Main Recommendations

1. The workforce delivering all aspects of care to people with acute and long term neurological conditions including neuromuscular disorders needs to be increased.

2. Service delivery needs to be improved and made equitable across Wales, provided on a 24/7 basis and support the care of acute non surgical traumatic brain injury and patients suffering stroke.

3. Rehabilitation services for acquired brain injury, long term neurological conditions and for spinal injury need to be improved. An added benefit of ongoing rehabilitation should be reduced re-admissions and reduced demands on respite care.

4. Thrombolysis services, for stroke, should be established alongside the neurology centres and networks then formed to include other main hospital sites. Rapid access neurovascular clinics should be established in stroke centres.

5. Each local neurological service requires access to a clinical neurophysiology service for EEG and EMG with waiting times for elective referrals of no more than six weeks.

6. The care pathway for head injured patients needs to minimise the time taken for initial assessment and transfer to a neurosurgical unit when necessary. Image transfer in the context of acute head injury needs to be addressed, as a priority.

7. Neurocritical care services need to be developed in Wales.

8. Services for acute spinal emergencies and non-complex spinal surgical services need to be developed.

9. Neurological services should be provided on a networked basis and include the development of care pathways from initial diagnosis to end of life care. Networks need to work with paediatric services to ensure transition care from child to adulthood is addressed appropriately.

Rationale

Evidence presented to the Review Group by patients, professionals and by benchmarking data showed that the Welsh population requires enhancement of
neurological, neurorehabilitation, neurophysiology, stroke management and diagnostic facilities.

The All Wales recommendations compliment the recommendations already published for North and Mid & South Wales.

They are designed to ensure that the entire population of Wales has access to high quality, safe and sustainable neuroscience, stroke and spine service.

Managed Clinical Networks (MCN) will provide the means by which agreed standards of care, care pathways and service monitoring can be applied.

1. **Medical Neurology**

   (i) The current academic medical neurology units should be supported and encouraged.

   (ii) Every medical admission unit and critical care area should have a designated named neurologist(s).

   (iii) A 24/7 helpline manned by senior trainees or consultants should be available as a single point of advice in each main neurological centre.

   (iv) The potential for telemedicine should be further explored to enhance both in-patient and out-patient care.

   (v) All units should plan the availability of 24/7 MRI.

   (vi) The neurology services should support the local stroke and acquired brain injury teams.

   (vii) Patients with an acute neurological disorder admitted to a hospital should at least have immediate access to an expert neurological opinion and be assessed by a neurologist within 24 hours, possibly via a telemedicine link.

   (viii) There should be rapid access to a designated regional neurosciences centre in which there are adequate numbers of critical care beds for neurological emergencies and access to neurosurgery.

   (ix) Nurse Specialists should support the medical workforce with a defined case load of no more than 300 patients each, in Epilepsy, Multiple Sclerosis, Parkinson’s and Neuromuscular disease.

   (x) Specialist clinics consisting of multidisciplinary teams (MDT) should be established to assist in the management of more complex aspects of the commoner neurological conditions (multiple sclerosis, Parkinson’s disease, epilepsy, neuromuscular disorders and stroke) as close to the patients home as is feasible.
(xi) An increase in the number of locally based physiotherapists, occupational therapists and speech and language therapists will be required to meet additional demands.

(xii) Patients with acute neurological conditions requiring non elective admission should be under the care of a consultant neurologist and their team.

(xiii) Neurology service development needs to include the needs of the local prison populations.

2. **Neurophysiology**

(i) EEG (diagnosis and management of epilepsy), Electromyography (EMG) and nerve conduction studies should be available at all main hospital sites. They could be provided by a clinical physiologist (neurophysiology) and e-linked to the main neurology centres with a quality assurance process monitored by the Network.

(ii) In addition to providing essential diagnostic services to the neurological patient, neurophysiology also provides essential services to orthopaedics, hand clinics and ophthalmology.

(iii) Complex neurophysiology for epilepsy surgery and for the intra-operative monitoring of cranial and spinal surgery should be available in theatre where neurosurgery and spinal deformity surgery is performed. Further development of the interface between functional imaging and neurophysiology should be encouraged.

3. **Stroke Management**

(i) Acute admitting hospitals in Wales should continue to develop their stroke units. All hospitals admitting acute stroke patients should have facilities and organisation that conform to the UK and ESO stroke guidelines.

(ii) The development of a stroke thrombolysis service, performing to the United Kingdom thrombolysis guidelines, should be established at the earliest opportunity. This should be a 24/7 service and initially should be centred on the five neurology units with networks extended to the other main hospital sites in a phased process. It will require the integration of consultant rotas, team working and training. Telemedicine networks should be developed to support thrombolysis at geographically remote sites where transfer to a primary stroke centre is impractical.

(iii) Prompt and authoritative radiological reporting will be needed to support this initially. This will require 24/7 local availability of CT scanning and prioritisation of acute stroke patients for CT access. In the foreseeable future MRI scanning is likely to be included.
(iv) Rapid Access Neurovascular clinics should be established as a preventative measure. These should be “One stop” clinics enabling clinical assessment, carotid and brain imaging (usually Doppler ultrasound and CT scanning) and the initiation of relevant therapy, including onward referral of appropriate cases to a vascular surgeon. Vascular surgical response times should be minimised to conform to UK guidelines.

(v) Stroke rehabilitation should follow local clinical pathways for acquired brain injury of whatever cause.

(vi) Clear links should be established between the Stroke Units and the neurosurgical service for the onward referral of patients to the neurosurgical unit when required. Guidelines should be in place for decompressive neurosurgery and interventional radiology.

4. Rehabilitation

(i) Inpatient Neurological Rehabilitation Centres should be developed, as part of the Managed Clinical Network, to cater for traumatic acquired brain injury, stroke and other neurological conditions requiring rehabilitation.

(ii) Rehabilitation strategies should be defined and implemented in the acute phase of management and carried through as necessary to specialist in-patient rehabilitation and on to the community acquired brain injury team.

(iii) All patients with moderate to severe brain injury need rapid access to in-patient neurological rehabilitation services.

(iv) All patients with acquired brain injury should have access to an acquired brain injury team and neuropsychology. Patients being repatriated from the tertiary centre should be referred into the rehabilitation centre and assessed for rehabilitation potential and should not be returned to orthopaedic or general surgical wards.

(v) Inpatient neurorehabilitation should be developed on a hospital site to ensure appropriate 24/7 medical cover and have the ability to provide a service to the acute phase of the neurological patient. These should link with a network of community neurological rehabilitation services which itself links with a coherent network of general rehabilitation services.

(vi) The co-location of all inpatient rehabilitation facilities (cardiac, amputation etc) would be hugely beneficial as would the effective integration with bioengineering and driving assessment centres.

(vii) Acute admitting hospitals should develop integrated facilities for stroke and head injured patients through acquired brain injury rehabilitation teams, to enable their return to the community. There needs to be a liaison rehabilitation team, led by a Rehabilitation Medicine Physician in every
hospital to support the other services and to ensure speedy and effective transfer to an in-patient or other rehab facility as needed.

(viii) Spinal injury units should have the ability to accept all patients with neurological injury within 24hrs of functional loss, except for those who require spinal stabilisation procedures who will first be admitted through a complex spinal surgical service. A minimum of 2 WTE consultants would be required to manage the spinal injury service. This rehabilitation service needs to be sited alongside neurological rehabilitation. The training of specialists in this and rehabilitation medicine is almost co-terminus and there would be benefits to staffing and to patients.

(ix) The service should be able to manage ventilated patients and could be further developed to oversee those patients with spinal injury, as well as those with other neurological conditions, who require home ventilation. This would represent a significant opportunity to develop an effective and integrated service in Wales.

(x) Depending on the special interests of the neurological and neurosurgical consultants, a minimum of 2 WTE consultants would be required for each in-patient rehabilitation centre. A full complement of allied health professionals and neuropsychologists would be needed to complete the teams.

(xi) The working together of acquired brain injury teams/team members and stroke community teams would maximise their effectiveness for patients.

(xii) The MCN must include the resources available through the voluntary sector and explore the potential to develop services in conjunction with existing voluntary sector providers.

(xiii) All those working in these MDT teams should have regular CPD which should be available at local, regional and tertiary levels.

(xiv) When children leave school they should have access to multidisciplinary rehabilitation services led by rehabilitation medicine physicians. This is particularly important for those with neurological and complex disabilities.

5. Neuroradiology and Image Linking

(i) All hospitals accepting acute admissions must have the facility to perform CT scans 24/7. Those hospitals undertaking thrombolysis must be able to perform CT scans within an hour of the patient’s admission. To be optimally effective this may need to be extended to include multimodal MRI or CT as soon as is feasible.

(ii) With effective and agreed guidelines for the management of acute patients CT scanning should be available without the need for negotiation over access to the scanner.
(iii) Those clinicians responsible for reporting or making management decisions on scans must be able to do this in an effective time scale. Daytime clinical activities should take this in to account. The ability to review scans at home out of hours should be developed.

(iv) All images in the future should be available on a national Welsh PACS service which should link with the tertiary centres.

(v) Interventional radiology should be developed alongside the neurosurgery service. It needs to be developed to be capable of delivering a 7 day per week service for the management of intracranial aneurysm and arteriovenous malformation, as well as tumour embolisation. There is also potential for it to develop into a 24/7 service if the evidence base for aggressive stroke management emerges (intra-arterial clot lysis and mechanical revascularisation). The interventional sessions will need to be fully resourced, with designated anaesthetic sessions and recovery facility.

(vi) Neuroradiology should be available on all in-patient neurology sites supported by neuroradiologists and image linking.

(vii) The availability of a 3 Tesla magnet will enhance the opportunities for research.

6. Neurosurgery

(i) There should be a separation of elective and emergency activity to allow a consultant or experienced trainee to be available to respond to requests for emergency opinions.

(ii) As a matter of urgency clear and unequivocal guidelines must be developed by those involved in:
   - The Management of Acute Head Injury, using the Society of British Neurological Surgeons (SBNS) and Trauma Audit and Research Network guidelines, supported by NICE guidelines on the initial management of head-injury.
   - The management of Spontaneous Subarachnoid Haemorrhage.
   - The management of an acute Neurovascular event.
   - The management of Acute Spinal Injury and Cauda Equina Compression.
   - The management of metastatic spinal cord compression (NICE)
   - The management of brain and other CNS tumours (NICE)

(iii) These guidelines must lead to a consistent and timely response from the Tertiary Centre. These guidelines should be evidence based and to ensure availability based within the “Map of Medicine”
7. **Neurotrauma**

(i) Current Trauma Audit and Research Network (TARN) data demonstrates that it currently takes between 5-7 hrs from injury to the neurosurgical operating theatre. Up to 5 hours of this time is expended in the initial receiving hospital assessing, scanning, resuscitating and stabilising the patient. Significant time is lost by delays in scanning and communication and decision making with the neurosurgical units. Addressing these delays together with ensuring effective transport, including the use of air ambulance, should enable a faster admission to the neurosurgical unit.

(ii) Each receiving unit should clearly designate who is responsible for the inpatient clinical care of non-neurosurgical head injuries and ensure that clinicians have the appropriate training and that a governance system is in place.

(iii) The SBNS (Society of British Neurological Surgeons) and TARN guidelines, as published in the Lancet (August 2008), should be adopted immediately.

(iv) Compliance with national audit such as TARN should be mandatory. Contemporaneous data collection and coding must be in place to monitor outliers and delays, in order to rectify system failures.

(v) Spinal injury with or without spinal cord damage represents a difficult problem for Accident and Emergency Departments. These difficulties are compounded by the need for MRI scanning which is not universally available out of hours or at weekends. Until a 24/7 service is available patients with evidence of neurological injury or with spinal instability should be transferred as an emergency to a tertiary centre.

(vi) Each receiving unit should have clear policies for the evaluation of potential spinal injury with clear lines of clinical responsibility.

(vii) Spinal injury with neurological deficit and or evidence of orthopaedic instability (SBNS/TARN, British Orthopaedic Association BOA Guidelines), should be admitted within 24hrs of injury with onward referral on completion of stabilisation to the Spinal Rehabilitation service if appropriate.

8. **Neurocritical Care**

a) **Neurocritical Care**

(i) It is clear that there is considerable unmet need for neurocritical care throughout Wales. At the moment this is probably at least 50% of current provision and possible more. When likely changes in practice are taken into account (e.g. transfer of all severe Traumatic Brain Injury (TBI), poor grade Sub Arachnoid Haemorrhage (SAH) and increased numbers of
stroke patients), the unmet need is likely to rise to 100% of current capacity.

(ii) Neuroscience critical care capacity in Wales should be planned to ensure adequate numbers of staffed level 2 and level 3 beds to allow access for all patients within appropriate clinical timescales. In general terms, capacity should be managed to allow:

- Patients requiring life-saving neurosurgery for an expanding intracranial mass lesion to be transferred to the neuroscience centre within 4 hours of acceptance for treatment.
- All other patients with severe head injury to be transferred to a neuroscience critical care bed, irrespective of whether neurosurgical intervention is required, and ideally within 24 hours.
- Other patients who require intensive care management in a neuroscience unit but who are stable on a general ICU should be transferred within 48 hours of referral.

(vii) Future plans should look beyond this minimum and incorporate sufficient capacity to accommodate the changes in practice that will occur over the next five years. These include, but are not limited to, admission of all patients with severe TBI to neuroscience units, increasing intervention in patients with poor grade SAH and the increased numbers of patients with ischaemic stroke, who will require neurocritical care.

(iii) If neuroscience critical care beds are integrated into a general critical care facility, appropriate policies should be in place to maintain access for neuroscience patients with consideration given to ‘ring-fencing’ a cohort of beds.

(iv) The workforce, medical staffing, nurse and allied health professionals should be as identified in the Neuroscience Critical Care Report: progress in developing services and in guidance published by the Intensive Care Society.

(v) In addition to the general facilities available to all critically ill patients, facilities for intracranial pressure monitoring should be routinely available. Facilities for other intracranial monitoring (e.g. cerebral oxygenation, cerebral microdialysis, cerebral blood flow, continuous EEG) should be available where appropriate.

(vi) There should be 24/7 immediate access to CT, and to MRI, diagnostic angiography and interventional neuroradiology within clinically appropriate timescales. Access to transcranial Doppler ultrasonography and diagnostic electrophysiological services should also be available within clinically appropriate timescales.

(vii) The rehabilitation process should start in the acute phase and allied health professionals and rehabilitation medicine specialists play a pivotal role in this aspect of care. Their specialist skills contribute to ensuring the best possible outcome for patients.
(ix) There should be a culture of data collection and performance review. Data should be collected to allow local and national activity planning, facilitate clinical audit, including the provision of comparative outcome data, and to inform financial flows.

(viii) The Critical Care Minimum Dataset should be collected for all neuroscience critical care activity and, in addition, membership of the Intensive Care National Audit Research Centre (ICNARC) Case mix Programme is mandatory. NccNet, a collaboration of neuroscience critical care units, has recently been established and is working towards the development of a national database for neuroscience critical care. Contribution to this database should be mandatory when established.

(ix) Local strategies should be developed to identify all critically ill neuroscience patients across the whole hospital, including those that require level 1 care.

(x) Neuroscience units often experience difficulties in discharging patients from critical care units when the period of specialist care has ended. Network guidelines should be agreed to facilitate the transfer/repatriation of patients to appropriate facilities in a timely manner.

b) Critical Care Outreach

(i) The concept of existing critical care outreach services should be applied to neuroscience patients in ward areas in the neuroscience unit.

(ii) In addition, the concept of neuroscience outreach should be adapted to support neuroscience patients along their complete care pathway, including the main hospitals and community.

(iii) When a critically ill patient with neurological disease is being managed in a main hospital intensive care unit, a named consultant from the neuroscience unit (usually the consultant neurologist covering that hospital) should be identified as the primary liaison between hospital and neuroscience unit.

c) Long term ventilation

(i) Neuroscience patients that require long term ventilatory support often remain for long periods, and inappropriately, in an acute environment. The plans for the development of a ‘step-down’ facility for the management of those patients who require long term ventilatory support.

(ii) Such a facility will require 24/7 medical cover and should preferably be located on an acute hospital site.
9. **Spinal Surgery**

(i) Non complex spinal services should be expanded in Wales to minimise patient travel.

(ii) Protocols and guidelines should be developed for the assessment of back pain and sciatica, cauda equina compression and when available from NICE, metastatic cord compression, to enable local evaluation and to minimise the need to travel. The services must be able to deliver the findings of NICE guidelines for metastatic cord compression. The fluctuations in bed requirements would be best managed with a combined resource.

(iii) Spinal assessment teams based on advanced nurse and allied health practitioners could provide support at the main hospitals sites and be based for CPD and quality assurance within the two spinal services.

(iv) The spinal services should have accessibility to interventional radiology for image guided biopsy, vertebroplasty and the neurovascular management of spinal vascular anomalies.

(v) Training opportunities for both neurosurgeons and orthopaedic neurosurgeons should be enhanced.