

# Roadmapping the Unmet Needs in the Brain Injury Patient Pathway

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## **Executive Summary**

Workshop led by the Institute for Manufacturing,  
Education and Consultancy Services,  
Cambridge, 23–24 June 2014

## Part 1: Acute Brain Monitoring Strategic Roadmapping

This workshop was designed to enable the NIHR Brain Injury Healthcare Technology Co-operative to explore priorities and gaps in the area of acute brain monitoring. The event was particularly concerned to:

- confirm unmet patient needs over the course of their pathway experience
- identify possible collaborations between industry, patients, commissioners and researchers to improve patient pathways in those areas of need

Key outputs were three opportunity areas selected for further investigation. Syndicate groups developed roadmaps and mini business plans.

This and a parallel workshop (tele-rehabilitation) took place over three sessions – evening, morning and afternoon. Each workshop brought together some twenty delegates representing commissioners, staff, researchers and industry.

Led by the University of Cambridge Institute for Manufacturing (IfM), the workshops employed the IfM landscaping methodology to identify areas for more detailed roadmapping.

The landscaping process began with identification of **trends and drivers**.

Delegates identified numerous **social, technological, economic, environmental, political and legal** developments. Emphasis was placed on the increasing importance of central direction of resources to priority areas and ‘design around the patient’.

Key issues in the current **strategic healthcare** context were: ‘Selecting and adopting technologies that really make a difference’ and ‘Will the patient wake and what is the prognosis?’ Trends and drivers over the short and medium term included data integration approaches to knowledge transfer and utilisation of sensing technologies. Demonstrating increased survival and quality of life was seen as the key driver for achievement over the longer term.

Regarding **NHS strategy**, personalised care and treatment was an important driver. Barriers to entry into the NHS for new products were highlighted as a major challenge.

Currently, the prime driver for **strategic outcomes and intentions for brain injury pathway** was the need for rapid assessment of injury. Looking ahead, the predominant goal would be extended technological advanced monitoring into non-traditional environments.

Next, delegates focused on the **patient pathway experience and unmet needs**.

Among the needs identified in **acute care** the following were emphasised: easy access to the whole patient clinical record; algorithm development for accurate prediction of prognosis; patient-centric design implementation; cross-fertilisation and knowledge sharing. Chief among bedside diagnostics needs were: diagnostic portable computerised tomography; 3D imaging – rapid, portable and bedside; single plug-and-play system for medical devices (long-term goal).

Other unmet needs included biomarker and imaging tools identifying patients at risk of deterioration (For example, dynamics) using biomarkers and advanced analysis of intracranial dynamics and determining risk

factors for late dementia. There was broad agreement as to the importance of the opportunity presented by non-invasive, mobile physiological monitoring of benefit to a wide variety of patients including those recently discharged from intensive care (the “ICU without walls” concept) and patients with neurodevelopmental disability and refractory epilepsy.

Following this analysis of trends, drivers and needs, delegates reflected on possible responses – **research projects and enabling mechanisms**. An extensive list of enabling projects and research items was identified, which is shown in full in section 3.3.

Following completion of the landscape delegates identified priority topics, from which three opportunity areas were selected for detailed investigation. Opportunities are directed at improving patient outcomes through the application of new technologies in the areas of:

- Extended patient monitoring
- Next-generation imaging
- Optimised R&D infrastructure for clinical care

A number of topics were also noted for potential future consideration.

Syndicate groups investigated the three priority opportunity areas and identified key actions:

- *Extended patient monitoring*: Funding for, and fostering of collaboration in: refining data capture and analysis software; specific technology development – intracranial pressure (ICP), near-infrared (NIR) spectroscopy, electroencephalogram (EEG), sensors, biomarkers
- *Next-generation imaging*: Scoping exercise to evaluate candidate gap closures: software and integration tools for rapid imaging; new ligands for positron emission tomography (PET) and/or single-photon emission computed tomography (SPECT) (processing); converting novel imaging modulation from prone to 2D imaging. Develop implementation consortia
- *Optimised R&D infrastructure for clinical care*: Create virtual community ‘Brain Injury Research UK’ and encourage establishment of UK brain injury research charity to support research in: optimisation of each step of the patient pathway; overarching themes (governance, IT, etc.)

It was stressed that further development is required on priority topics identified which are beyond the remit of delegates:

- Improving communication technology across NHS sites
- Working more closely with national procurement and manufacturers to gain the right outcomes for patient needs, creating useable, open, scalable standardised products and services

Participant feedback on the workshop was very positive. The process employed was judged to generate good outputs with broad participation.

On circulation of the initial draft of workshop outcomes, qualifying comments were fed back concerning the extent to which Brain Injury Health Care Technology Co-operative (HTC) might facilitate and support collaborations to take forward the priority areas.

The HTC will work with lead organisations, including Health Knowledge Transfer Networks and Cambridge Enterprise to build national consortiums and collaborations over the coming months to take forward the identified priority areas. It is the intention that these collaborations will develop proposals for major grant funding for unmet needs in the brain injury pathway. Collaborations will be representative of community including clinicians, academics, industry, patients and commissioners.

## Part 2 Tele-rehabilitation Strategic Roadmapping

This workshop was designed to enable the NIHR Brain Injury Healthcare Technology Co-operative to explore priorities and gaps in the area of tele-rehabilitation. The event was particularly concerned to:

- confirm unmet patient needs over the course of their pathway experience
- identify possible collaborations between industry, patients, commissioners and researchers to improve patient pathways in those areas of need

Key outputs were five research and enabling projects selected for further investigation. Roadmaps and mini business plans were developed by syndicate groups.

This and a parallel workshop (acute brain monitoring) took place over three sessions – evening, morning and afternoon. Each workshop brought together some twenty delegates representing commissioners, staff, researchers and industry.

Led by the University of Cambridge Institute for Manufacturing (IfM), the workshops employed the IfM landscaping methodology to identify areas for more detailed roadmapping.

The landscaping process began with identification of trends and drivers. Key among **social trends** identified was the need to ensure equal access and outcomes against both clinical and patient definition of 'return to normal'.

**NHS strategy** brought multiple drivers:

- Extended use of complex data to drive patient management
- Increasing focus on 'health economics' driving better value from technology
- Identification of efficiencies across all agencies through technological advances in order to keep people in own homes
- Strategic outcomes improvement and preventative technologies
- Stratified rehabilitation plans integrated with carer needs and capabilities
- Need for practitioner education in support of 'whole patient' approaches, supported by technology applications

Core **patient needs** included:

- Straightforward, effective tele-rehabilitation delivering what the patient actually needs
- Carer support

Several challenges were identified, including:

- Early supported discharge (ESD) into complex, potentially remote support networks
- Reduced frequency/intensity of therapy sessions as a result of ESD

Next, the landscaping process focused on the **patient pathway experience and unmet needs**. Delegates prioritised the following needs.

### ***Patient education***

Information on available services and equipment should be readily available to a patient to support effective self-management

### ***Patient rehabilitation management***

The patient pathway should encompass:

- Tailored information and assessment tools to enable patients to self-monitor progress in their home environment
- Tailored treatments incorporating patient's own learning
- The setting of realistic quality of life expectations for patient and families
- Education, training and staff to support prevention of adverse behavioural/mental health outcomes
- Stratification and personalisation (one size does not fit all)
- Care coordinated effectively between acute and community services
- Continuous 'real time' access to medical device utilisation
- Information extracted to provide feedback to both clinicians and patients

### ***Treatments***

Early intervention to promote cognitive recovery is important. There is also an unmet need for psychological support.

### ***Medical devices***

Prime issues are usability and compliance. There is a need for (not necessarily sophisticated) technologies that people want to use.

Following analysis of trends, drivers and needs, delegates reflected on possible responses. Chief among the **research projects and enabling mechanisms** thus identified were the following.

### ***Enabling projects***

- Set up a self-help home monitoring project supported by a dedicated development facility
- Examine large data collection projects e.g. UK Biobank in order to learn from their experience

### ***Organisation***

- Set up systematic reviews to examine indicators of successful response to different therapies as the precursor to an 'effective treatments project'. This should include one exemplar each from Cognitive Behaviour Therapy and Constraint Induced Movement Therapy
- Adopt an 'implementation science' approach to implementation and evaluation of interventions

### ***Technology, IT and communications***

- Set up an information resource/website to support patient and carer need for information (Under Healthcare Technology Co-operatives/Acquired Brain Injury Rehabilitation Alliance) including patient feedback of experience
- Improve communication technology across NHS sites
- Secure mobile device connectivity in patient home (Wi-Fi, 3G, Bluetooth)

### ***Suppliers and partners***

- Work more closely with national procurement and manufacturers to gain right outcomes for patient needs, creating useable, open, scalable standardised products and services
- Utilise expertise of patient leaders in drive for new co-design methodologies
- Increase number of third sector/charity psychologists in care of patients with long-term conditions

Following analysis of possible research and enabling projects and mechanisms delegates prioritised five opportunity areas for detailed investigation:

- Setting up a patient information portal

- Creating an integrated patient rehabilitation record
- Setting up home assessment and monitoring services
- Promoting physical activity through activity monitoring device and therapy service redesign
- Piloting approaches for prevention of avoidable emotional and cognitive problems after acute brain injury

Further areas were prioritised as important but beyond the remit of the workshop delegates, while a number of topics were also identified for possible future consideration.

Syndicate groups investigated the five priority opportunity areas and identified key actions:

- *Setting up a patient information portal:* Develop project proposal and option appraisal for site launch within 18 months
- *Creating an integrated patient rehabilitation record:* Establish funding for project with pilot rollout in 2015 and national roll out in 2016
- *Setting up home assessment and monitoring services:* Secure funding for pilot project to deliver service within 1–2 years. To include market need assessment; website/call centre-enabled technology service; enhanced specialist advice and signposting
- *Promoting physical activity through activity monitoring device and therapy service redesign:* Develop proposals to supply patients with commercial off-the-shelf tools and accelerometers to facilitate information on progress against personalised goals
- *Piloting approaches for prevention of avoidable emotional and cognitive problems after acute brain injury:* Secure funding for programme to pilot suitable technologies, working with a compliant, representative group of patients, carers, staff and commissioners in developing predictive battery and screening assessments.

It was stressed that further development is required on the priority topics identified which are beyond the remit of delegates:

- Improving communication technology across NHS sites
- Working more closely with national procurement and manufacturers to gain the right outcomes for patient needs, creating useable, open, scalable standardised products and services

Participant feedback on the workshop was very positive. The process employed was judged to generate good outputs with broad participation.

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The HTC will work with lead organisations, including Health Knowledge Transfer Networks and Cambridge Enterprise to build national consortiums and collaborations over the coming months to take forward the identified priority areas. It is the intention that these collaborations will develop proposals for major grant funding for unmet needs in the brain injury pathway. Collaborations will be representative of the wider community including clinicians, academics, industry, patients and commissioners.