

Neurology Center

(Seoul National University Hospital)

1. Introduction

Despite endeavors of neuroscientists and neurologists, neurological disorders still impose a high mortality and disability on the Korean population, and their incidence and prevalence is rapidly increasing as the population ages. The Seoul National University Hospital (SNUH) Neurology center cares for patients suffering from a variety of neurological disorders with the finest diagnosis and treatment, providing education to cultivate doctors to lead the field of neurology and supporting basic and clinical research to overcome neurological disorders. The SNUH Neurology center is well organized with several sub-centers, which include the emergency center, inpatient ward, intensive care unit, outpatient clinic, and diagnostic laboratories equipped with trans-cranial Doppler, nerve conduction study, electromyography, electroencephalography, evoked potential, video-oculography, and neuropsychological testing. In addition, the Stroke Unit, Movement Disorder Center, and Epilepsy Monitoring Unit have been operated to provide a high-quality service to patients with specific disorders. Growth has been remarkable in both quantity and quality. The number of annual inpatients reached about 2,461 in 2012 and the number of new patients in outpatient clinic reached about 18,298 in 2012. The center has also accomplished significant development in research with members of the center annually publishing about 120 papers in international and domestic journals. Along with quantitative growth in faculties and facilities, the capacity and quality of education is expanding enormously both domestically and internationally. Thus, our center is open to everyone for the purpose of education with regards to patient care and research. We are now introducing an education program fit for global visitors. The SNUH Neurology center is internationally recognized as leading the medical field in academic research, education and patient care. In providing an excellent educational environment, the center will maintain that lead. We always strive for excellence in training and education.

2. Visiting Fellowship Program

This is an integrated practical education course which provides experience in clinical practice and research in neurological disorders within a few weeks and is designed to let the trainee acquire comprehensive knowledge of care for patients with neurologic disorders.

The trainee is expected to learn the fundamental skills of neurological examination, laboratory investigation, and both acute and long-term care through this course. It is also expected that in-depth discussion on intriguing cases and participation in clinical and basic research may raise new ideas on future research and aid future collaboration.

1) Duration: 2 weeks or 4 weeks program courses, which are basically similar in contents; however, there is a better chance of more in-depth involvement in practice and research in the 4 week's program.

2) Accommodations: Accommodations can be made in the dormitory located on the hospital grounds. A nearby motel (ten minute walk) is another option by trainees' if or when the dormitory is not available.

3) Center informations:

① **Outpatient care unit:** Two outpatient nurses and seven certified nursing assistants work in the outpatient care unit. With a total of seven medical offices, outpatient care is performed 12 sessions per day. In addition, special clinics are opened to provide patients with more professional and effective diagnosis and treatment.

- ALS Clinic - Monday afternoon

- Myasthenia Gravis Clinic - Monday afternoon (Pf.Jung Joon Sung)

- Parkinson's Disorder Clinic - Wednesday morning (Pf.Beom S.Jeon)

- Botox Clinic - Wednesday afternoon (Pf.Beom S.Jeon)

- ② **Inpatient wards:** Inpatient wards include Ward 104 (37 beds including 5 beds in the Stroke unit), Ward 105 (30 beds including 4 beds in the Epilepsy monitoring unit), Parkinson Center (4 beds located in the Ward 45) and the Internal Medicine ICU (4 to 5 beds). There are two chief residents in charge of each ward, one third year resident in charge of the Epilepsy monitoring unit, one second year student in charge of the ICU, three first year residents in charge of wards, two residents in rotation to the Department of Emergency Medicine and Family Medicine, two interns working for inpatient cares along with 31 nurses and five certified nursing assistants. To ensure quality care in the emergency room, a second year resident is permanently stationed during the day to diagnose and treat those patients visiting the emergency room. A resident is also stationed during the night shift.
- ③ **Stroke Center:** Since brain damage takes a relatively shorter time than other organs, immediate attention and care is more important than anything else. Recently, several research accomplishments have improved the operation of the stroke intensive care unit equipped with immediate and intensive management system for hyper-acute stroke patients. The SNUH Neurology center opened the Stroke unit in September 5, 2007 providing excellent care to acute stroke patients. Professional nursing resources stand by 24 hours a day to monitor the status of patients. Furthermore, a specialist in charge of the Stroke unit along with the faculty in charge is stationed to provide the patients with high-quality medical services. We also run a brain perfusion Lab equipped with two trans-cranial Doppler machines which evaluate hemodynamic status among blood vessels in the brain while measuring the speed, quantity and direction of brain perfusion. In this lab, hemodynamic diagnoses of blood vessels in the brain and also tests to detect embolic materials in the brain are performed.
- ④ **Movement Disorder Center:** Currently, two professors specialized in movement disorders provide patient care for more than 20,000 outpatients every year, including Parkinson disease, dystonia, tremor, ataxia, chorea, and myoclonus. In addition, more than 3,000 patients are hospitalized every year for diagnosis and/or management of movement disorders. In year 2005, the Movement Disorder Center was established in collaboration with the department of Neurosurgery for deep brain stimulation in patients with Parkinson disease, dystonia, and tremors. In this world-renowned center, we provide 24-hour patient monitoring for optimal patient care using a specialized protocol. Since 2005, more than 250 patients underwent deep brain stimulation surgery and are being

followed. With this achievement, the Movement Disorder Center was selected as a World-Class center of Seoul National University Hospital in 2011. In addition, much clinical, transitional and laboratory research is underway and more than 10 papers are published in SCI journals every year. Furthermore, we are in collaboration with researchers all over the world.

- ⑤ **Neuromuscular Disorder Center:** We have a specialized center for amyotrophic lateral sclerosis and Multiple sclerosis/Neuromyelitisoptica. Tests on peripheral nerves, muscular disorders, neuromuscular copula disorders and motor neuron disorders are performed to diagnose and evaluate functions of nerves at a clinical neurophysiology laboratory. The tests include neurotransmission test, needle electromyography, repetitive nerve stimulation test, blink reflex test, evoked potential, autonomic neuropathy function test and transcranial magnetic stimulation test, and intraoperative neurophysiological monitoring (IOM). The lab is equipped with four electromyography machines and a transcranial magnetic stimulator, evoked potentials measurement device. In addition, this lab also performs electro-oculography using the latest oculographic analysis device which is essential to diagnose different types of patients with movement disorders and dizziness.
- ⑥ **Epilepsy Center:** At Seoul National University Hospital, several faculty members from Neurology, Neurosurgery, and Pediatric Neurology along with Radiology, Anesthesiology and Nuclear Medicine established the 'Seoul National University Hospital Epilepsy Association' on September 14, 1993. The association provides patient care and promotes research activities through active academic exchanges. In an effort to provide even better care for epileptic patients, the Epilepsy monitoring unit opened in September 1994. Since then, the unit has been taking the pivotal role in diagnosis and treatment of obstinate epileptic patients. The center is equipped with five electroencephalographs supporting moving pictures and a lab that concurrently observes and analyzes the status of patient at the occurrence of symptom and electroencephalography. With such technology, it is possible to discover a sudden attack due to epilepsy and perform a surgical operation while classifying different types of epilepsy and diagnosing various disorders with similar symptoms with epilepsy. Electroencephalography (EEG) is also an important tool to record electrical activation spontaneously generated in a brain on the scalp and to evaluate the functions of brain. The EEG lab is equipped with two digital electroencephalographs and an analog electroencephalograph.

- ⑦ **Neurology Research Center:** The Neurology Research Center focuses on not only various clinical research on outpatients and inpatients, but also fundamental scientific research. Specifically, the department is constructively utilizing Seoul National University Hospital Biomedical Research Institute to diagnose and treat patients under clinical studies and performing various experiments and research using the labs within the research center. Several dozens of researchers and students in master and Ph.D. programs are actively participating in research.

4) Facility location:

- ① **Neurology office:** Neurology offices are located on the eleventh floor of Seoul National University Hospital. It consists of faculty offices, resident offices, administrative office and library. Three secretaries are assisting in department affairs and each faculty member's work.
- ② **Outpatient care unit:** As you enter the main entrance of the hospital, our outpatient offices are located in the first basement level, which can be accessed by escalator on the left of the first floor.
- ③ **Inpatient wards:** The Wards 104 and 105 are located on the tenth floor of main building of Seoul National University Hospital.
- ④ **ICU:** Critical patients for the Department of Neurology are admitted to the Internal Medicine ICU on the third floor of main building of Seoul National University Hospital.
- ⑤ **Stroke unit:** Hyper-acute stroke patients are admitted to the stroke unit with the total of five beds available in the Ward 104.
- ⑥ **Epilepsy monitoring unit:** Epileptic patients who need intensive care are admitted to the epilepsy monitoring unit with the total of four beds in the Ward 105.
- ⑦ **Parkinson Center:** Parkinson patients who need intensive care are admitted to Parkinson center with the total of four beds in the Ward 45 located on the fourth floor of main building of Seoul National University Hospital.
- ⑧ **Special Laboratories:** Special laboratories include nerve electromyography lab, evoked potentials lab, electroencephalography lab, trans-cranial Doppler lab, and neuropsychology lab on the fourth floor.

5) Curriculum

A. General program

A-1.2 weeks' program

- ① Outpatient clinic
 - A. Observation of 1-2 sessions per stroke, Parkinson, ALS, myasthenia gravis, and epilepsy clinics.
- ② Inpatient clinic
 - A. Ward round for 4-5 days with faculties
 - B. Special unit round of stroke unit, ICU, emergency room, Parkinson center, epilepsy monitoring unit
- ③ Laboratory
 - A. 1 session of NCS/EMG/EP/VOG
 - B. 1 session of TCD performance
 - C. 1 session of EEG recording
- ④ Conferences
 - A. Case conferences 2 times
 - B. Participation in morning conference, guest lecture, topic seminar, journal club, and Neurology grand round
- ⑤ Research meeting
 - A. Participation in various meetings as trainee's preference
 - B. 1-2 times of open discussion about the subjects of trainee's interest with faculties
- ⑥ Reports of accomplishment
 - A. At the end of the 2nd week
 - B. Presentation of trainee about what the trainee learn and feedback from the faculties

- ⑦ Optional schedules
 - A. Choice of subspecialty education
 - B. Please refer to special programs of stroke, movement disorder, neuromuscular disorder, and epilepsy centers.

A-2.4 weeks' program

- ① Outpatient clinic
 - A. Observation of 1-2 sessions per stroke, Parkinson, ALS, myasthenia gravis, and epilepsy clinics.
 - B. In-depth discussion about special outpatient with faculty at the outpatient clinic
- ② Inpatient clinic
 - A. Ward round for 4-5 days with faculties
 - B. Special unit round of stroke unit, ICU, emergency room, Parkinson center, epilepsy monitoring unit
 - C. In-depth discussion about special inpatient with special faculty at the ward
- ③ Laboratory
 - A. 2 session of NCS/EMG/EP/VOG
 - B. 2 session of TCD performance
 - C. 2 session of EEG recording
 - D. 2 sessions of Hands-on training (as trainee preference)
 - E. Education of interpretation skill
- ④ Conferences
 - A. Case conferences 2 times
 - B. Participation in morning conference, guest lecture, topic seminar, journal club, and Neurology grand round
 - C. Presentation of case or research topic

- ⑤ Research meeting
 - A. Participation in various meetings as trainee's preference
 - B. 1-2 times of open discussion about the subjects of trainee's interest
- ⑥ Reports of accomplishment
 - A. At the end of the 2nd and 4th week
 - B. Presentation of trainee about what the trainee learned and feedback from the faculties
- ⑦ Optional schedules
 - A. Choice of subspecialty education
 - B. Please refer to special programs of stroke, movement disorder, neuromuscular disorder, and epilepsy centers.

B. Special program

B-1. Stroke Center

- ① Attendance of critical pathway for thrombolysis in hyperacute stroke patients
- ② Stroke unit round
- ③ Emergency room round
- ④ Conference
 - A. Stroke seminar (every week, 3:00 PM, Thursday)
 - B. Neurovascular conference (every week, 4:00 PM, Wednesday)
- ⑤ Research meeting for clinical and basic research (every week, 6:00 PM, Wednesday)
- ⑥ Participation in basic research regarding stem cell and neuroprotection

B-2. Movement Disorder Center

- ① Outpatient clinic: everyday (Mon. – Sat.), 40-60 patients per day: in Korean, but non-Korean speaking trainee is expected to understand what is going on
- ② Botulinum toxic clinic: Every Wednesday. Approx. 30 patients: hemifacial spasm, blepharospasm, torticollis, and other focal/segmental dystonias
- ③ Ward round: everyday (Mon. – Fri.)
- ④ Movement Disorder Seminar: Every Wednesday, 6:30pm – 9:00pm: movement disorder videos, journal reviews, and discussion on ongoing researches
- ⑤ Deep brain stimulation surgery: (every) Monday

B-3. Neuromuscular Disorder Center

- ① Attendance for the amyotrophic lateral sclerosis (ALS) clinic/ or multiple sclerosis/neuromyelitisoptica (MS/NMO) clinic Monday (PM).
- ② Conference
 - A. EMG/NCS/EP interpretation (every morning 9:00 AM)
 - B. EP/EMG conference (every other week, 2:00 PM, Tuesday)
- ③ Research meeting for the stem cell research in ALS (optional)
- ④ Attendance for the intraoperative neurophysiologic monitoring for the various types of surgery (optional).
- ⑤ Inpatient ward round for the interesting or rare cases

B-4. Epilepsy Center

- ① Recording and Interpretation of routine EEG
 - A. Technical processing of recording EEG and principal of EEG interpretation: Daily afternoon: PM 05:00-06:00
 - B. Review and discussion on selected case or EEG atlas

② Video EEG monitoring

- A. Technical recording processes of video EEG monitoring and principal of interpretation:
Daily AM 09:00-11:00
- B. Discussion of diagnosis and treatment planning: Daily AM 11:00-12:00
- C. Technical recording processes of video EEG monitoring: Daily PM 02:00-03:30
- D. Review and discussion on interesting or selected cases: Daily PM 03:30-04:00

③ Epileptic surgery

- A. Insertion of intracranial electrodes: Once every two weeks, the first week of Monday
PM 01:00-04:00
- B. Invasive intracranial EEG monitoring: During the week after insertion of intracranial
electrodes
- C. Function mapping study: Friday of surgery week PM 01:00-04:00
- D. Main epileptic surgery: Monday, next week of insertion of intracranial electrodes
- E. Post-epileptic surgery care

④ Conference of surgical treatment of epilepsy

- A. Once every two weeks, first Thursday AM 10:00-12:00
- B. Discussion about the decision of resection margin and planning of surgical treatment
- C. Practical case conference for decision making by team approach: neuro-surgeon,
epileptologist, radiologist, pathologist, nuclear medicine

⑤ Epilepsy research meeting (ERM)

- A. Each Wednesday PM 00:30-01:30
- B. Review of important and recent epilepsy paper

5) Routine time tables

Mon	Tue	Wed	Thu	Fri
7:30am Morning conference Weekly report Weekly briefing	7:30am Morning conference	7:30am Morning conference	7:30am Neuroradiology conference	7:30am Morning conference
8:00am Transfer or mortality case conference	8:00am Guest lecture	8:00am Case conference	8:30am Morning conference	8:00am Journal club
2:00pm ICU conference	2:00pm EP/EMG seminar	4:00pm Neurovascular conference	3:00pm Stroke seminar	2:00pm Neuropathology conference
3:00pm Stroke registry		6:00pm Movement seminar	4:00pm Neurology grand round	5:00pm Staff lecture

* Schedules for each specialty can be arranged individually.

4. Homepages

Seoul national university hospital

<http://www.snuh.org/english/>,

SNUH Neurology center

<http://www.snuhneurology.net>

Movement disorder center

<http://snumdc.org/>

Information of Korea

<http://www.visitkorea.com/>

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