

Annexure I: Uniform Curriculum For MCh And DNB residency courses in Neurosurgery for India

1. Introduction:

a. Background:

- i. The neurosurgical training in India at present has many drawbacks.
- ii. 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.
- iii. Hence there is an urgent need to streamline the standard of training and evaluation throughout the country.
- iv. The following recommendations are put forward in this regard (Common for M.Ch. and D.N.B. qualifications).
- v. These recommendations are the summary of the consensus arrived at the Meeting of the NSI Committee for devising the uniform guidelines for neurosurgical training held at the AIIMS, New Delhi on 15-3-2014.

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 (1year 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 1			
	Existing regulations	Mandatory Recommendations	Optional Recommendation
Beds	20	Minimum 20 beds exclusively for Neurosurgery. Exclusive Neurosurgery ICU beds with ventilators and monitors (Minimum 5)	>20 beds
Teachers	One Professor (Associate Prof + 3years), One Associate Professor (Asst. Prof + 2 years) and one Assistant Professor.	Same	May have multiple units, each unit dedicated to one sub speciality
Radiology	CT and MRI mandatory	CT scan and MRI (must), angiography facilities (desirable).	DSA with neuro interventional capabilities Other advanced equipment: -Gamma knife -intra-op MRI
Student teacher ratio	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.	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. Staff pattern: 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	

		qualification).	
Allied departments	-	Neurology unit, Pathology (exclusive Neuropathology desirable) department.	Neurophysiology Neurovirology
Operation theatre and equipment	-	<ul style="list-style-type: none"> • Exclusive Neurosurgery OT. • Operating Microscope • C arm, • Neurosurgical drill, • Urinoscopy (Desirable) • Stereotaxic equipment (Desirable) • CUSA (Desirable) • The microsurgical training lab should be equipped with a surgical microscope and surgical drills. 	Other high end equipment -Intra-op MRI -Neuronavigation -Intra-operative electrophysiology -
Library	-	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.	
Sub-specialty in department	-	Minimum one sub speciality (viz. spinal surgery, skull base surgery, neurovascular surgery, paediatric neurosurgery, etc.)	Multiple sub specialities will help to provide a comprehensive approach
Academic activity	-	Minimum weekly clinical discussion, journal club, monthly symposia, seminars. (Records to be maintained)	More activities are welcome, but the academic activities should be balanced so that the clinical work does not suffer,
Accreditation	-	To be renewed every five	

review		years, after formal inspection.	
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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-specialty 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-specialty 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		
	Mandatory	Desirable
Cases	<ul style="list-style-type: none"> - 400 cases exposure at least for whole training program (@ 300 cases performed per OT in a year) - At least 2 OT's a week average including trauma - With around 1/3 cranial and 1/3 spinal - At least 10% supervised/ performed independently (at least 10 craniotomies) - Spectrum: Neuro-trauma, Neuro-oncology, stroke and 	Desirable: sub specialities <ul style="list-style-type: none"> - Cerebrovascular including endovascular - Functional and epilepsy - Neuro-endoscopy - Peripheral nerves

	<p>cerebrovascular, paediatric, spinal</p> <p>- If any of the above specialties is not available, may be posted in another centre</p>	
Hierarchy	<p>3 years/ 6 years:</p> <p>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)</p> <p>2nd year/ 3rd-4th: Neuro trauma: Contusions, ICH. Elective cases exposures, all craniotomies, spine exposures,</p> <p>3rd year/5-6th year: Sub-speciality exposure depending on interest, elective exposures,</p>	
Independent surgery (supervised)	<p>Neuro trauma- chronic SDH, epidural hematoma, depressed fracture, contusions, ICH (experience with conventional craniotomy required)</p> <p>Elective: VP shunts (always supervised), gliomas</p> <p>Lumbar disc/ cervical disc</p>	<p>Gliomas: at least 2 anatomical regions</p> <p>Surface meningiomas</p> <p>Chiari malformation</p> <p>Midline sub occipital exposure and surgery</p>
Internal assessment of operative skills	<p>Once in 6 months</p> <p>Case performed under supervision and graded by a faculty (different faculty every time)</p> <ul style="list-style-type: none"> - Pre operative assessment - Surgical planning - Exposure - Surgical techniques and brain handling - haemostasis 	
Log Book	<p>Should be maintained with at least following entries-</p> <ul style="list-style-type: none"> • Name/ hospital id no/ age/sex • Diagnosis • Surgery performed 	

	<ul style="list-style-type: none"> • Special remarks • Role of resident • Comments by the surgeon/signature 	
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- 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, observer ship in other institutes and posting in allied specialties (**Table 3**).

TABLE 3	Expected duty and knowledge paradigm
3 year candidate	5 year candidate:
<p>1st 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.</p> <p>2nd 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</p> <p>3rd 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 three months One additional year of post examination Senior Residency on a Voluntary basis</p>	<p>1.5 year: Rotation to General Surgery to learn basic surgical skills. No interruptions</p> <p>6 months: Rotation to other super speciality surgical branches: Examination at end of 2 years on surgical training conducted under convenorship of HOD Neurosurgery and General Surgery</p> <p>3rd 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.</p> <p>4th 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</p> <p>5th 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 three months One additional year of post examination Senior Residency on a Voluntary basis</p>
1st year: Learn Anatomy, physiology, biochemistry pharmacology of nervous system.	1st 2 years: Learn basic principles of surgery (inflammation, wound healing, blood

<p>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.</p> <p>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</p> <p>2nd year: Primarily responsible for supervised ward rounds, informed consent, Patient records and discharge summaries, follow up of patients.</p> <p>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.</p> <p>Participation in all academic activities of the Department. 15 days of Neurology Posting</p> <p>3rd year: Overall in charge 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/orthopaedics/ paediatrics/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</p>	<p>transfusion, sutures), basic surgical skills, exposure to patients and operative procedures in general surgery. Being evaluated at end of two years.</p> <p>3rd year: Same as 1st year of 3-year candidate.</p> <p>4th Year: Same as 2nd Year candidate of 3-year course.</p> <p>5th Year: Same as 3rd year candidate of 3-year course.</p> <p>6th year: Chief residency</p>
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- 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 can be for 1 month in 2nd year. Other rotation can be in Radiology (interventional work)/Orthopedics (Spine)/ Pediatrics/Plastic surgery (flaps/ nerve repair/ craniofacial work)/ Laboratory/ ENT (skull base): 1 month (Final year).
- 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:

TABLE 4		
S. no	Academic session	Schedule
1	Seminars	Once a week
2	Journal club	Once a week
3	Bed side Neurosurgery & combined with Neurology	Once a month
4	Treatment, planning sessions	Once a week
5	Neuro radiology sessions	Once a week
6	Discharge & death audits	Once a week
7	Students' CPC	Once a month
8	Neuro ophthalmology, Neuropathology sessions, Neuro-otology rounds	Once a month
9	Didactic Lectures in neuroradiology,	Once a

	neuroanaesthesia, Neuropsychology, Haematology, endocrinology, Respiratory physiology, ventilator care,	month
10	Case presentation	Once a week

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. 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 centres 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 5			
Clinical exam	Number of cases	Time for examinee	Exam evaluation (examiner)
Long case	1	1 hour	1 hour
Short case	2	15 mins each	15 mins each
OSCE stations	5	10 mins	Simultaneous
Preop case	1	30 mins	30 mins
Operative	1 (Optional)	--	30 mins
Neuroradiology	1	45 mins	Simultaneous
Ward round	1 (Optional)	30 mins	Simultaneous
Grand viva (to include neuropathology/ instruments/recent advances)	1	30 mins	Simultaneous

- viii. Clinical examination of the candidate should focus on candidate's 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 an 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 sub-specialties 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 cognizance 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. **Counselling 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.