The birth of neurocritical care stemmed from the appreciation that an already affected brain (primary injury) is greatly influenced by systemic alterations that may adversely affect its function (secondary injury).

### Outcomes Measures

- **Monitoring**
  - Neurocritical care
  - ICP waves

- **Therapy**
  - General
    - Acute ischaemic stroke:
      - (i) rt-PA: within 3 hrs of symptom onset can result in clinical and statistical significant improvement - at least 30% of treated patients will be completely independent 3 months after treatment.
      - (ii) Intraarterial thrombolysis:
        - May increase the window treatment to 6 hrs.
        - May be used as rescue therapy after intravenous thrombolysis.
      - (iii) Ultrasound-enhanced systemic thrombolysis:
        - Uses transcranial doppler to enhance thrombolysis.
    - Intracerebral haemorrhage:
      - One of the major discoveries has been the realisation that intraparenchymal hematomas grow in about 38% of patients within 3hrs of onset. Such growth may result in increased mortality.
      - (i) Recombinant factor VIIa:
        - The most promising intervention to limit hematoma growth with resulting improved mortality and functional outcome thus far has been the administration of recombinant activated factor VIIa.
      - (ii) Surgical evacuation:
        - Surgical evacuation of intracerebral hematomas within 24 hrs has not shown benefit when compared with initial conservative treatment.
        - The one group of patients who may benefit from surgery with improved functional outcome is that with cerebellar hematomas.
      - (iii) Blood pressure management:
        - On the other hand, there is the risk of increasing the size of the hematoma if blood pressure remains elevated, and on the other, there may be the theoretical risk of causing cerebral ischemia if blood pressure is reduced.
        - A prospective study is under way to evaluate the optimal blood pressure control level in these patients.
    - Subarachnoid haemorrhage:
      - Cerebral vasospasm treatments:
        - Calcium antagonists, particularly nimodipine and possibly magnesium, reduce the risk of poor outcome and cerebral ischemia.
        - Volume expansion has been commonly used under the assumption that hypovolemia is related to cerebral ischemia. However, convincing evidence of its benefit is lacking.
      - Hypothermia:
        - The use of intraoperative (i.e., during aneurysm clipping) hypothermia does not improve clinical outcome.
      - Coiling vs clipping:
        - Randomized trial revealed that in patients with ruptured cerebral aneurysms, for which both endovascular coiling or surgical clipping are treatment options, the outcome in terms of disability at 1 yr is better for patients undergoing endovascular coiling.
    - Hypoxic ischaemic insult:
      - Evidence from randomized controlled trials has demonstrated that institution of mild-to-moderate hypothermia results in improved survival and functional outcome of these patients.
    - Traumatic brain injury:
      - Patients admitted to specialized trauma centers are more likely to experience a reduced hospital length of stay and mortality, with improved functional outcome.
      - Aggressive management of hypotension in the prehospital setting is important. A recent randomized controlled trial showed that aggressive fluid management in the prehospital setting revealed decreased mortality, most likely related to avoidance of hypotension.
      - Induced hypothermia has also been applied to patients with severe traumatic brain injury. Studies have revealed that induced hypothermia may confer benefit particularly to those patients with elevated intracranial pressure. However, the routine use of this treatment remains controversial.
    - Treatment of fever:
      - Elevated core body and brain temperature is associated with worsening neurologic injury and functional outcome critically ill neurologic patients, regardless of the type of injury. Such association is very important because fever is a frequent occurrence in neurologic patients while in the ICU.
      - What remains to be answered is whether effective fever reduction results in significantly improved functional outcome and mortality rates in these patients.