
Precis of Panel Discussion

Neurocritical Care

President's Symposium

XXVIII Canadian Congress of Neurological Sciences

Toronto, June 19, 1993

G. Bryan Young

Panelists

Charles Bolton *Departments of Clinical Neurological Sciences and Medicine, University of Western Ontario, London, Ontario*

Keith Chaippa *Department of Neurology, Harvard Medical School and Director, EEG and Evoked Potential Laboratory, Massachusetts General Hospital, Boston, Massachusetts*

Richard Moulton *Department of Surgery (Neurosurgery), University of Toronto*

J. Paul Muizelaar *Department of Neurosurgery, Medical College of Virginia, Richmond, Virginia*

Allan Ropper *Department of Neurology, Tufts University and Chief of Neurology, St. Elizabeth's Hospital, Boston, Massachusetts*

William Sibbald *Departments of Medicine, Surgery and Anesthesia, University of Western Ontario and Director of Critical Care Trauma Centre, Victoria Hospital, London, Ontario*

Can. J. Neurol. Sci. 1994; 21: S3-S5

Neurocritical care is a discipline devoted to acute or subacute, life-threatening diseases of the nervous system. In many of these (see Table 1) there is potential for recovery, reversibility or rehabilitation to a functional level. Neurocritical care units or Neuro-ICUs are special care areas for the management of such patients: dedicated, skilled clinical and technological observation and rapid intervention are facilitated. Patient care is the main purpose of such units, but they serve as an important resource for education, training and research (clinical, basic science and health care issues).

In the prototype units the director is a neurologist, neurosurgeon or a neuro-anesthetist with special training in intensive care. There is a close relationship with other physicians, particularly anesthetists, general intensivists, other surgeons, respiratory physicians, clinical microbiologists and, in teaching hospitals, housestaff. Other health professionals who play key roles include nurses, respiratory therapists, physiotherapists, social workers and various technologists.

There are few neurocritical care units in Canada. Those in existence are threatened by economic cutbacks. Can they be justified? What has to be done if neurocritical care units are to continue and further evolve? These issues were discussed by a panel of experts at the President's Symposium on Neurocritical Care held in Toronto on June 19, 1993, during the Canadian Congress of Neurological Sciences.

In the early days of critical care unit development, critical analyses were not required, but now they are. There is a sentiment in the U.S. and Canada that "It is time for a rigorous effort to establish what procedures produce beneficial outcomes under what conditions – and to eliminate stark 'over-utilization'".¹ A principal justification is a reduction in avoidable morbidity and mortality, but cost-benefit analyses are expected. These have not been adequately done in any branch of critical care medicine.

Dr. Sibbald emphasized the challenges that must be met if hospitals are to fund such units, in the face of shrinking governmental funding. Governments use SWOT (strengths, weaknesses, opportunities and threats) methodology. If we introduce new diagnostic, monitoring and treatment initiatives, we need to demonstrate their effectiveness and discard older, less useful technologies.

Dr. Sibbald outlined four simple questions we must ask ourselves:

1. What are we doing now?
2. How well are we doing?
3. Can we do better?
4. What strategies and measurable objectives should we set?

Problems with General ICUs that Could Be Better Addressed in Neuro-ICUs

1. General ICUs are more costly than neuro-ICUs. Dr. Ropper pointed out that most neurology and neurosurgery

Table 1. The following diseases are appropriate for admission to the Neuro-Observation or Neurocritical Care Unit:

1. Intracranial hemorrhage of any type including subarachnoid hemorrhage
2. Subdural hematoma and epidural hematoma
3. Head injury without mass lesion
4. Spinal cord injury, inflammation or compression
5. Status epilepticus or frequent epileptic seizures
6. Myasthenia gravis with pharyngeal weakness or ventilatory failure
7. Guillain-Barré syndrome with ventilatory compromise or cardiovascular dysautonomia
8. Intracranial abscess with decompensation or seizures
9. Bacterial, fungal or tuberculous meningitis (after clearance from Infectious Diseases) or encephalitis
10. Intracranial tumors and decompensation or frequent seizures
11. Malignant hyperthermia or malignant neuroleptic syndrome
12. Ischemic stroke with brain swelling or "progressing" or unstable stroke; stroke with compromise of upper airway function.

Modified with permission from Ropper AH: *Neurological Intensive Care. Annals of Neurology* 1992; 32: 564-569

patients do not require the expensive technology of the general ICU. Some beds are of the "step-down" type and the monitored beds do not require the expensive equipment found in the general ICU. In his Neurology Special Care Unit in Boston, the average costs of construction were approximately one-quarter the cost of a bed in a general ICU.

2. Quality of care. Neurocritical care units manage acute, specific problems affecting the nervous system; this is not as reliably available in general ICUs or on wards. Dedicated neuro-nurses and housestaff guided by specific protocols give better assurance that patients are monitored and treated appropriately. Although personnel are the most valuable resource in such units, technological advances extend clinical evaluation; these include intracranial pressure monitoring, cerebral blood flow determination, transcranial Doppler sonography, jugular venous oxygen saturation measurements, continuous EEG monitoring and evoked response testing. The significance of change in a clinical sign or monitored parameter is promptly appreciated and acted upon. The unsatisfactory scenario of the neurologist finding the patient with "blown pupils" that were documented but not acted upon is hopefully avoided. This is of great importance in patients with raised intracranial pressure, high risk post-operative neurosurgical patients and other unstable patients. This special care develops within a "culture" of individuals trained in the nervous system disorders.

3. Availability of beds for surgical cases. Dr. Moulton emphasized that neurosurgeons wish to have intensive care unit beds that will be reliably available for their cases. If there is only a general ICU, these beds may be taken by non-neurological cases. With a neurocritical care unit, elective neurosurgical cases are less likely to be canceled.

4. The general ICU often does not provide the correct *level of care*. A survey of charts was conducted at Victoria Hospital, London, Ontario (Table 2). The charts and numbers of patients were identified using MRI data. A random sample of these charts was then reviewed in detail by a neurologist and a neurosurgeon. The two reached a consensus re: the patients in each

Table 2. A Survey of Cases Suitable for a Neurocritical Care Unit.

Diagnosis	No. of Cases/Year (No. with assisted ventilation)	# (%) Requiring NCCU
Head Injury	200 (44)	125 (62.5%)
Ischemic stroke	173 (52)	130 (75%)
Intracranial hemorrhage	77 (52)	77 (100%)
Status epilepticus	10 (6)	10 (100%)
Guillain-Barré	14 (6)	8 (57%)
Alcohol withdrawal	24 (0)	5 (21%)
Encephalitis	3 (1)	2 (67%)
Total	501 (161 = 32%)	357 (71%)

(From a Needs Analysis by K. Elisevich and B Young using HMRI data and a Sampled Chart Review for Victoria Hospital, London, Ontario: Pooled Data from 1988-1992).

category who should have had a higher level of care (as provided by a Neurocritical Care Unit which looked after both patients who required assisted ventilation and those who did not). A conservative estimate was used. Of the various common neurological and neurosurgical problems, only 32% required assisted ventilation. Thus from Table 2, $357 - 161 = 196$ patients/year, do not receive the increased, optimal level of care they require. This amounts to over half of those patients who require neurocritical care. Such care could be provided by intermediate care units.

5. Dr. Muizelaar pointed out that ICUs may be wasteful of resources when (a) patients do not have the severity of illness which requires that intensity of nursing, monitoring or care but require more than ward beds can offer; (b) patients are kept in ICU beds beyond the time when the prognosis becomes hopeless for meaningful recovery. The neurocritical care unit could be designed to be more cost-effective in providing the appropriate level of care and monitoring. Protocols developed by neurologists and neurosurgeons can identify patients with hopeless prognoses. Dr. Chiappa asserted that technological advances can be of value in determining an essentially hopeless prognosis: e.g., the bilateral absence of thalamo-cortical somatosensory evoked responses have a greater than 94% association with an outcome no better than persistent vegetative state.² Other technological advances may lead to improved guidelines for withdrawal of care in the future. Resources could be saved if patients with hopeless outlooks could be moved out of intensive care unit beds once the prognosis is established.

6. Insufficient neuro input. Drs. Bolton and Moulton both felt that neurologists, neurosurgeons, neuroanesthetists and neuro-nurses should have more input for various aspects of patient management, including monitoring, in ICUs. Dr. Ropper emphasized that assisted ventilation requires a neurological perspective for optimal management of a number of conditions including raised intracranial pressure. Neurological consultation with appropriate tests can better anticipate and identify the causes of respiratory failure. More specifically, the comprehensive needs of patients with Guillain-Barré and myasthenia gravis are better handled in a neurologic ICU setting.

Justification of Neurocritical Care Units

The panelists agreed that it is difficult to justify intensive care units, including neurocritical care units, on the basis of improved outcomes. Such benefits are marginal when averaged over a large group of patients, even though special care units may make a vital difference to a subpopulation of patients. Justification on economic grounds is feasible if beds are shifted from more expensive ICUs to lower cost/intensity neurocritical care units. A supplemental mechanism is the reduction of regular ward beds by: (a) avoiding admissions for investigation (since most neurological and neurosurgical investigations can be done on an out-patient or day admission basis) and (b) improved discharge planning for other patients, including earlier transfer to alternate levels of care, e.g., rehabilitation medicine.

How can we obtain our goals and where are the mine-fields?

Neurologists, neurosurgeons and neuroanesthetists must take a leading role in health care planning for their patients. Some Canadian initiatives, such as the National Program for the Comprehensive Care for the Brain Injured,³ have resulted in more efficient utilization of hospital resources. Care maps may further help with the comprehensive management of other patients.

The axiom that poor quality is more costly than good quality is generally true. Quality of care and continuous quality improvement are popular health care initiatives. This has created concern among physicians who resent the comparison of patient care to private sector manufacturing processes. Dr. Sibbald pointed out that physicians have to adjust to this if they are to be heard. If it can be shown that money can be saved by the management and technology associated with neurocritical care units, such initiatives may be justified in the minds of those who control the purse strings.

Clinical neuroscientists should design the structure and process for the best management of patients. Dr. Sibbald maintained that this requires longitudinal planning for patients: care maps, protocols, guidelines, management units and perhaps centralization for some conditions. It was suggested that "turfdoms" should be things of the past, and instead, we should plan for patient care. Whether this is feasible in our highly competitive environment remains to be seen.

Some raised cautionary notes about buying-in to these concepts. Dr. Ropper argued that physicians should *tell* government how the health care dollars should be allocated for patient care, rather than be directed by the external pressures of economic concerns. Dr. Bolton supported the concept that governments need to be educated regarding effective allocation of monies for technology, which can be cost saving when used appropriately. Members of the audience expressed concerns about centralization of patient care: facilities for intensive management are necessary wherever there are neurosurgeons. Transportation to larger critical care units in larger centres is a major undertaking in terms of time invested and risk to the patient. On the other hand, after the patient is stabilized, subsequent management in a neuro-special care unit may be a superior method of detecting and preventing further damage.

It is clear that as clinical neuroscientists we must adjust to the changes in the health care system. Ideally we should be partners in planning. A meeting of minds may be possible if planning for quality of care and cost-effectiveness go hand-in-hand.

REFERENCES

1. Califano JA. Editorial. *New York Times Magazine* 1988; 44: 44.
2. Chiappa K. Electrophysiologic Monitoring in the Intensive Care Unit. *Can J Neurol Sci* 1994; 21: S12.
3. Hill NC. A national program for the comprehensive care for the brain injured – the neurosurgeon's role. *Can J Neurol Sci* 1993; 20 (Suppl. 2): S10.