

CRITICAL CARE FOR NEUROLOGY PATIENTS

- A neurological unit serving a population of one million needs 5 – 7 dedicated critical care beds for neurological patients to allow a safety factor of 1.33
- Critical care beds should be sited in close proximity to imaging and other investigative services.
- Neurocritical care should continue to take place within the DGH but only when there are appropriately qualified teams in place.
- A flexible Level 3: Level 2 bed ratio staffed as one is needed
- Level 1 critical care beds should be developed to take pressure off existing critical care facilities.

There is little by way of evidence to support critical care provision for neurological patients and this paper is based on loose estimates only as to what might be required. At present, however, what is known is that the majority of acutely ill patients with neurological disorders are cared for away from the active involvement of neurologists and neuro intensivists in district hospitals. Those that require transfer to Neurology or Neurology Neurosurgery Centres often wait substantial periods during which time their condition may be suboptimally managed. When they are transferred they do so often at the expense of neurosurgical patients and others with head injury. Their early discharge from critical care is hampered by the lack of Level 1 critical care facilities¹ both within neurology units and at the DGH.

Present Resources

There are two ways of examining this, either to identify the demand for each of Level 3, 2 & 1 services or to identify the present capacity. Nothing is known about the number of Level 1 patients or the beds available for them. Identifying level 2 capacity is not always easy and the hardest data are for level 3 facilities. There are mechanisms for identifying neurology / neurosurgery occupancy of level 3 beds using NHS statistical data but no means of capturing level 1 and 2 activity. Level 3 availability in England is shown in Table 1.

Casemix

Neurologists might be expected to admit a variety of groups of patient to a Critical Care facility including:

- ❖ Non surgical traumatic brain injury
- ❖ Status epilepticus
- ❖ Raised intracranial pressure
- ❖ Non traumatic diffuse brain injury including post anoxic injury, encephalitis, toxic and metabolic encephalopathy,
- ❖ Non traumatic focal brain injury
- ❖ Cerebral infarction or haemorrhage

¹ Critical Care – Levels of support

Level 0: Patients whose needs can be met through normal ward care in an acute hospital

Level 1: Patients at risk of their condition deteriorating or those recently relocated from higher levels of care, whose needs can be met on an acute ward with additional advice and support from the critical care team

Level 2: Patients requiring more detailed observation or intervention, including support for a single failing organ system or post-operative care, and those stepping down from higher levels of care

Level 3: Patients requiring advanced respiratory support alone or basic respiratory support, together with the support of at least two organ systems. This level to include all complex patients requiring support for multi-organ failure

- ❖ Infection
- ❖ High spinal injury
- ❖ Peripheral nerve diseases including Guillain Barre Syndrome and Motor Neurone Disease
- ❖ Myasthenia gravis
- ❖ Muscle disease including reversible muscle disease e.g. polymyositis and irreversible muscle disease e.g. muscldystrophies

They would also increasingly expect to be involved in procedural and post procedural multidisciplinary care including

- ❖ Aneurysm coiling
- ❖ Carotid stenting
- ❖ Deep brain stimulation
- ❖ Non invasive ventilation
- ❖ Plasma exchange
- ❖ Thrombolysis in acute stroke
- ❖ Cooling in stroke and head injury

and be involved in critical illness events such as confirming brain stem death and assisting in the diagnosis of metabolic encephalopathy and critical illness neuropathy or myopathy.

Does managing neurological patients on an ITU with neurological involvement make a difference to outcome?

There is limited evidence of effectiveness in this area but in the diagnosis and treatment of status epilepticus on an ITU of 26 patients transferred in status, only 14 were confirmed to be in status, 6 had drug induced coma and 6 were in pseudostatus including 4 who had been intubated (*Walker et al QJM 1996 89 913 – 920*).

The 2002 Report of the National Confidential Enquiry into Perioperative Deaths has revealed that 80% of patients who died within three days of surgery were urgent or emergency admissions. Returning critically ill patients to wards postoperatively produced a poorer prognosis even amongst patients treated in an ITU preoperatively and the 6% of patients who died in these circumstances were a measure of this weakness. The 2002 Report concluded that a lack of a high dependency or intensive care unit bed, so frequently a feature of previous NCEPOD Reports, still blights postoperative care. No such data have ever been collected for patients with medical neurological disorders.

Predicting bed numbers & Commissioning

Modelling for calculating critical care bed numbers is challenging in that planning and providing critical care based only on averages is not best practice. The dangers include an under estimation of necessary beds and other resources and inadequate understanding of activities and processes. It is therefore important to avoid the simple calculation of the number of necessary beds from average length of stay, target occupancy level, and expected number of patients.

Based on a study of neurosurgical patients in Bristol, to meet 95% ($\pm 2SD$) of the neurosurgical critical capacity, a minimum of 15 beds would be required with a flexible Level 3: Level 2 bed ratio of 3:2. The Bristol unit serves a population of two million patients and the minimum recommendations for critical care in a regional neurosurgical unit are:

- 5.5 Critical care beds/1000 admissions
- 7.5 Critical care beds/million

These minimum numbers must be multiplied by an appropriate safety factor, in common with best practice in other disciplines where public safety is an issue, for example civil engineering. If a safety factor is not applied the service will fail at periods of peak demand. Applying a safety factor multiplier of 1.33 the minimum recommendations for critical care in a regional neurosurgical unit become:

- 7 Critical care beds/1000 admissions
- 10 Critical care beds/million

Data from Sheffield would suggest that about 50 neurological patients reach the centre each year consuming an additional 800 bed days i.e. 3 additional beds are required at any one time for acutely ill neurological patients in a network serving 2.2 million people. This takes no account of the numbers of patients on general ITU's in the DGH that require neurocritical care with either non operated head injury or acute neurological disorders who should be cared for by neurologists and neuro-intensivists (as recommended in *Neurology on the United Kingdom – The Care of Acute Neurological Emergencies. ABN 2002*).

Whilst it has been estimated that an additional 5 – 7 beds should be added to the total required / million population for those with non surgical neurological disorders, new, systematically collected, epidemiological data are urgently required to estimate the need for Level 1,2 & 3 neurological critical care beds.

Commissioning

Commissioning neurocritical care services should take place through appropriate networks including critical care and neurosciences networks and must include the commissioning of appropriate care at both the centre and the DGH.

Challenges for neurology

Information is required urgently about casemix and numbers of patients in England who require critical care.

Neurologists should agree standards of care for neurocritical care in line with those set out by the SBNS.

The Neurology CCST should include sufficient training to make any engagement in neurocritical care safe and to generate a new generation of neurological intensivists.

Neurocritical care should be commissioned in both the DGH and the Neurology Neurosurgery Centre at an appropriate level for the casemix.

Future manpower projections and model job plans should include involvement in critical care neurology.

Any development should be linked to the minimally invasive ventilation programme.

Graham Venables
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Association of British Neurologists
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Appendix 1
Level 2 and 3 Critical Care facilities at Neurology Neurosurgery Centres in England

Unit	No Level 3 beds	No Level 3 beds open	No Other level 3 & location	No Level 2 beds	No Level 2 beds open	Is Level 2 care given on neuro wards
Cambridge	13	13	11 GICU	8	8	Yes
Nottingham	0	0	14 GICU	0	0	?
Newcastle	0	0	8 GICU	11	11	Yes
Middlesborough	0	0	15 GICU	4	4	Yes
Preston	0	0	9 GICU	0	6	Yes
Manchester	14	14	9 GICU	8	6	Yes
Walton	9	9	0	4	4	Yes
Oxford	6	4	0	4	1	Yes
Bristol	7	7	0	0	0	Yes
Plymouth	4	4	? GICU	4	4	Yes
Sheffield	5	4	6 GICU	10	8	No
Birmingham	7	7	? OTHER	4	4	No
Stoke	0	0	6 OTHER	?	?	?
Coventry	2	2	13 GICU	2	2	?
Southampton	7	4	13 GICU	6	6	No
Haywards Heath	3	3	0	2	2	No
Hull	6	3	GICU	8	?	?
Leeds	7	7	7 GICU	6	6	Yes
London ChX	0	0	12 GICU	7	7	Yes
Royal Free	0	0	20 GICU	0	0	Yes
Royal London	0	0	15 GICU	4	4	Yes
Oldchurch	3	3	7 GICU	8	8	No
AMH	7	5	0	3	3	No
Kings	14	14	0	12	12	?
NHNN	16	14	0	4	4	Yes
Total	130	117		123	108	

Appendix 2

NEUROCRITICAL CARE FOR PATIENTS WITH NEUROLOGICAL DISORDERS (Modified from the SBNS)

INTRODUCTION

The outcome of patients with severe, acute neurological illness or injury is improved by treatment in a high quality Critical Care Unit with dedicated specialised facilities, staffed by a multidisciplinary team including Consultants with training in neurosciences critical care, supported by adequate facilities. Whilst not all neurologists will have active involvement in the care of such patients, Trusts offering critical care will be expected to have sufficient trained staff in other areas to meet these standards.

OBJECTIVE

All aspects of neuro-critical care will be coordinated by named personnel to ensure that standards are met

Standard & Level	Standard	Demonstration of compliance
	In each Commissioning organisation, a single named officer will have responsibility for co-ordination and monitoring the service provision for neuro-critical care.	Commissioning officer identified and responsibilities defined
	Trusts providing neuro-critical care will nominate a Clinical lead to oversee this service and ensure that the required standards of patient care are addressed across the network.	Clinical lead identified and responsibilities defined
	The Commissioning officer and Clinical lead will have responsibilities agreed by the commissioners of health care, providers, and users of neuro-critical care	Involvement of all interested parties Written agreed responsibilities
	The Clinical lead will be responsible for the establishment and co-ordination of a multi-disciplinary team tasked to provide the full range of services for these patients	Membership list of the multi-disciplinary team, with documented roles and responsibilities for each

OBJECTIVE

The neuro-critical care service will be designed and developed around the needs of the patient as an individual

Standard & Level	Standard	Demonstration of compliance
	Each patient will have a named key worker responsible for co-ordinating their care	The patient and/or carer will be able to name their key worker
	Patients and carers will be empowered to deal with the effects of critical illness through the provision of information in an appropriate language, education and practical support where required	Printed and other information sources Education and support programmes
	The unit will provide practical help for patients and relatives, including help with accommodation when required	Documentary evidence.
	Patients or the family/carers will influence the way their care is delivered	Evidence of involvement in patient care plan
	Patients/carers will have the opportunity to provide feedback on the quality of care received	Results of surveys
	Patients and carers will help design and develop the neuro-critical care service including local guidelines for care.	Patient, carer, and primary care representation

OBJECTIVE

Adequate resources will be available to allow assessment, admission, investigation and treatment to agreed standards at times appropriate to the patient's need

Standard & Level	Standard	Demonstration of compliance
	There will be a dedicated unit or area for the intensive care of neurosciences patients.	Documentation of designated unit(s)
	There will be 24 hour cover by support services, including Imaging anaesthetic cover, physiotherapy and other paramedical specialities.	Record of rotas for all specialities.

	Referring hospitals will know the primary Neurocritical Care Unit for their locality.	Clear guidelines for the referral of patients within a Region. Presence of Critical Care networks.
	The service will provide a full 24 hour emergency service, sufficient to meet the needs of its catchment population	Record of compliance with required unit specification. Record of admissions and refusals
	Where patients with acute neurological illness are cared for outwith the Neurology Centre similar standards of care shall apply.	Network arrangements Audit of outcome for delayed/denied admissions
	The Neurocritical Care Unit will be covered by consultants with appropriate training in Neurocritical Care. Consultant sessional allocation to Neurocritical Care will allow adequate clinical cover of the Unit including on-call responsibility, management, audit, teaching and follow up	Representation from professional bodies representing intensive care on appointment committees. Record of rota. Compliance with consultant job plans and working time directive
	Nursing staff numbers will be sufficient to allow one nurse to one bed for Level 3 patients, and one nurse for two beds for Level 2 high dependency patients. This will allow flexibility in the number of Level 3 and Level 2 beds available.	Record of nurse staffing
	A critical care outreach facility will be available, including Level 1 critical care beds, regular consultant sessions and support staff.	Demonstrate response to Department of Health initiative of "critical care without walls".
	There will be agreed protocols for the transfer of patients cared for in district hospitals or Neurology only centres to designated neurology neurosurgery centres when neurosurgical intervention is required,	Protocols

OBJECTIVE

Multiprofessional teams will work together, across disciplines and locations, to achieve optimum decision making, treatment, and outcome

Standard & Level	Standard	Demonstration of compliance
	Patients with a critical neurological illness will be cared for by multidisciplinary teams containing adequate numbers of specifically trained staff including Neurologists, Neurointensivists Neuroanaesthetists, Neuroradiologists, Neuro and critical care trained nursing and paramedical staff, Neuroscience trained therapy and rehabilitation staff and there will be links to social and community support services	The name of each team member or staff position with their role agreed by the lead clinician.
	The team members will meet at intervals, commensurate with the progress of the patient, to review diagnosis, management and future planning.	Entries in patient case-notes.
	All members of the MDT will take part in continuing education and continuing professional development	CME / CPD programmes/attendance logs
	Neurology SpR training programmes will include formal training in critical care	Local curriculum
	Members of the Multidisciplinary Team will meet at least annually to discuss, to review, and to record operational policies	Record at least one meeting per annum.

OBJECTIVE

Care will be provided in accordance with agreed national guidelines

Standard & Level	Standard	Demonstration of compliance
	Patients will be admitted to Neurocritical Care according to admission criteria agreed between the Neurointensivists and Neurologists.	Record of admission and discharge criteria.
	Transfer to the neuro-critical care unit will be conducted by appropriate personnel when safe.	Guidelines for the transfer of head injured patients – Association of Anaesthetists, 1996.
	The team will consider and agree local network-wide clinical guidelines, based upon nationally established standards.	Agreed local guidelines
	Each patient will have a management plan established by the Consultant Intensivists and their junior colleagues in consultation with the neurological team. Guidelines of management will be evidence based and according to nationally established standards.	Written record, including management options, unit protocols, and guidelines.
	The Clinical lead will be responsible for the development and dissemination of guidelines/integrated care pathways together with arrangements for their regular review and revision	Evidence of dissemination of guidelines/care pathways to referring centres and to centres receiving patients after the completion of their acute intervention

OBJECTIVE

There will be effective communication between all those responsible for the patient's care, and with the patient and where appropriate their family and other carers

Standard & Level	Standard	Demonstration of compliance
	The treatment planned for each individual patient will be established or authorised by the responsible Consultant.	A written record, including options of management discussed.
	Regular communication with patients and their relatives will be maintained to discuss treatment plans, clinical progress, prognosis, concerns, etc.	Written records in notes.
	The team will provide written material for patients and relatives including an explanation of the diagnosis, and management options available, the likely implications and prognosis.	Written or other type of material (audio/visual) in languages suitable to population served. Evidence of availability
	Information will be provided about support networks, outreach services, liaison with other health and community services, self help groups, psychological, social and cultural support	Written or other type of material (audio/visual) in languages suitable to population served. Evidence of availability
	The Neuroscience Team will communicate the patient's diagnosis and care plan to specialists who refer and receive patients and to general practitioners and to teams responsible for rehabilitation and community reintegration	Discharge summaries audit 'Core' information at the time or in advance of discharge The definitive summary dispatched within 10 days.
	Arrangements will be in place for patients or carers to gain access to a member of the Neurological Team to discuss the patients care.	Survey of patient's experiences and of the services offered by the Team, the results, action identified and implemented

OBJECTIVE

There will be adequate facilities for ongoing care of patients after acute neurocritical care management

Standard & Level	Standard	Demonstration of compliance
	There will be adequate provision of level 1 critical facilities	Number of beds.
	Units will arrange for the necessary follow up review and after-care by the MDT of patients who have undergone treatment, or for whom treatment is no longer possible	Evidence of regular follow up and review protocols
	Consultant sessions will be provided for a regular follow up clinic to help review the outcome of patients and improve the service.	Recommendation of the Intensive Care Society
	A neurological disability rehabilitation team is available	Personnel in post
	There will be links with social and community eg social worker & domiciliary nursing	Named team members

OBJECTIVE

There will be an audit process assessing outcome, to include effectiveness of care, compliance with guidelines and analysis of avoidable distress, disability and death

Standard & Level	Standard	Demonstration of compliance
	The Clinical lead will be responsible for ensuring regular audit of the work of the team, its compliance with guidelines/care pathways and the instigation of any necessary action	Evidence of an audit cycle, regular reporting of results and a timetable for review of guidelines
	Participation in National Programmes for Audit.	Membership of ICNARC or equivalent.
	All aspects of clinical practice where recognised standards exist, or improvements might be made, will be considered for audit. At least one audit of clinical practice of demonstrable clinical significance will occur annually	Details of annual audit programme including outcomes, action plans and effects of changing practice
	Arrangements will be in place for formalised risk assessment, “near miss” and incident reporting, complaints and potential/actual litigation analysis. Such information should form part of the clinical audit programme.	Record of risks etc. Minutes of meetings, audits performed
	Regular morbidity and mortality review meetings will take place within the audit programme. All clinical staff shall be provided with sufficient time to prepare for and to regularly attend such meetings.	Registry of attendance and lessons learned/practice changed
	Information systems will be developed to ensure regular production of clinically relevant reports to support clinical governance needs	Regular, clinically relevant, reports

OBJECTIVE

The neuro-critical care unit will actively engage in research and development of relevant projects

Standard & Level	Standard	Demonstration of compliance
	A research infrastructure will be in place to help improve the quality of service and patient outcomes.	Record of research project(s)

OBJECTIVE

Audit results will inform the business cycle to allow effective planning and development of neuro-critical care, according to patient need

Standard & Level	Standard	Demonstration of compliance
	Information systems will be developed to ensure regular production of clinically relevant reports to support performance indicators for contract negotiations	Regular, clinically relevant, performance reports