PART A: UNIFORM CURRICULUM FOR MCh AND DNB
NEUROSURGERY

1. BACKGROUND:
   a. The neurosurgical training in India at present has many drawbacks.
   b. The important of these are lack of uniformity in the facilities in various teaching
departments, lack of uniform curriculum, lack of uniformity in the standard of
examinations and lack of adequate practical experience, especially, of those
trained in non-teaching private institutions.
   c. Hence there is an urgent need to streamline the standard of training and evaluation
throughout the country.
   d. The following recommendations are put forward in this regard (Common for
M.Ch. and D.N.B. qualifications) in a preliminary well written document
prepared by Prof VG Ramesh in 2013.
   e. On the basis of this report, a meeting was conducted by NSI at AIIMS, New
Delhi, on 15-3-2014. This meeting was organized by Prof PS Chandra, under the
Chairmanship of Prof BS Sharma for devising the uniform guidelines for
neurosurgical training all over India. The committee members consisted of senior
Teaching faculty members from reputed Institutes from all over the country.
   f. During this meeting, which was a day long procedure, detailed discussions were
held. Following this, the inputs from the committee was condensed into an
exhaustive document prepared by Prof P Sarat Chandra and Dr Vivek Tandon
along with relevant inputs from Prof VG Ramesh.
   g. These recommendations were discussed in the GBM of NSI held at Coimbatore in
December 2014. All the members suggested that this should be put on the NSI
website so as to allow suggestions and inputs from all the members of NSI. This
everybody felt would not only enhance the quality of the document but would
also provide greater transparency by placing it on a public forum.
   h. Based on the decision taken, the guidelines were placed on the NSI website on
23rd February, 2015. A period of 4 months was provided for all the members to
respond.
   i. The following were the nature of the suggestions received during this time:
      i. All the suggestions even though excellent were of general nature, had no
specific suggestions. Wherever it was possible, this was integrated into the
curriculum.
      ii. All the suggestions have praised the efforts of NSI in developing this
curriculum.
      iii. There were some apprehensions, whether such curriculum can be
implemented well, but all of them felt that this was in a right direction.
   j. The final guidelines were also discussed by the EC during the mid yearly meeting
held in the month of April in 2015 at Chennai and approved by all the EC and
now is being placed on the NSI website
   k. Committee members

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Members Name (in alphabetical order except 1-5)</th>
<th>Institution</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>BS Sharma (Prof and)</td>
<td>AIIMS, New Delhi</td>
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</table>
2. **FINAL RECOMMENDATIONS:**

   a. **DURATION OF TRAINING:**

      i. **Background: Points to note:**

         1. Both three and six years training programs are important for our country. However, neurosurgical training for finer skills development is likely to take more than 3 years. Therefore, more centres should be encouraged to adopt 6 year training module.

         2. All candidates should be given an opportunity to work in their department for one extra year, in case they are not able to pass their examination on time or are interested in working for an extra year. This will help in providing them support for their family as well.

         3. After deliberating the bi-annual induction to annual induction into program, it was felt that 6 monthly inductions helps in maintaining resident hierarchy and moreover, conductance of final examination becomes easier as the number of candidates appearing are less.

            a. The committee felt that there should be uniformity in curriculum and training.

            b. Committee members were of the strong opinion that final examination of the 6 year candidates should be held at 6 years instead of 5 years to bring in more accountability and improve training.
4. **Training program and objective assessment: What we can learn from other countries?** In United states the training program for neurosurgery was for 72 months (i.e. 6 years). Due to changing pattern of residency and decreased work hours, they are now advocating 84 months of training program (i.e. 7 years). The salient highlights of the proposed system are –
   a. Length must be 84 months
   b. Provide 54 months of clinical neurological surgery education (min. 21 months at primary institution) to include:
      c. 06 months general patient care education
      d. First 18 months to include min. 3 months clinical neuroscience education and 3 months critical care education applicable to the neurosurgical patient
      e. Minimum 42 months operative neurological surgery
   f. 12 months as chief resident
   g. Remaining months used for elective clinical education and/or research (up to 30 months)
   h. It was re-emphasized by all the committee members that like most of the developed countries we should have a goal, that neurosurgeons passing out of any medical school in our country should at least be proficient in the skills.
   i. It was discussed that our model of training should also aim similarly to provide equivalent or better level of proficiency at every level. The way forward is to have objective criteria for assessment at each level and to have well defined targets for each level. For the ease of understanding skills and knowledge for each level can be classified, in the manner, shown in the figure below.

5. **Recommendations:**
   a. **Mandatory:**
      i. 3 years – for post M.S./D.N.B. (General Surgery) candidates
      ii. 6 years – for M.B.B.S. candidates (1 year General Surgery + 5 years Neurosurgery)
      iii. More centres to be encouraged to start 6 year training program.
      iv. Increasing the total training period to 7 years for direct MBBS and to 4 years for post MS will be preferable
      v. One year of this is recommended as Chief resident
      vi. Posting for 3 months for critical medicine, 3 months for basic neurosciences (pathology, animal lab etc.)

b. **MINIMUM INFRASTRUCTURE FOR STARTING NEUROSURGERY TRAINING:**
   i. Background:
1. The neurosurgical training in India at present has many drawbacks. The important of these are lack of uniformity in the facilities in various teaching departments, lack of uniform curriculum, lack of uniformity in the standard of examinations and lack of adequate practical experience, especially, of those trained in non teaching private institutions.

2. Hence committee deliberated this important issue of minimum existing infrastructural requirement for training program (Common for M.Ch. and D.N.B. qualifications).

3. These are the bare minimum mandatory infrastructure required for starting Neurosurgery training program and accreditation to all such institutions running the programs in the absence of the above infrastructure should be revoked.

4. **Mandatory requirement: see Table 1**

   See below Table 1
<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Existing regulations</th>
<th>Mandatory Recommendations</th>
<th>Optional Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beds</td>
<td>20</td>
<td>Minimum 20 beds exclusively for Neurosurgery. Exclusive Neurosurgery ICU beds with ventilators and monitors (Minimum 5)</td>
<td>&gt;20 beds</td>
</tr>
<tr>
<td>Teachers</td>
<td>One Professor (Associate Prof + 3 years), One Associate Professor (Asst. Prof + 2 years) and one Assistant Professor.</td>
<td>Same</td>
<td>May have multiple units, each unit dedicated to one sub speciality</td>
</tr>
<tr>
<td>Radiology</td>
<td>CT and MRI mandatory</td>
<td>CT scan and MRI (must), angiography facilities (desirable).</td>
<td>DSA with neuro interventional capabilities Other advanced equipment: - Gamma knife - intra-op MRI</td>
</tr>
<tr>
<td>Student teacher ratio</td>
<td>Each PG teacher eligible to have 2 candidates per year Additional candidate may be taken for the Associate Professor with 5 years PG experience if 10 more beds are available.</td>
<td>Because of existing regulations some of the centres have 40-45 trainees at any given time. This hampers training greatly. There should be a cap, beyond a maximum number even if increase in number of teachers is there, centres should not be allowed to take more candidates. This figure should not exceed a maximum of 36 residents, inclusive of all 3 year and 6 year candidates. That means number of trainees in each year cannot be more than 6. <strong>Staff pattern:</strong> For one candidate intake per year, the department must have at least: One Professor/Senior Consultant, One Associate Professor/Consultant, One Assistant Professor/Junior Consultant(with PG)</td>
<td></td>
</tr>
<tr>
<td>Allied departments</td>
<td>-</td>
<td>Neurology unit, Pathology (exclusive Neuropathology desirable) department.</td>
<td>Neurophysiology Neurovirology</td>
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</tr>
<tr>
<td>Operation theatre and equipment</td>
<td>-</td>
<td>• Exclusive Neurosurgery OT. • Operating Microscope • C arm, • Neurosurgical drill, • Neuroendoscopy (Desirable) • Stereotaxic equipment (Desirable) • CUSA (Desirable) • The microsurgical training lab should be equipped with a surgical microscope and surgical drills.</td>
<td>Other high end equipment • Intra-op MRI • Neuronavigation • Intra-operative electrophysiology • -</td>
</tr>
<tr>
<td>Library</td>
<td>-</td>
<td>Department library with recent Neurosurgery textbooks, Basic Science and Neurology textbooks. Internet facilities, Minimum of two International Journals to be subscribed. It is desirable that universities or institutes procure online journals and reading material through sites like HINARI and upToDate etc.</td>
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<tr>
<td>Sub-specialty in department</td>
<td>-</td>
<td>Minimum one sub speciality (viz. spinal surgery, skull base surgery, neurovascular surgery, paediatric neurosurgery, etc.)</td>
<td>Multiple sub specialities will help to provide a comprehensive approach</td>
</tr>
<tr>
<td>Academic activity</td>
<td>-</td>
<td>Minimum weekly clinical discussion, journal club, monthly symposia, seminars. (Records to be maintained)</td>
<td>More activities are welcome, but the academic activities should balanced so that the clinical work does not suffer,</td>
</tr>
<tr>
<td>Accreditation</td>
<td>-</td>
<td>To be renewed every five</td>
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</tr>
</tbody>
</table>
c. TRAINING CURRICULUM:
   i. Background: Committee deliberated at length about the proposed ideal and optimal operative experience required for resident in a neurosurgical program. The hierarchy of such experience, exposure to sub-speciality and maintenance of log book were also discussed. As there are no existing recommendations in this regard, committee recommended the following.

   ii. Mandatory recommendations
      1. Clinical and surgical exposure:
         a. The committee members felt that it is extremely important to standardize the operative exposure for neurosurgical students because there are huge country wide variations in this area.
         b. In case an institute has inability to fulfil bare requirements, in absence of a particular sub-speciality there, candidates should be allowed to go and train for a stipulated period at any other institute, where that kind of surgery is being practiced.
         c. Candidates who fail to achieve the above mentioned targets, despite facilities being available, should not be allowed to appear in examination (see Table 2).

### TABLE 2

<table>
<thead>
<tr>
<th>Mandatory</th>
<th>Desirable</th>
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<tbody>
<tr>
<td>Cases</td>
<td>- 400 cases exposure at least for whole training program (@ 300 cases performed per OT in a year)</td>
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<td>- At least 2 OT’s a week average including trauma</td>
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<td>- With around 1/3 cranial and 1/3 spinal</td>
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<td></td>
<td>- At least 10% supervised/ performed independently (at least 10 craniotomies)</td>
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<td>- Spectrum: Neuro-trauma, Neuro-oncology, stroke and review years, after formal inspection.</td>
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<td></td>
<td>Desirable: sub specialities</td>
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<tr>
<td></td>
<td>- Cerebrovascular including endovascular</td>
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<tr>
<td></td>
<td>- Functional and epilepsy</td>
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<td></td>
<td>- Neuro-endoscopy</td>
</tr>
<tr>
<td></td>
<td>- Peripheral nerves</td>
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</table>
| **Hierarchy** | 3 years/ 6 years:  
1 year/ 2nd year: lumbar puncture, EVD, tracheostomy, intubation, emergency, scalp suturing, simple neuro trauma: chronic subdural, extradural hematoma, learning elective cases exposures, VP Shunts (under supervision)  
2nd year/ 3rd-4th: Neuro trauma: Contusions, ICH. Elective cases exposures, all craniotomies, spine exposures,  
3rd year/5-6th year: Sub-speciality exposure depending on interest, elective exposures, |
| --- | --- |
| **Independent surgery (supervised)** | Neuro trauma- chronic SDH, epidural hematoma, depressed fracture, contusions, ICH (experience with conventional craniotomy required)  
Elective: VP shunts (always supervised), gliomas  
Lumbar disc/ cervical disc |
| **Log Book** | Gliomas: at least 2 anatomical regions  
Surface meningiomas  
Chiari malformation  
Midline sub occipital exposureand surgery |

| **Internal assessment of operative skills** | Once in 6 months  
Case performed under supervision and graded by a faculty (different faculty every time)  
– Pre operative assessment  
– Surgical planning  
– Exposure  
– Surgical techniques and brain handling  
– hemostasis |
| **Log Book** | Should be maintained with at least following entries-  
• Name/ hospital id no/ age/sex  
• Diagnosis  
• Surgery performed |
**d. Work distribution over various years of the residency program and academic sessions.** The committee also discussed important issues pertaining to expected duties to be performed every year (for both 3 year and 6 year candidates), expected knowledge paradigms required for each, work hours for residents, post duty off and number of duties a week, observership in other institutes and posting in allied specialties (Table 3).

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>Expected duty and knowledge paradigm</th>
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<tbody>
<tr>
<td><strong>3 year candidate</strong></td>
<td><strong>5 year candidate:</strong></td>
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<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; year: 2 months completely supervised. patient care, history taking and examination, supervised discharge summary, basic procedures, Academic activities after 4 months. All basic courses. OPD, Supervised emergency calls and references after 4 months. 2&lt;sup&gt;nd&lt;/sup&gt; year: Supervised rounds, overall in-charge of ward work, OPD, emergency calls and references, supervised OT, all basic courses completed, publications completed. Passed basic neurosurgery examination at 1.5 months, academic activity</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; year: Rotation to General Surgery, including general emergency and trauma care to learn basic surgical skills. No interruptions Examination at end of 1 year on surgical training conducted under convenership of HOD Neurosurgery and General Surgery 3&lt;sup&gt;rd&lt;/sup&gt; year: 2 months completely supervised. patient care, history taking and examination, supervised discharge summary, basic procedures, Academic activities after 4 months. All basic courses. OPD, Supervised emergency calls and references after 4 months. 4&lt;sup&gt;th&lt;/sup&gt; year: Supervised rounds, overall in-charge of ward work, OPD, emergency calls and references, supervised OT, all basic courses completed, publications completed. Passed basic neurosurgery examination at 1.5 months, academic activity</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; year: Overall in-charge of ward and emergency, OT. Academic activities suspended in last 4 months. 20 days off before theory and 7 days before practical examination. External posting for two months. Additional month if the centre is lacking in a particular sub-speciality (Neurotrauma, Spine, Vascular, Paediatric, Neurooncology) One additional year of post examination Senior Residency on a Voluntary basis</td>
<td>5&lt;sup&gt;th&lt;/sup&gt; and 6&lt;sup&gt;th&lt;/sup&gt; year: Overall in-charge of ward and emergency, OT. Academic activities suspended in last 4 months. 20 days off before theory and 7 days before practical examination. External posting for two months. Additional month if the centre is lacking in a particular sub-speciality (Neurotrauma, Spine, Vascular, Paediatric, Neurooncology) One additional year of post examination Senior</td>
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<tr>
<td><strong>1st year:</strong></td>
<td>Residency on a Voluntary basis</td>
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<tr>
<td>Learn Anatomy, physiology, biochemistry, pharmacology of nervous system. Learn clinical history taking, examination and basic neurosurgical skills in ward and ICU. Responsible for informed consent, Patient records and discharge summaries, follow up of patients. Supervised learning in elective and emergency neurosurgical procedures, Learning hospital protocols, Basic 01 courses in computers, biostatistics, elective courses, Presentation in Local state chapters, Assigned one neurosurgical subspeciality area to cover.</td>
<td><strong>1st years:</strong> Learn basic principles of surgery (inflammation, wound healing, blood transfusion, sutures), basic surgical skills, exposure to patients and operative procedures in general surgery. Being evaluated at end of two years. <strong>3rd year:</strong> Same as 1st year of 3 year candidate.</td>
</tr>
<tr>
<td><strong>2nd year:</strong> Primarily responsible for supervised ward rounds, informed consent, Patient records and discharge summaries, follow up of patients. First on call on elective and emergency neurosurgical procedures, references and OPD. Basic 01 courses in computers, biostatistics, elective courses completed Presentation in National conference. Record keeping and publications from one neurosurgical subspeciality area. Basic neurosurgical examination at the end of 1.5 months. Participation in all academic activities of the Department. 15 days of Neurology Posting.</td>
<td><strong>4th Year:</strong> Same as 2nd Year candidate of 3 year course.</td>
</tr>
<tr>
<td><strong>3rd year:</strong> Overall incharge of wards. First on call in OTs. Supervises ward, OPD, emergency, references and patient record work. Based on individual competence, assigned independent OTs. 2 month of external posting and 1 month of internal posting in radiology/orthopedics/pediatrics/plastic surgery/labs. Completed two scientific publications in indexed journals. Submitted abstract to national/international conferences. 20 days leave before theory examination and 1 week before practical examination. Exit exams in 2 parts. One has to pass theory before practical are conducted.</td>
<td><strong>5th Year – 6th year:</strong> Same as 3rd year candidate of 3 year course.</td>
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</table>

**e. Work hours for residents:** Committee members felt that neurosurgery is a work intensive branch and it is important for candidates to understand this. However,
overwork can lead to stress and can impair patient care. Therefore it is important to have guidelines for mandatory off days and working hours per week. Their recommendations are as under:

i. Maximum of 84 hours per week work schedule.
ii. Definite off for half a day after night duty.
iii. Ensure proper streamlining of duty hours in first year.
iv. Night duty no more than once in 3 days.
v. Official off of 20 days before theory and practical examination.
vi. Duty leave to attend conferences and external rotations.

f. **Observership in other institutes and interdepartmental rotation:** It was felt that neurosurgical procedures have become extremely advanced and specialized and it has become virtually impossible to have all sub-speciality disciplines under one roof. However, all candidates must be exposed to various sub-specialities. This can only take place by allowing mutual observership programs and encouraging candidates to go for observership to different institutes. The recommendations in these regards are:

i. 1-2 months of observership in final year
ii. Ratified by the Academic council. Resident to be considered as being ‘on Duty’
iii. Has to submit a report after rotation ratified by the concerned Head of department of the host institute
iv. One or two places based on the individual choice
v. Only given if all other academic formalities of the department are complete, such as thesis and submission of publications
vi. Hands on training in the host institution to be ensured including carrying out of duties
vii. Exposure to Neuropathology and Laboratory work essential
viii. Interdepartmental posting to Neurology for 1 month in 1st year of 3 year course 2nd year of 6 year course. Other rotation can be in Radiology (interventional work)/Orthopedics (Spine)/Pediatrics/Plastic surgery (flaps/nerve repair/craniofacial work)/Laboratory/ENT (skull base): 1 month in Final year. (Optional).

**g. Academic sessions:** Academic sessions comprise an extremely important part of training of a resident. These must be taken seriously by all centres. The logbook of residents should have record of all such presentations and must be graded by the faculty when resident is the presenter. Residents must be encouraged to participate actively in treatment planning and learn from their teachers. The committee recommends following weekly session for all centres:

<p>| TABLE 4 |
|--------------------------|-------------------------|
| <strong>S. no</strong> | <strong>Academic session</strong> | <strong>Schedule</strong> |
| 1 | Seminars | Once a week |
| 2 | Journal club | Once a week |
| 3 | Bed side Neurosurgery &amp; combined with Neurology | Once a month |
| 4 | Treatment, planning sessions | Once a week |
| 5 | Neuro radiology sessions | Once a week |
| 6 | Discharge &amp; death audits | Once a week |</p>
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<tbody>
<tr>
<td>7</td>
<td>Students’ CPC</td>
<td>Once a month</td>
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<tr>
<td>8</td>
<td>Neuroophthalmology, Neuropathology sessions, Neuro-otology rounds</td>
<td>Once a month</td>
</tr>
<tr>
<td>9</td>
<td>Didactic Lectures in neuroradiology, neuroanaesthesia, Neuropsychology, Hematology, endocrinology, Respiratory physiology, ventilator care</td>
<td>Once a month</td>
</tr>
<tr>
<td>10</td>
<td>Case presentation</td>
<td>Once a week</td>
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### h. Thesis/Dissertation:

i. The thesis should be of a good quality that is worthy of publication in an indexed journal.

ii. The thesis should be submitted 6 months before the final examination and evaluated by external examiners.

iii. The thesis/dissertation has to be approved before the trainee is permitted to appear for the final examination.

### i. Conferences:

i. **Attendance of Neurosurgical conferences/workshops:**
   1. For 6 year candidates: Minimum 5.
   2. For 3 year candidates: Minimum 3.

ii. **Paper presentation at conferences:**
   1. For 6 year candidates: Minimum 3. (– 1 in a national conference of NSI preferably)
   2. For 3 year candidates: Minimum 2. (– 1 in a national conference of NSI preferably)

### j. Papers: Publication of papers (in peer reviewed journals):

i. For 6 year candidates: Minimum 2. (– at least one in Neurology India)

ii. For 3 year candidates: Minimum 1. (– ideally in Neurology India)

iii. (In case an Institution is unable to fulfil the bare requirements, e.g. absence of a particular sub-speciality, the trainees should be allowed to go and train for a stipulated period at any other Institute, where that particular surgery is practised.)

iv. Trainees who fail to achieve the above mentioned targets, despite facilities being available, should not be allowed to take the examination.

### d. EXAMINATION:

a. **Pattern:**

i. **6 YEAR COURSE:**

   1. **Part I:** at the end of I year.

      a. **Theory papers:**
         i. Basic Sciences in relation to General Surgery
         ii. General Surgery.

      b. **Clinical and oral examination in General Surgery:**
         i. Long and 2 short cases in General Surgery
2. **Part II:** at the end of III year.
   
a. **Theory papers in Basic Neurosciences and Clinical Neurology:**
   
i. Neuroanatomy and physiology  
ii. Neurochemistry and pathology;  
iii. Clinical Neurology  

b. **Clinical and Oral examination in Clinical Neurology:**
   
i. Long and 2 short cases in Neurology  
ii. Viva (including Neuroanatomy and Neuropathology specimens, EEG, Evoked potentials, etc.)  

c. **Part III:** at the end of VI year.
   
i. **Theory papers in Neurosurgery:**
   
1. Neuroradiology and Clinical Neurosurgery  
2. Operative Neurosurgery and Recent advances.  

ii. **Clinical examination, ward rounds and oral examination:**
   
1. **Clinical examination:** Long case and 2 short cases  
2. **Ward Rounds:** Minimum 2 cases in Head Injury and Neurosurgery ICU  
3. **Viva:**
   
a. Neuro-radiology  
b. Instruments,  
c. Operative procedures,  
d. Recent advances,  
e. History of Neurosurgery.

ii. **3 YEAR COURSE:**

1. **Part I:** at the end of I year.
   
a. **Theory papers in Basic Neurosciences and Clinical Neurology:**
   
i. Neuroanatomy and physiology  
ii. Neurochemistry and pathology;  
iii. Clinical Neurology  

b. **Clinical and Oral examination in Clinical Neurology:**
   
i. Long and 2 short cases in Neurology  
ii. Viva (including Neuroanatomy and Neuropathology specimens, EEG, Evoked potentials, etc.)  

2. **Part II:** at the end of III year.
   
a. **Theory papers in Neurosurgery:**
i. Neuroradiology and Clinical Neurosurgery
ii. Operative Neurosurgery and Recent advances.

b. Clinical examination, ward rounds and oral examination:
   i. Clinical examination: Long case and 2 short cases
   ii. Ward Rounds: Minimum 2 cases in Head Injury and Neurosurgery ICU
   iii. Viva:
       1. Neuro-radiology
       2. Instruments,
       3. Operative procedures,
       4. Recent advances,
       5. History of Neurosurgery.

b. Final Examination pattern and pre-requisites
   i. Final exam for MCh or DNB neurosurgery is extremely important. There is urgent need to revamp the whole system which is working on outdated pattern. Moreover, various centers are having different norms and pattern for conducting this exam.
   ii. Standardization of this procedure can go a long way in paving a healthy, objective and unbiased examination procedure. This will in itself bring a lot of improvement in training and skill development of candidates.
   iii. The committee examined many issues pertaining to the above topic and has recommended the following pre-requisites and pattern for examination-
   iv. It must be mandatory for candidates to clear theory before clinical examination is conducted.
   v. Examination should be held in two parts- A) Basic exam, B) Final exam
   vi. Examiners: There should be two external and internal examiners. One examiner each from external and internal examiners should have more than 10 years of experience while the other two examiners should have more than 7 years of experience.
   vii. The clinical examination must comprise of following (Table 5):

<table>
<thead>
<tr>
<th>TABLE 5</th>
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<tbody>
<tr>
<td>Clinical exam</td>
</tr>
<tr>
<td>Long case</td>
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<tr>
<td>Short case</td>
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<tr>
<td>Preop case</td>
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<tr>
<td>Operative (May be omitted as)</td>
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</tbody>
</table>
viii. Clinical examination of the candidate should focus on candidates ability to reach a diagnosis and differential diagnosis, on the basis of history and examination. He should be able to advise appropriate investigations and draw evidence based management plan based on these.

ix. Candidates appearing for examination must carry their log book and internal department assessment report. This should be mandatorily reviewed by the examiners to ascertain the competency of the examinee regarding ability to perform emergency and elective neurosurgical procedures. His aptitude towards patient care and ability to work in his own group and other departments is also important and must be given due credit. Candidates research and scientific papers should also be assessed and given due credit.

x. Candidates must either write a good quality thesis that should be worthy of publication or must have a paper in a indexed journal with his name as a first author. Paper should be an original article. Case reports, letters to editors etc and articles in non-indexed journals should not be considered in lieu of thesis work.

xi. Final examination for three year and six year candidates should only be held in the final year and not before 2 months of the completion of the course.

xii. All candidates must furnish the eligibility certificate, duly signed by their respective head of department or board of evaluation. This certificate is to verify the candidate has fulfilled all the requirements. In case of absence of this certificate, candidates’ candidature should be cancelled.

xiii. For every 3 candidates, examination should be held for 2 days. (i.e. for 6 candidates, exam will be conducted for 4 days). This will allow examiners, proper time to evaluate each candidate.

xiv. 20% marks of the final examination should be from internal assessment. This should be mandatory. Internal assessment must comprise of a transparent and objective system of candidates evaluation by the whole department. Negative remarks, if any, should be communicated to the candidates in a transparent manner. Internal assessment should be submitted to the external examiner and marks be included in the final tabulation of result. Internal assessment for each candidate should be carried out every year by the senior faculty members.
of the department. Mid term assessment of dissertation and research should be carried out by the university.

xv. The committee believes continuous assessment and supervision during the residency programme is must to ensure uniformity in training. The above recommendations, once implemented will bring uniformity in the country and objective examination system will lead to overall improvement in standards.

xvi. **EXAMINERS:**

1. **For Part I of 6 year course:** At least one Internal and One External General Surgeons with an Internal Neurosurgeon convenor.

2. **For Part II of 6 year course and Part I of 3 year course:**
   a. One Internal and One External Neurosurgeons
   b. One Internal and/or One External Neurologists

3. **For Part III of 6 year course and Part II of 3 year course:**
   a. Two Internal and Two External Neurosurgeons
   b. Examiners shall be only from M.Ch. teaching institutions for M.Ch. and M.Ch./D.N.B. training institutions for D.N.B.
   c. Examiners shall be Professors with minimum 9 years teaching experience and not Associate Professors/Readers.

4. **MANDATORY POST QUALIFICATION EXPERIENCE:** Minimum one year post-qualification work/training (as Tutor/Lecturer) after 6 or 3 year postgraduate training in the same or another Neurosurgery department shall be made mandatory before the M.Ch./D.N.B. qualification is registered by the Medical Council. This one year period will help the candidate to advance and fine-tune his surgical skills.

**e. WIDENING THE SCOPE OF TRAINING**

a. The Indian training programs are work intensive but there are some extremely important areas where a resident needs to be trained before he is allowed to practice independently. Some of the key issues discussed in this regard by committee were related to advanced training on simulators and medicolegal aspects of medicinal practice. The views of the committee are summarized below-

b. **Shortening the learning curve:** Committee took cognizance of the fact that neurosurgery in last 2 decades has grown into various subspecialites and now to master one thing, a person has to undergo many gruelling hours of training. Moreover, it is a known fact that results of surgeons learning a procedure vary greatly in comparison to experts. Therefore, it is extremely important for the centres to dedicate resources for building futuristic labs, where cadaveric and simulator based training can be imparted. This will greatly decrease the learning
curve and can lead to better patient outcomes in coming years. Minimal attendance level in these labs should be made mandatory requirements before a candidate is allowed to take up his final year exam.

c. **Medico legal aspects of Neurosurgical practice:** Medico-legal cases are on the rise. Neurosurgical procedures involve risk to life and limb and thus neurosurgeons are at high risk of getting embroiled in such medico-legal cases. The committee took *suo moto* cognisance of the fact that, no centre in India is educating its residents in this regard. The committee believes that resident training program should have a curriculum where medico-legal aspects of medicine are taught to residents and they are made aware of likely problems they may face while practicing independently. Amongst the many problems, learning how to take a proper, legally valid consent, maintaining medical records, fair practice protocols, and what constitutes medical negligence should be mandatorily taught.

d. **Counseling for residents:** Stress needs to be addressed but it needs to be emphasized that neurosurgery is a stressful branch. Important factor is to treat residents in an unbiased manner, because biased treatment of residents causes tremendous discord amongst them. Therefore, there is a need to have a counselling and grievance redressal mechanism in the residency program. This program should have

i. Core member of program must consist of a Director of program, psychiatrist & psychologist.

ii. Director should be well trained clinician with knowledge of resident’s need & issues involved in resident’s training

iii. He should not have responsibility for evaluating resident’s performance as this will pose conflict of interest to the role

iv. Develop common strategies and gain understanding of essential aspects of the residency experience.

v. Discussions of work schedules, finances, lifestyle, common problems residents encounter, and potential barriers to acceptance of the assistance program.

vi. Services be confidential with no reporting of details of individual cases to anyone at the institution,

vii. Dedicated phone access availability at all times

e. **Others:**

i. Seminars, guest lectures and support groups should be arranged to address issues of self care, prioritizing demands, dealing with the ambiguity and risks of clinical work, improving communication skills, mentoring, managing the professional–personal interface.

ii. A confidential resident questionnaire should be distributed annually to all residents about their overall residency experience

iii. A quarterly newsletter, distributed to all residents, for providing information and education through articles related to stress management, wellness, family matters and other health-
related topics. It helps highlight the availability and visibility of the program.

iv. Such kind of counselling programs can lead to facilitating an optimal environment for professional growth and long-term well being that survives long after residency training is completed. It helps in conflict resolution and also assures safety of patients.

f. **CONCLUSION:** The above recommendations are the minimum standards for Neurosurgery training and are purported to have uniform standard of training and evaluation throughout India in both M.Ch. and D.N.B. training centres.
PART B: SUMMARY

1. DURATION OF TRAINING:
   a. 3 years – for post M.S./D.N.B. (General Surgery) candidates
   b. 6 years – for M.B.B.S. candidates (1 year General Surgery + 5 years Neurosurgery)
   c. More centres to be encouraged to start 6 year training program.

2. MINIMUM INFRASTRUCTURE FOR STARTING NEUROSURGERY TRAINING
   a. **Number of Trainees:** Maximum should be 6 per year irrespective of the size of the Department.
   b. **Staff pattern:** For one candidate intake per year, the department must have at least:
      i. One Professor/Senior Consultant (Associate Professor + 3 years)
      ii. One Associate Professor/Reader/Consultant (Asst. Professor + 2 years),
      iii. One Assistant Professor/Junior Consultant (with PG qualification)
   c. **Bed strength:**
      i. Minimum 20 beds exclusively for Neurosurgery.
      ii. Exclusive Neurosurgery ICU beds with ventilators and monitors (Minimum 5)
   d. **Diagnostic facilities:**
      i. CT scan, MRI are essential.
      ii. Angiography facilities are desirable.
   e. **Allied departments:**
      i. Neurology unit,
      ii. Pathology (exclusive Neuropathology desirable) department.
   f. **Operation Theatre:**
      i. Exclusive Neurosurgery OT.
      ii. Operating Microscope (High end with Observer eye piece and recording facilities),
      iii. C arm,
      iv. Neurosurgical drill,
      v. Neuroendoscopy (Desirable)
      vi. Stereotaxic equipment (Desirable)
      vii. CUSA (Desirable)
      viii. Microsurgical training lab with a surgical microscope and surgical drills.
   g. **Department Library:**
      i. With recent Neurosurgery textbooks, Basic Science and Neurology textbooks.
      ii. Internet facilities, Minimum of two International Journals to be subscribed. Access to online Journals and reading material through sites like HINARI, UPTODATE, etc.
   h. **Sub speciality:** Minimum one sub speciality to be established (viz. spinal surgery, skull base surgery, neurovascular surgery, paediatric neurosurgery, etc.)
   i. **Academic activity:** Minimum weekly clinical discussion, journal club, monthly symposia, seminars. (Records to be maintained)
   j. **Accreditation to be renewed every five years, after formal inspection.**
k. These are the bare minimum mandatory infrastructure required for starting Neurosurgery training program and accreditation to all such institutions running the programs in the absence of the above infrastructure should be revoked.

3. TRAINING CURRICULUM:
   a. **1st year of 6 year training:** Posting in General Surgery to learn basic principles of surgery, basic surgical skills, exposure to patients and operative procedures in general surgery.
   
   b. **3 years training/ 6 years training:**
      i. Posting in Neurosurgery: **1st year/2nd-3rd year:** Patient care, history taking and neurological examination, case-sheet writing, preparing discharge summaries, supervised emergency calls, exposure to basic neurosciences, Academic activity, Neurology posting for one month.
      ii. **2nd – 3rd year/ 4th to 6th year:** Overall in-charge of ward work, OPD, Emergency calls, Academic activity, Posting in other Neurosurgical centre(s) for 2 months in the beginning of final year.
      iii. **Academic activity:** Clinical case discussion, pre-operative discussion, journal club, neuro-radiology discussion, grand rounds, medical audit, symposia, seminars. (Active participation to be recorded in logbook and certified)

c. **Minimum operative surgical exposure required for the trainees:**
   i. **Mandatory:**
      1. 400 cases exposure at least for the whole training program (Minimum 300 cases performed in the OT in a year).
      2. At least 2 OTs a week including trauma
      3. About 1/3 cranial and 1/3 spinal cases
      4. At least 10% supervised/ performed independently (at least 10 craniotomies)
      5. Spectrum of surgeries should include Neuro-trauma, Neuro-oncology, Stroke and cerebrovascular surgery, Pediatric Neurosurgery, Spinal surgery.
      6. If any of the above specialities is not available, the trainee may be posted to other centres where such speciality is available.
   ii. **Desirable:** Exposure to sub-specialities including
      1. Cerebrovascular surgery including endovascular procedures
      2. Functional Neurosurgery and Epilepsy surgery
      3. Skull base surgery
      4. Neuro-endoscopy
      5. Peripheral nerve surgery

d. **Practical Surgical training curriculum:**
   i. **1st year of 6 year training:** Posting in General Surgery to learn basic principles of surgery, basic surgical skills, exposure to patients and operative procedures in general surgery.
   ii. **3 years training/ 6 years training:**
      1. **1st year/2nd – 3rd year:** Lumbar puncture, external ventricular drainage, tracheostomy, endotracheal intubation, emergency scalp suturing, Simple neuro-trauma including chronic subdural hematoma, extradural hematoma, learning elective case exposures, VP shunt (under supervision).
2. **2nd year/ 4th-5th years**: Neurotrauma: contusion and intracerebral hematoma, Elective cases: craniotomy and spinal exposures.

3. **3rd year/ 6th year**: Elective exposures, supervised surgery, Sub-speciality exposure depending on interest.

4. **Independent surgery (supervised)**: Neuro-trauma: Chronic SDH, EDH, depressed fractures, ICH, contusions, (Experience with conventional craniotomy required).

5. Elective cases: VP shunt (always supervised), Gliomas (at least 2 anatomical regions), Surface meningiomas, Chiari malformation, Midline suboccipital exposure and surgery, Lumbar disc and cervical disc surgery.

iii. **Internal assessment**:

1. **Theory and clinical**: Once in 6 months

2. **Operative skills**:
   a. Once in 6 months
   b. Cases performed under supervision and graded by a faculty (different faculty each time) and assessment should include Pre-operative assessment, Surgical planning, Exposure, Surgical techniques and tissue handling and Hemostasis.

3. **Log Book**:
   a. Should be maintained with at least the following entries:
   b. Name/Hospital ID No/ age/ sex
   c. Diagnosis
   d. Name of Surgery
   e. Special remarks
   f. Role of the resident
   g. Comments by the surgeon with signature.
   h. Participation in academic activity with details also should be recorded and certified.
   i. The log book should be hand written and signed by the Unit Head/ HOD every month.

4. **Thesis/Dissertation**:
   a. The thesis should be of a good quality that is worthy of publication in an indexed journal.
   b. The thesis should be submitted 6 months before the final examination and evaluated by external examiners.
   c. The thesis/dissertation has to be approved before the trainee is permitted to appear for the final examination.

5. **Attendance of Neurosurgical conferences/workshops**:
   a. **For 6 year candidates**: Minimum 5.
   b. **For 3 year candidates**: Minimum 3.
   c. **Paper presentation at conferences**:
      i. **For 6 year candidates**: Minimum 3. (– 1 in a national conference of NSI preferably)
      ii. **For 3 year candidates**: Minimum 2. (– 1 in a national conference of NSI preferably)

6. **Publication of papers (in peer reviewed journals)**:
a. For 6 year candidates: Minimum 2. (– at least one in Neurology India)
b. For 3 year candidates: Minimum 1. (– ideally in Neurology India)
c. (In case an Institution is unable to fulfil the bare requirements, e.g. absence of a particular sub-speciality, the trainees should be allowed to go and train for a stipulated period at any other Institute, where that particular surgery is practised.)
d. Trainees who fail to achieve the above mentioned targets, despite facilities being available, should not be allowed to take the examination.

4. EXAMINATION:
   a. Examination Pattern:
      i. 6 YEAR COURSE:
         1. Part I: at the end of I year.
            a. Theory papers:
               i. Basic Sciences in relation to General Surgery
               ii. General Surgery.
            b. Clinical and oral examination in General Surgery:
               i. Long and 2 short cases in General Surgery
               ii. Viva in General Surgery
         2. Part II: at the end of III year.
            a. Theory papers in Basic Neurosciences and Clinical Neurology:
               i. Neuroanatomy and physiology
               ii. Neurochemistry and pathology;
               iii. Clinical Neurology
            b. Clinical and Oral examination in Clinical Neurology:
               i. Long and 2 short cases in Neurology
               ii. Viva (including Neuroanatomy and Neuropathology specimens, EEG, Evoked potentials, etc.)
         c. Part III: at the end of VI year.
            i. Theory papers in Neurosurgery:
               1. Neuroradiology and Clinical Neurosurgery
               2. Operative Neurosurgery and Recent advances.
            ii. Clinical examination, ward rounds and oral examination:
               1. Clinical examination: Long case and 2 short cases
               2. Ward Rounds: Minimum 2 cases in Head Injury and Neurosurgery ICU
               3. Viva:
                  a. Neuro-radiology
                  b. Instruments,
                  c. Operative procedures,
                  d. Recent advances,
ii. **3 YEAR COURSE:**

1. **Part I:** at the end of I year.
   a. **Theory papers in Basic Neurosciences and Clinical Neurology:**
      i. Neuroanatomy and physiology
      ii. Neurochemistry and pathology;
      iii. Clinical Neurology
   b. **Clinical and Oral examination in Clinical Neurology:**
      i. Long and 2 short cases in Neurology
      ii. Viva (including Neuroanatomy and Neuropathology specimens, EEG, Evoked potentials, etc.)

2. **Part II:** at the end of III year.
   a. **Theory papers in Neurosurgery:**
      i. Neuroradiology and Clinical Neurosurgery
      ii. Operative Neurosurgery and Recent advances.
   b. **Clinical examination, ward rounds and oral examination:**
      i. **Clinical examination:** Long case and 2 short cases
      ii. **Ward Rounds:** Minimum 2 cases in Head Injury and Neurosurgery ICU
      iii. **Viva:**
          1. Neuro-radiology
          2. Instruments,
          3. Operative procedures,
          4. Recent advances,
          5. History of Neurosurgery.
   iii. Theory papers to be evaluated by the external examiners well before clinical and oral examination and only those candidates who have passed the theory shall be allowed to appear for the clinical and viva examination.

5. **EXAMINERS:**
   a. **For Part I of 6 year course:** At least one Internal and One External General Surgeons with an Internal Neurosurgeon convenor
   b. **For Part II of 6 year course and Part I of 3 year course:**
      i. One Internal and One External Neurosurgeons
      ii. One Internal and One External Neurologists
   c. **For Part III of 6 year course and Part II of 3 year course:**
      i. Two Internal and Two External Neurosurgeons
      ii. Examiners shall be only from M.Ch. teaching institutions for M.Ch. and M.Ch./D.N.B. training institutions for D.N.B.
      iii. Examiners shall be Professors with minimum 9 years teaching experience and not Associate Professors/Readers.
   d. **POST QUALIFICATION EXPERIENCE:**
      i. **One year post-qualification work/training** (as Tutor/Lecturer) after 6 or 3 year postgraduate training in the same or another Neurosurgery department shall be optional, but desirable. This one year period will help the candidate to advance and fine-tune his surgical skills.