

Review Article

Evaluation of the Department of Neurosurgery of the Seoul National University Hospital

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The Department of Neurosurgery (DNS) of the Seoul National University Hospital (SNUH), belongs to the largest and oldest such institutions in Korea. Because of its growing reputation it is hardly surprising that the DNS draws visitor and scholars for clinical education and academic exchange from far beyond Korea. I myself visited the SNUH in February and March 2013. During this time I composed this evaluation in which I compare the DNS to my home Department at the Johannes Gutenberg-University in Mainz/Germany, as well as the situation of Neurosurgery in Korea and Germany in general. In the first part this evaluation summarizes data concerning equipment, staff and organizational structure, as well as educational and scientific issues of the DNS. In the second part some issues of interest are discussed in special regard to the corresponding practices in Germany.

Key Words : Neurosurgical unit · Departmental evaluation · International standard.

INTRODUCTION

The Seoul National University Hospital (SNUH) is a government funded hospital located in the very heart of Seoul, the capital of Korea. It is one of the largest healthcare providers within the region and also within the whole country. Its history dates back to the late Chosun kingdom and the number of visiting international fellows and scholars indicates its growing international reputation. Within the larger Seoul area SNUH has two branch hospitals, namely Boramae Medical Center and Seoul National University Bundang Hospital⁹.

The Department of Neurosurgery, of the SNUH (hence forward referred to as DNS) is in itself one of the oldest and largest of such institutions in Korea. It has a volume of more than 3000 procedures and more than 70 papers published in national and international journals annually. It is an important unit within the SNUH. Presently the elected president of the SNUH (Professor Hee-Won Jung) is faculty of the DNS. Beyond that, several recent articles document the DNS's role nationwide, in Asia² and worldwide⁹.

While being given the chance to spend two months in this renowned department, I composed this evaluation of the DNS on

request of its chairman Professor Chun Kee Chung. As recent reports have already embarked on describing the department's achievements in terms of numbers, I will rather focus on the DNS's organization and structure. This evaluation is based on my personal observations, several interviews with residents and fellows of the DNS and the publications cited below.

I underwent neurosurgical training in Germany and Switzerland myself. Presently I work at the Department of Neurosurgery of the Johannes Gutenberg-University, Mainz/Germany (hence forward referred to as NMU). Quite naturally my judgment is influenced by this experience. The assessment and suggestions offered in this essay consequently rather represent my personal opinion than objective data. Likewise I do not claim that my assessment and recommendations are complete.

In the first part I will give a short description of the DNS and thereafter discuss some points of interest in comparison to my own department (the NMU).

DESCRIPTION OF THE DNS

Neurosurgical wards

The DNS currently has two regular wards (55W, 45W), of 32

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beds each. Patients from all neurosurgical subspecialties are admitted on these wards. The attending neurosurgeons see their own patients, respectively the patients belonging to their own subspecialty, on their daily ward rounds.

Personnel

The nurses on neurosurgical wards work in a three shift-system. Their number seems appropriate to perform all tasks assigned to them. Prior to graduating as nurse, in Korea four years of training are required. However, in their further career most nurses stay for long periods on the same ward. They are not required to routinely rotate into other (non-neurosurgical) departments. This allows them to accumulate significant experience in neurosurgical care and guarantees an overall high quality of nursing.

Intensive care unit

Technically the DNS has 13 beds on the intensive care unit (ICU), which is led by the Department of Anesthesiology. However, sometimes different departments compete over available ICU beds. Besides some patients, like poly-trauma patients, occupy ICU beds over prolonged periods of time. Both may result in intermittent shortage of ICU capacity. As the DNS does not have own intermediate care beds to buffer this shortage, it may lead to cancellation or postponement of elective neurosurgical procedures.

Personnel

Neurosurgical residents do not regularly rotate on the ICU. No neurosurgical faculty is routinely present on the ICU during business hours. Basic care is provided by anesthesiologists. Neurosurgeons visit their ICU patients on the daily ward rounds only.

ICU nurses complete the same four years of education like their counterparts on neurosurgical wards. Likewise they have no mandatory rotation after graduating. However as the ICU serves several (surgical) disciplines the nurses are not able to specifically concentrate on neurosurgical issues, such as increased intracranial pressure or post SAH vasospasm, etc.

Pediatric beds

For pediatric patients ten additional beds on regular wards and three ICU beds are available in the children hospital.

Operating rooms

The DNS uses three operating rooms (ORs) in the central OR tract on the second floor of the SNUH main building. Additionally 1.5 ORs in the children hospital are reserved for elective neurosurgical procedures. Neurosurgical subspecialties have fixed time slots for their elective cases during the week.

Personnel

Following their four years education as nurses, OR nurses rotate into different specialties, such as Neurosurgery, Trauma, Thoracic surgery, etc., for one year (2 months in each). After

this period they stay in one field without further mandatory rotation. This gives them the opportunity to acquire special skills of their chosen discipline. Especially in areas using complicated and highly specific technical equipment, like neurosurgery, this is of great importance.

At DNS the OR personnel is very considerate towards hygienic standards and carefully observes regulations. They are however less concerned of their own personal safety, as contaminated material is sometimes removed bare handed, sharp devices, such as needles, are recapped, etc.

Anesthesia

Anesthesiologists are present during the complete procedure and modern techniques, such as invasive monitoring or TIVA, and recent equipment (Dräger Primus[®] respirators, etc.) are routinely applied. The department is also capable to take care of awake operations.

Induction and termination of anesthesia is generally performed within the OR. There are neither rooms nor teams to perform overlapping induction of anesthesia.

Specifically neurosurgical equipment

Specific neurosurgical equipment includes modern operating microscopes (Zeiss Pentero[®] and Leica OH5[®]) for each neurosurgical OR. Standard tools, such as mono- and bipolar coagulation, high speed drills, suction, etc. are always used, CUSA technology (Integra excel+[®] and Söring) is available if required.

5-ALA fluorescent guided surgery is applied for glioma resection. Two Polaris based image-guidance systems (Stryker and Cybermed), provide image-guidance, mainly for tumor resection and open neurovascular surgery. Other teams also use image-guidance for specific tasks, like some procedures in the cranio-cervical junction.

The DNS performs EEG monitoring (ECoG) and electrophysiological monitoring (MEP, SEP, etc.). MEP and SSEP are routinely performed in craniotomy cases. A full-time technician is appointed for this task.

Intraoperative imaging comprises intraoperative 5-ALA fluorescent guided surgery, ICG angiography and standard fluoroscopy using C-arms. Preoperative imaging studies can be reviewed via the hospital's PACS-system. However monitors are not located within the ORs but only in adjacent rooms.

An endoscopic system (Storz) is frequently used for minimal invasive spine- and endoscope assisted skull base surgery.

The functional team uses the stereotactic LeksellR frame (Elektra instruments, Stockholm, Sweden).

Outpatient clinic

The outpatient clinic is set up in collaboration with the Department of Neurology at the Neuroscience Center. Each neurosurgical subspecialty offers specific sessions for all kinds of neurosurgical disorders. A neurosurgeon regularly sees more than 50 or even 70 patients per day.

Scheduling of procedures

Elective surgery

Elective procedures are scheduled by the team-leader of the corresponding subspecialty. Generally the schedule is prepared about one week ahead. If two or three days before surgery unassigned OR-capacity remains, the responsible team-leader will offer this capacity to other neurosurgical subspecialties. If they likewise do not require any further OR-capacity, he will finally inform the Department of Anesthesiology so that the spare capacity becomes available to other disciplines.

Upon completion of the surgical schedule, the physician assistant (PA), of which each team employs at least one (vascular 1, oncology 2, spine 1, etc.), is informed. The PA will arrange admission and a bed on one of the neurosurgical units. For this purpose PAs from all teams daily join ward-rounds to identify and assign available beds. Following this the PA will contact and inform the patient about the admission date.

Hospitalization time, quite naturally, varies greatly depending on the diagnosis and course of the treatment. If patients require prolonged hospitalization they are transferred to the rehabilitation unit of the SNUH. It is the resident's responsibility to request a bed from the Department of Rehabilitation. However, as the number of rehabilitation beds at SNUH is limited, prolonged hospitalizations on neurosurgical wards are not uncommon. In these cases other hospitals might be contacted. If discharged patients are in need of further assistance, it generally remains to their families to provide it.

Emergencies

There are two residents on-call at all times (24 h/7 days per week). Both have to stay in the hospital during their whole time on duty. One is assigned to OR duties, while the other takes care of emergencies on wards and in the emergency room.

Emergencies requiring neurosurgical attention are first reported to one of these residents. Depending on the involved team's customs, the on-call resident will either inform a fellow, or directly contact a faculty member.

Emergency operations will be performed in the next available OR, while the anesthesiologist on-call decides about the urgency and assigns the OR if several cases compete for the next available emergency capacity.

If an emergency patient has to be admitted to the ICU, then it is the resident on-call's responsibility to transfer another patient to the ward, or contact other specialties whether they can help with a bed. If no beds can be commanded, he will contact another hospital and organize patient transfer.

Quality control

Craniotomy patients routinely undergo postoperative CT control. Postoperative implant positions (pedicle screws etc.) are routinely controlled by 2D X-ray.

During the routine morning conferences, held daily at 7:30

AM, the emergency cases are reported. Together with history and clinical data, selected CT slices or radiographies of the patients are presented. Physicians are requested to attend this conference. However, some residents and fellows are not always present, and some quite regularly leave the conference before it ends.

A mortality and morbidity conference is scheduled monthly. Cases to be presented are suggested by the fellows and finally confirmed by the chairman. Attendance is generally good. Specialists from other subjects are not regularly invited.

Microbiologists, hospital pharmacist or other non-neurosurgical specialists do not routinely round on neurosurgical wards or patient records. Critical incident monitoring is not yet performed routinely.

Patients' identity is regularly checked by the anesthesiologist upon arrival in the OR. Patients do furthermore wear name tags when transported to the OR.

Prior to skin incision a surgical team-time-out is recommended, but not always performed.

Subspecialties and centers

The DNS has a high level of specialization. Faculty, fellows and residents form distinct teams, dedicated to neurosurgical subspecialties. Furthermore five independent centers provide specific complex technologies. Currently 16 neurosurgeons and two physicists form the DNS's faculty²⁾.

Spinal and functional neurosurgery

The spinal team consists of three faculty members and two fellows. Specialties include minimal invasive (endoscopic) spine surgery and spine tumor surgery. The whole range of spinal implants is frequently implanted. A neurospinal conference is held weekly on Tuesdays at 4:00 PM. Outpatient clinic takes place several times per week. The spinal team is operating on four working days in one or two (on Friday) of the DNS's ORs.

The functional neurosurgery subspecialty at DNS covers all kind of functional neurosurgical procedures from open epilepsy surgery over stereotactic placement of electrodes (such as deep brain stimulation or spinal cord stimulation) to radio-surgery for pain-syndromes. The group closely cooperates with the Departments of Neurology, Nuclear medicine and Neuroradiology. Together they operate the Comprehensive Epilepsy Center in order to optimize perioperative patient care. The integration of highly specialized centers, namely the Gamma Knife Center and the Magnetoencephalography Center, as well as the close cooperation with other disciplines presents a very strong feature of this subspecialty at the DNS.

Vascular neurosurgery

The DNS provides both open surgery and endovascular treatment for all kinds of neurovascular disorders. Therefore the personnel is organized in two independent teams.

Besides open surgery and endovascular procedures, about 150 AVM cases per year are treated by Gamma knife surgery in the

DNS's Gamma Knife Center.

Open surgery

Two faculty members who supervise a varying number of fellows and residents constitute this team. All kind of cerebrovascular operations are performed. Bypass-surgery for Moyamoya disease and surgical treatment strategies for ischemic disorders are a special feature of open vascular neurosurgeons at the DNS. Recent technologies, such as image-guidance or ICG-angiography are frequently applied. Outpatient clinic is held twice weekly. Except for emergencies the team has OR capacity on Tuesdays and Thursdays.

Routine neurovascular conferences are held weekly on Wednesdays at 4:00 PM. Neuroradiologists, neurosurgeons and neurologists constitute the board members.

Endovascular interventions

Endovascular interventions are dealt with by an interventional team consisting of employees of the DNS and the Department of Neuroradiology, under the guidance of Professor Moon Hee Han, who holds a professorship in both departments. Outpatient clinic is held twice weekly. Except emergency cases, procedures requiring anesthesia (like coiling, embolization or stenting) are scheduled on Mondays and Fridays.

The cooperation between neurosurgeons and neuroradiologists is very close. Physicians from both disciplines share the same angiography-suits and frequently join for interventions or discuss cases. All in-patients scheduled for endovascular treatment or diagnostics are however admitted on neurosurgical wards, as the Department of Neuroradiology does not have any beds of its own. Wardrounds and general patient care prior to and after endovascular interventions are therefore exclusively provided by the DNS.

Once monthly endovascular team members attend a meeting of neuro-interventionalists from all mayor Seoul hospitals where difficult or interesting cases of the last month are reported and openly discussed.

Neuro-oncology

With six faculty members (and presently 1 fellow) the neuro-oncology team is the largest subspecialty at the DNS. Recent technologies (image-guidance, 5-ALA fluorescence guidance, CUSA, etc.) are applied during all kind of tumor related procedures.

The close cooperation with the Gamma Knife Center allows for combined treatments of open- and radio-surgery and enables the DNS to offer both treatment modalities out of a single hand.

A multidisciplinary tumor-board (NeuroOncology Board) meets weekly, each Monday at 5:00 PM. Neurosurgeons/neuro-radio-oncologists, diagnostic radiologists and pathologists attend this meeting.

The team operates every working day in average in two of the DNS's three ORs. Outpatient clinic is held regularly.

Pediatric neurosurgery

The pediatric section consists of three faculty members and presently one fellow. It provides neurosurgical care for all neurosurgical disorders in childhood. Operations are scheduled every working day (the team uses 1.5 Ors in of the children hospital). Outpatient clinic is held frequently.

Endovascular interventions are performed in close cooperation with the endovascular team of the DNS.

Centers

As already mentioned above, in addition to these teams covering mayor neurosurgical subspecialties, five centers are integrated within the DNS, providing more complex technologies. These centers are : Gamma Knife Center, Magnetoencephalography Center, Minimally Invasive Brain Surgery Center, Parkinson Center and the Comprehensive Epilepsy Center for intensive care for the patients²⁾.

Education

The education at DNS is organized strictly following the academic year. Each March the department recruits five new residents. During the following years (1 year internship, 4 years residency) they will rotate through the DNS. After completion of their term, they qualify for neurosurgical board examinations. All residents I interviewed while working at the DNS were very satisfied with the overall quality of their education. All of them were willing to continue their education after board examinations in a fellowship program at DNS or elsewhere.

New fellows, like interns and residents, start their terms in one of the DNS's subspecialties each year at the beginning of March. Both residents and fellows are formally attached to the attending faculty members of their corresponding teams, while these faculty members are responsible for their practical and theoretical education.

The DNS starts each day with a morning conference at 7:30 AM. Following presentation of emergency cases and the OR schedule, residents frequently have to prepare and report interesting cases. This makes these conferences more educative for themselves and their peers. Additionally each Saturday special lectures for residents and fellows are offered by the DNS's faculty.

Research

The staff of the DNS shows an exceptional interest in clinical research, which is most impressively documented by the high volume of publications^{9,10)} (more than 70 annually). The application of PAs for documentation and data collection greatly contributes to the successful generation of clinical data. In Korea composing of a scientific publication is obligatory for qualification for board examinations. Residents and fellows frequently present their manuscripts in the morning conference, discussing the current state of their projects.

The DNS's brain tumor tissue bank was established in 1995. It currently includes more than 6000 specimen. The pediatrics

section's brain bank, collecting brain tumor and brain specimen from epilepsy surgery, started the same year. Both offer a good basis for basic research.

Within the DNS five research laboratories are dedicated to basic research, and offer physicians (residents, fellows and faculty) the background to develop their projects and investigate their ideas.

DISCUSSION

Wards

Nurses education, training and overall competency within the DNS seems appropriate and meets international standards.

The assignment of many organizational and administrative tasks to a team of PAs seems a very effective system.

Other groups of non-medical professionals are not regularly involved in direct patient care at DNS.

German nurses are generally educated for three years, while they need an additional two years specific training if they want to qualify for the ICU or OR.

The work of our admission-manager is comparable to that of the DNS's PAs. Besides we recently employed a clinical hospital pharmacist, optimizing our medical therapy (taking medication history, checking medication in terms of correct dosage, possible interactions, etc.). This has not only improved the overall quality of the medical treatment, but also helped to reduce the residents and nurses workload¹¹.

ICU

While the high volume of procedures the DNS performs annually^{9,10} impressively documents its general capacity and size, ICU capacity seems to be a bottle neck, restricting further growth. The admission of patients in very critical conditions (like poly-traumas, etc.), or complications that require long term respiration therapy, easily results in cancellation of elective procedures and/or the transfer of other emergency cases to other hospitals.

Besides, the fact that the DNS's ICU is exclusively managed by anesthesiologists has some disadvantages. Anesthesiologists are less experienced in managing specifically neurosurgical conditions, like vasospasm or elevated intracranial pressure.

The NMU has its own ICU. However this is not a nationwide standard, but varies greatly among German hospitals. Nevertheless all neurosurgical residents in Germany have to rotate on an ICU for at least 6 months. This helps anesthesiologists to better manage specifically neurosurgical disorders, while neurosurgeons can learn anesthesiological techniques and prepare themselves for emergencies.

To buffer intermittent shortages in ICU capacity the NMU has set up its own intermediate care unit, which can take of patients who require more intensive care for longer periods.

Time management in the OR

The DNS does not have separate rooms for induction and

termination of anesthesia, so both has to be performed in the OR itself. This prolongs the changing times between surgical procedures, which is frequently more than 1.5 hours. Consequently it either restricts the number of procedures performed per day, or results in significant exceeding of the official maximum working hours.

At NMU we likewise lack resources for overlapping induction of anesthesia. In some German centers where it is performed routinely however, it contributes to save significant OR time.

At NMU we are continuously struggling to improve our starting- and changing times, for example by strict documentation and analysis of the times required for each step (transport of the patient to the OR, induction of anesthesia, arrival of residents/neurosurgeons, positioning, etc.).

OR technology

The DNS owns and applies up to date technology for all kind of major neurosurgical procedures, including many minimal invasive techniques. The standard application of electrophysiological monitoring (mostly SSEP and MEP) for all craniotomy patients is an outstanding feature. Frequent application helps to develop a routine and increase the overall quality of the monitoring. Image-guidance, 5-ALA fluorescence guidance and intraoperative ICG angiography are routinely used in some areas, namely neuro-oncology and open vascular neurosurgery.

At NMU we yet apply electrophysiological monitoring only in selected cases (such as surgery close to eloquent brain-areas). Concerning image-guidance and intraoperative imaging, I believe, that its role will further increase within the near future. At NMU we presently use several systems (2 Brainlab Kolibri[®], a Siemens ARCADIS Orbic[®] 3D C-arm and a Mazor robotics Renaissance[®] robot) for an increasing number of indications. Meanwhile this includes pedicle screws placement⁵, stereotactic puncture and lysis of ICH¹³ and even EVD or shunt-catheter placement in selected cases⁶. While this is not yet international standard, a growing number of articles document the benefits, especially in combination with minimal invasive approaches⁷.

Outpatient clinic

DNS's faculty members see an extremely high number of patients in their outpatient clinic. This is an astonishing performance.

At NMU we generally see less than half that number of patients per day. As German law strictly demands careful information concerning alternative treatments and possible risks at this early stage of the treatment, we consider 30 min per patient as necessary.

Planning of procedures and management style

Within the DNS team-leaders are comparatively independent in their clinical decisions and, as the SNUH is a public hospital, no economic pressure interferes with their medical judgment. The position of the chairman is that of a primus inter pares (the

first among equals). This assignment of responsibilities to team-leaders also applies to administrative issues, like the scheduling of procedures. The administration is thus firmly divided between subspecialties (time slots for surgery are individually assigned and managed by each team etc.). This keeps the effort at a manageable level and allows reliable long term planning (ORs are scheduled days or even weeks in advance).

In contrast to the decentralized management style applied at the DNS, and most anglo-american countries; German institutions, including NMU, are more hierarchically structured. Administrative duties and clinical responsibilities are concentrated in the hand of the director and/or his assistant. He will schedule all operations and assign faculty members, fellows and residents to their respective duties. Thus a single contact person keeps the overview of the whole department and decides on important issues.

Teams/subspecialties

The division of the DNS into distinct teams for each subspecialty (like vascular, oncology, etc.) allows a high level of specialization, while still offering the complete spectrum of neurosurgery. The incorporation of centers (like the Gamma Knife Center, etc.) offering advanced and complex technologies into the DNS is doubtless a strong feature of the department. The DNS can thus offer multimodal treatment strategies, as for example required in large AVM's or some brain-tumors, out of a single hand. Thus patients do not have to change their contact physician during long and complex treatments, which reduces the risk of loss of time and/or information.

For endovascular interventions the excellent and close cooperation between DNS and the Department of Neuroradiology achieves the same goal.

The strict division of subspecialties also contrasts the situation at NMU. In Mainz, like in most German centers faculty members are generally expected to cope with all kind of neurosurgical disorders. This is of special importance during on-call duties, as at NMU only two faculty members are obliged to be reachable at any time. Our pediatric neurosurgery section presents the only exception from this rule. It is largely independent and its background on-call service is provided by its own faculty.

At NMU most centers providing specialized equipment and techniques are not integrated into the Department of Neurosurgery. Endovascular treatment is performed by the Department of Neuroradiology and stereotactic radiation therapy is lies in the hands of our radio-oncologists.

Quality management

The DNS applies several modern methods to ensure its high quality standards. Mortality and Morbidity conference with open discussions on complicated cases is scheduled each month. Some teams (endovascular) even routinely meet with specialist from other hospitals to discuss important issues, including complications.

Name tags are issued to the patients scheduled for surgery and team-time-out is recommended prior to skin incision in all surgical procedures. It is however important, to regularly remind the employees of these recommendations. This does also apply for measures ensuring personnel's personal safety, such as using protective gloves when dealing with potentially contaminated materials, or to avoid recapping of sharp instruments after use⁴⁾.

The DNS performs standardized monitoring of postoperative results by clinical examination and imaging studies. Craniotomy patients in the DNS routinely undergo CT imaging, while spinal implants are checked by plain X-ray.

Like the DNS, NMU has introduced name tags and team-time-out in the OR (which might also not be performed very strictly I fear, especially while I myself am abroad). Complications are regularly discussed among faculty and, if considered helpful, neuroradiologists or other specialists. The introduction of critical incident monitoring, which is yet more frequently applied by anesthesiologist¹¹⁾, constituted a further step⁶⁾. Regular meetings with specialists from other hospitals are not yet standard at NMU.

In Mainz, like at DNS, every craniotomy patient is scheduled for control-CT 4 hours after surgery. At NMU we also perform CT-scans of all spinal implants, as we consider it superior to plain 2D X-ray in ruling out any misplaced implants.

Education

The education at DNS, like the general organization and management style, follows the anglo-american system, which has been adopted by most countries worldwide. In interviews DNS's residents reported several advantages of this system. The strict adherence to academic years and firm attachment to individual teams and their attending faculty, clearly defines the reciprocal responsibilities of residents and faculty. Faculty members furthermore receive a good feedback of their trainees' individual abilities and deficits. In Korea the residents are not performing surgeries themselves. Primarily they take care of the patients outside the OR and develop their surgical skills while assisting fellows and faculty as first or second assistant. Morning conferences and special educative days are useful to help residents to cover the theoretical background of our science.

After finishing their residency, the candidates take board examinations and graduate as neurosurgeons. Korean neurosurgical board examinations reach high levels in international rankings³⁾.

In interviews DNS residents reported, that after taking board examination, in average about 80% of Korean neurosurgeons will continue their formal education by joining a fellowship program. However, among those working at the DNS everyone seems willing to augment his experience by one or several fellowships.

Fellows, like residents, do not frequently perform surgical procedures independently. They do however regularly work as first assistant, performing approaches and closing wounds, etc.

for their attending faculty members.

In Germany academic years are of no importance after graduating from medical school. Residents and fellows can start in new positions at any time of the year. This makes the system on one hand more flexible. Residents can choose to work halftime or even pause their education for a certain period, which especially benefits young parents. While on the other hand controlling each resident's individual progress is more difficult. Before qualifying for board examinations German residents have however, to complete a strictly defined number of procedures by themselves (100 spinal operations, 50 craniotomies for intra-cerebral lesions, 50 craniotomies for traumatic head injuries, etc.)¹²⁾. To achieve this, they largely depend on their superiors, who will have to take the role of assistant during these procedures, while still bearing the full responsibility. Thus depending on the conditions and their personal initiative it can take residents much longer than the minimally required 6 years to finally graduate as neurosurgeons. At NMU it is our policy to encourage young colleagues to take their board examinations as soon as possible.

During morning meetings at NMU the residents routinely present in detail the operative technique of procedures in which they will assist, or which they will be allowed to perform with assistance of a faculty member. This makes morning conferences even more educative and interesting for them. Regular educational sessions are held on Tuesdays prior to the morning conferences and intermittently on other dates.

Following board examination, German neurosurgeons are expected to cope with most neurosurgical emergencies, as well as to manage standard cerebral and spinal disorders by themselves. This comprises basically those procedures which are obligatory for qualification for board examination. Young graduated neurosurgeons will get assistance from their superiors only on demand or in more complex cases. However, such more complex procedures require additional experience, which young German neurosurgeons gather during the following years, while working at different institutions. A formalized fellowship-system, where young neurosurgeons apply for certain subspecialties, is not common.

Research

Using the PAs for collection of clinical data is an excellent way of getting high quality clinical data. Consequently the clinical research at DNS is very good. The high number of tumor specimen collected within the last two decades, proves the DNS's employees high motivation and dedication to science. The Department itself provides several facilities for basic research.

Furthermore the frequent presentation of manuscripts by residents and fellows documents the efficient recruitment and motivation of these young doctors for scientific issues. Besides, during several national scientific meetings I could attend while in being in Korea, an astonishing number of the DNS's alumni presented recent data. This shows that the DNS's successfully inspired its graduates to continue research after leaving the department.

At NMU we have no PAs who help on data collection and physicians unfortunately often lack the time to do it themselves. Tumor specimen (fresh, fixed or in culture) are however, like at DNS, collected during each resection. The NMU has its own neuro-oncology lab and a laboratory for microscopic and minimal invasive techniques, including animal research facilities. Presently we are working on establishing a laboratory for image-guided and computer assisted neurosurgery as well.

In order to graduate for German board examinations, applicants do not need any scientific publication. However, German physicians are required to compose a scientific thesis in order to get the degree of a medical doctor (Dr. med.). Before completion of this thesis they are "physicians" but not "doctors".

CONCLUSION

The DNS is a large neurosurgical unit providing international standard of care for all kinds of neurosurgical disorders. The staff is sufficient in numbers and well educated, the dedication to clinical research is exceptional. While each neurosurgical institution should always strive to further improve its service to patients and extend the boundaries of our science; the present structure, equipment and employee's motivation of the DNS seem capable to meet these challenges and the requirements of providing neurosurgical care to a modern society such as that of Korea.

I honestly congratulate Professor Chung and his team for their achievements and wish the Department of Neurosurgery at the SNUH that it might in future keep its well recognized and well deserved prominent position nationwide and internationally.

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