available but not part of NCASRI)	

*Copies of these tools are provided in the data collection pack

5.13.1 Descriptive analysis of MTC Data

Descriptive data analysis will be carried out on data collected for *eligible patients* in the MTCs over the 14-month recruitment period. The data items listed above will be used to describe

- The patient population – age, gender, nature and severity of injuries, impairment, the type and complexity of rehabilitation needs
- Clinical pathway parameters (including the length of stay in the MTC, discharge destination etc),
- The process of evaluation of rehabilitation needs, RM consultant assessment etc
- The quality of documentation, in including completeness of the rehabilitation prescription (RP) and the tools within the SpRP

The following will be analysed for the population as a whole, as well as by individual service.

5.13.2 Descriptive data items will include:

i. Patient data -

- Socio-demographic data - Age, gender
- Clinical characteristics - Injury Severity Score, mechanism of injury (blunt vs penetrating), pre-existing medical conditions, critical care admission, Glasgow Coma Score on admission.
- Severity and nature if impairment, dependency and rehabilitation needs at discharge
- Critical care length of stay (LOS)
- Overall hospital length of stay
- Discharge destination *(home, mortuary, rehabilitation)*
- Transferred out *(e.g. further Specialst Care, Repatriation/ reverse transfer)*
- Readmission and Reason for readmission
- Outcome data - GOSE

ii. Process data –

- Completion rate of the five assessment tools - CNC, RCS-T, PCAT, NPDS-H and NIS-T (%)
- Completion of tools by a CRM and/or a therapist (%)
- Completion of a Rehabilitation Prescription (%)
- Completion of a Specialist Rehabilitation Prescription (SpRP) by discharge from the MTCs (%)
- Details of referral to Level 1/2 services (E)
- Discharge destination

iii. Completeness of Rehabilitation prescription data fields (% complete)

- Presence of a Rehabilitation prescription
- Presence of physical factors
- Presence of cognitive/mood factors
- Presence of psychosocial factors
- Presence of physical factors
- Did the patient receive a copy of the RP
- Patient Categorisation recorded
- Recommended destination for rehabilitation
- Date referred
- Date assessed
- Actual destination for rehabilitation
- Reason for variance

5.14 Appendix 4: UKROC dataset – list of current data items

UKROC is a hierarchical database, in which different service levels have different reporting requirements. Level 1 (tertiary) services are low volume high cost services which warrant a more exhaustive set of data requirements that the higher volume lower cost Level2 (local) specialist services.

The table below summarises the minimum data reporting requirements for each service level

UK ROC Minimum Data Reporting Requirements Checklist – 2016/17

Items	Service Level (actual or aspired)					Notes
	1*	2a*	2b*	2b	Other	* using weighted bed day tariff
Patient Identification & Demographics						
Patient Name	✓	✓	✓	✓	✓	for local use only
Date of Birth	✓	✓	✓	✓	✓	for age calculations & data linkage
Gender	✓	✓	✓	✓	✓	
Ethnicity						desirable if available
Local Identifier						for local use
Hospital Number						for local use
NHS Number	✓	✓	✓	✓		for future data linkage
Commissioning & Referral						
Funding Source (NHS England, CCG, private etc)	✓	✓	✓	✓	✓	
Service Level (1, 2a, 2b, 3)	✓	✓				if commissioned at several levels
Patient Category (a, b, c, d)	✓	✓	✓	✓		
CCG name or code	✓	✓	✓	✓	✓	
GP Practice name, code and/or postcode	?	?	?	?		may be required by commissioners
GP name and/or code	?	?	?	?		may be required by commissioners
Patient postcode						optional, though useful if available
Referral date	✓	✓	○	○		
Referral source	✓	✓	○	○		
Date of decision (added to active waiting list)	✓	✓	○	○		
Date fit for admission	✓	✓	○	○		
Initial Assessment						
Date of initial assessment	✓	✓	○	○		
Assessed by (uni/multi-disciplinary)	✓	✓	○	○		
Diagnosis						
Onset date (original and/or current)	✓	✓				
Diagnosis category/subcategory	✓	✓	✓	✓	✓	
ICD 10 codes						optional
Admission Details						
Date of admission	✓	✓	✓	✓	✓	
Proposed discharge date	✓	✓	○	○		
Proposed trimpoint date						
Admitted from	✓	✓	○	○		
Admission purpose	✓	✓	○	○		
Interruptions & Extensions						
Interruptions (start & end date, reason)	✓	✓	✓	✓		
Extension date	✓	✓	✓	✓		
Discharge Details						
Date fit for discharge	✓	✓	○	○		
Discharge date	✓	✓	✓	✓	✓	
Reason for delay	✓	✓	○	○		
Discharge mode	✓	✓	○	○		
Discharge destination	✓	✓	○	○		
Discharge postcode						optional, though useful if available
Admission & Discharge Assessments (all assessments should be submitted with fully itemised scores)						
Patient Categorisation Tool (on admission)	✓	✓	✓	✓		complexity measure
RCS-E version 13 – scored retrospectively	✓	✓	✓	✓	✓	complexity measure
FIM+FAM (including NIS)	✓	✓	✓	✓		outcome measure
NPDS-H (used to demonstrate cost efficiency)	✓	✓	✓	✓		outcome measure
Barthel or FIM+FAM or FIM or NPDS-H/NPCNA					✓	outcome measure
Mayo-Portland Adaptability Inventory (MPAI-4)						new in software version 16
Fortnightly Assessments (scored retrospectively for all patients throughout the year based on what was provided)						
RCS-E version 13	✓	✓	✓	○		complexity/inputs measure
Cross-Sectional Data Tranches (all assessments should be scored retrospectively based on what was actually provided) Collected fortnightly for ALL patients until at least 100 sets of matching assessments have been completed						
Matching RCS-E, NPDS-H/NPCNA & NPTDA	✓	✓	✓	○		complexity/inputs measures
RCS-E version 13				✓	✓	complexity/inputs measure
Data Submission Frequency						
Monthly (including all current inpatients)	✓	✓	✓	✓		
Optional – no requirement to participate					✓	ideally submitted monthly or quarterly
Other (submitted annually and following any significant changes to service)						
Service Profile	✓	✓	✓	✓	✓	including staffing levels and costs

○ level 2b services are strongly encouraged to submit these items even though they are not currently mandatory.

April 2016

5.14.1 Key UKROC data items for this audit

Data	Fields	Purpose
Identifiers	NHS number	Identification for linkage
	Date of birth	Confirming identification and age
	Age, Gender	Socio-demographic data
	Diagnosis / nature of injuries	
Response times	Date of referral by MTC	To identify waiting times for assessment and admission to Level 1 or 2 rehabilitation service
	Date of assessment by Rehab unit	
	Date of acceptance for admission	
	Date fit for transfer	If not yet fit for transfer at time of acceptance
Process within the rehab service	Date of Admission	
	Date of Discharge	
	Length of stay in rehabilitation (days)	
Timing of baseline assessment	Dates of completion of the following:	Timeliness of baseline assessments
Rehabilitation Needs on admission	Category of needs (A,B,C,D)	Confirming category A or B needs requiring treatment in a Level 1 or 2 rehabilitation service
	Patient Categorisation Tool (PCAT)	
	Rehabilitation Complexity Scale (RCS-E)	
Functional independence during rehabilitation (Admission, discharge and change scores)	UK FIM+FAM – (Motor, cognitive and total scores)	Gains from rehabilitation in terms of: • Functional independence • Reduction in care needs • Reduction in on-going care costs Calculation of cost-efficiency
	Northwick Park Dependency Scale (NPDS/NPCNA)*	
Optional:	Neurological Impairment Set (NIS) Goal attainment scaling (GAS) FIM+FAM Extended activities	Alternative gain parameters if more appropriate to patient
Discharge planning on leaving the rehab unit	Discharge mode	Discharge destination
	Discharge destination	
	Anticipated discharge date	Discharge delays
	Actual discharge date	
	Reason for delay	
	Post code / CCG	Geographic differences in
Structure	Staffing levels	Compliance with national standards for staffing levels in relation to complexity of case load

*Copies of these tools are provided in the data collection pack

5.14.2 Descriptive analysis of UKROC Data

Descriptive data analysis will be carried out on data collected for *rehabilitation patients* in the Level 1 and 2 rehabilitation centres over the follow-up period. The data items listed above will be used to describe

Data collected in Level 1 and 2 UKROC rehabilitation centres will be analysed to establish level of compliance with the process reference standards within Level 1 and 2 rehabilitation services. This will include:

- The patient population – age, gender, nature and severity of injuries, impairment, dependency (including any differences between the eligible group and the rehabilitation group) and within patient change since this discharge from the MTC if admission for rehabilitation is delayed)
- Rehabilitation needs, complexity - inputs
- Functional outcomes following specialist rehabilitation - including change in care needs and input for care, nursing, therapy and medical intervention as well as clinical and cost-efficiency.
- The quality of documentation and reporting.

The following will be analysed for the population as a whole, and for services grouped by type and level of service, as well as for individual service providers.

5.14.3 Descriptive data items will include:

i. *Patient data -*

- Socio-demographic data - Age, gender
- Severity and nature of impairment, function dependency and rehabilitation needs
- Category / complexity of need on admission
- Source MTC

ii. *Process times in the rehabilitation service – including completeness of reporting*

- Response times for assessment (within 10 working days from referral) and admission (within 6 weeks of accepting)
- Assessment of baseline function and category / complexity rehabilitation needs (within 10 days of admission)
- Staffing ratios in relation to the RCS-E and level of rehabilitation unit
- Assessment and reporting of outcomes and discharge destination at the end of rehabilitation

iii. *Progress within the rehabilitation service*

- Discharge to home or other suitable long-term placement (according to needs and dependency)
- Gains in independence (or individual goal attainment where more appropriate) in relation complexity of rehabilitation needs as measured with the FIM/FAM or GAS
- Reduction in care needs as measured by the NPDS/NPCNA
- Cost efficiency (in terms of time to offset the cost of rehabilitation through savings in ongoing care in the community, as estimated by the NPCNA)

5.15 Appendix 5 - Information from ONS-Mortality data and HES

Data	Fields	Purpose
ONS-Mortality data	Date of death	To identify those who have died
HES	Dates of admission and discharge and HRG codes for inpatient treatments in the 6 month period after discharge from the MTC	Too identify hospital treatments other than rehabilitation in a Level 1 or 2 rehabilitation service HRG data will indicate the principal purpose of admission

After linkage of *recruited and rehabilitation* datasets with the above HES and ONS-Mortality datasets, descriptive data analysis will be carried out on data collected to identify:

- For *recruited* patients who were not admitted to Level 1 / 2 services discharge from the MTCs:
  - The proportion of patients admitted to other in-patient services after discharge from the MTCs.
  - The primary and secondary purposes of those admissions from HRG data – ICD/OPCS codes
  - The availability (and results) of any outcome measures recorded in HES
- For *rehabilitation* patients who were not identified in the MTCs as having complex needs, but were subsequently admitted to Level 1 / 2 services
  - Where they received their acute major trauma care
  - Why they were not identified as having Category A or B needs, which may be
    - Administrative – due to lack of staff to complete RPs and SpRPs in MTCs
    - Clinical – genuine change in circumstances / needs.

5.15.1.1 ONS data

Linkage with ONS data will support the identification of those patients who subsequently died and are therefore not be expected to appear in the rehabilitation dataset