

Review Article

Standards for Endovascular Neurosurgical Training and Certification of the Society of Korean Endovascular Neurosurgeons 2013

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Certification Committee of Society of Korean Endovascular Neurosurgeons⁹

The need for standard endovascular neurosurgical (ENS) training programs and certification in Korea cannot be overlooked due to the increasing number of ENS specialists and the expanding ENS field. The Society of Korean Endovascular Neurosurgeons (SKEN) Certification Committee has prepared training programs and certification since 2010, and the first certificates were issued in 2013. A task force team (TFT) was organized in August 2010 to develop training programs and certification. TFT members researched programs and systems in other countries to develop a program that best suited Korea. After 2 years, a rough draft of the ENS training and certification regulations were prepared, and the standard training program title was decided. The SKEN Certification Committee made an official announcement about the certification program in March 2013. The final certification regulations comprised three major parts: certified endovascular neurosurgeons (EN), certified ENS institutions, and certified ENS training institutions. Applications have been evaluated and the results were announced in June 2013 as follows: 126 members received EN certification and 55 hospitals became ENS-certified institutions. The SKEN has established standard ENS training programs together with a certification system, and it is expected that they will advance the field of ENS to enhance public health and safety in Korea.

Key Words : Endovascular Neurosurgery · Certification Committee · Society of Korean Endovascular Neurosurgeons.

INTRODUCTION

Endovascular neurosurgery (ENS), intravascular neurosurgery and interventional neuroradiology have become major treatment modalities for cerebrovascular diseases along with neurosurgical operations. Despite gradual advances in noninvasive neurodiagnostic technology, diagnostic cerebral catheter angiography is still recognized as the gold standard for evaluating cerebrovascular diseases⁴. However, all ENS procedures car-

ry a risk for stroke, indicating that appropriate and acceptable knowledge, procedural training, and case experience are necessary to perform ENS procedures safely. While several other countries have suggested ENS training standards^{1,3,4,7,9,10,14,15,17,19} or have begun ENS certification, no ENS training programs or certification systems have been established in Korea. There are two ENS-associated societies in Korea; The Society of Korean Endovascular Neurosurgeons (SKEN) and the Korean Society of Interventional Neuroradiology. The need for standard ENS

• Received : November 19, 2013 • Revised : December 27, 2013 • Accepted : February 13, 2014

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training programs and certification in Korea cannot be overlooked due to the increasing number of ENS specialists and expanding ENS fields. The SKEN Certification Committee has prepared training programs and certification since 2010, and the first certificates were issued in 2013. The purpose of this study was to introduce training standards and define the minimum training and case experience required for certification.

PREPARATION OF THE TASK FORCE TEAM AND CERTIFICATION COMMITTEE

A task force team (TFT) was organized in August 2010 to develop training programs and certification. TFT members conducted research on programs and systems in other countries^{1-6,8-21)} and conceptualized the programs that would best suit Korea. After 1 year of effort, a rough draft of the ENS training and certification regulations was prepared, and the standard training program title was decided. The certification comprises personal certification, hospital certification, and training-facility certification. The first briefing meeting was arranged for the executive directors of the SKEN in August 2012. The TFT emphasized the need for standard training programs and certification, and it was decided to introduce the training programs and certification. The TFT felt the need for more information on the current ENS situation in Korea before prescribing detailed rules; thus, they conducted a questionnaire survey of all SKEN members. This enabled the TFT to gather informative data such as hospital capacities, case experience, ENS constitution, and disease distributions. Then, detailed rules were discussed based on the survey results and regulations in other countries^{1,3,4,6,9,14,15)}. Much effort was put into designing a program that best suited Korean society, and it took 20 months to complete the final draft. This draft was approved by the executive committee at the second briefing meeting and they resolved to form a Certification Committee. After the meeting, the TFT published a report entitled "Research Results of Korean Neuroendovascular Surgery Standard Training and Certification Program". The first meeting of the Certification Committee was held in November 2012, and detailed plans to introduce ENS certification were discussed. The certification regulations were amended several times in the course of subsequent meetings. The Certification Committee officially announced the certification program in March 2013, and applications for certification were accepted for 8 weeks. The applications were then evaluated for 3 weeks, and the results were announced in June 2013 as follows : 126 ENS members received personal certificates and 55 hospitals received hospital certificates.

THE MAIN ISSUES IN SKEN CERTIFICATION

Some patient-safety issues were discussed among the committee members at the time of developing the certification system : "How can we prove whether SKEN members are capable

of performing endovascular treatment?", "What would be sufficient endovascular procedural experience for trainees?", "Are most endovascular procedures performed under an operative neurosurgical back-up system?"

As the ENS field in Korea has been expanding, the number of ENS specialists has also been increasing. Unfortunately, secure ENS procedures and units could not be guaranteed, as the SKEN did not have standard training protocols or minimal requirements for ENS units. Hence, the Certification Committee included minimum requirements for safe ENS in the regulations and essential structural elements for ENS units. Additionally, the following aspects were considered important : number of ENS cases (associated with operator skill), types of ENS, and presence of an open neurosurgery backup.

Controversy arose among the Certification Committee when the adequate number of ENS cases for certified trainees was to be decided, as standard foreign training programs and certifications did not fit the Korean situation^{1,10,15,18)}. Moreover, the committee did not have a clear picture of the Korean ENS training situation, since ENS training was conducted at each hospital with no common training protocol or certification process. The Certification Committee had several meetings to analyze the foreign systems and conduct a survey. The appropriate number of ENS cases for trainees was established based on these analyses and research.

ENS offers immediate advantages over microscopic neurosurgery, as it is less invasive and provides more rapid recovery for patients. Because the number of neurosurgeons who choose to subspecialize in ENS is increasing, the number of hospitals in which only ENS is available, with no open neurosurgery backup, is also increasing. This allows hospitals to have simpler surgical setups, thereby reducing costs. However, this also means that the number of hospitals at which neurosurgical operations are not available when needed is increasing. Therefore, the committee decided that for patient safety, which is the top priority, certified ENS hospitals should be equipped with a neurointensive care unit and microscopic neurosurgical setup.

The Certification Committee agreed that more stringent rules should be applied to certification of training hospitals because they are operated based on an authorized and reliable ENS training program. Therefore, the committee decided that certified training hospitals should be fully equipped with more facilities, cases, types of diseases, and medical staff than required for certified ENS hospitals. Moreover, evaluation standards for ENS training directors were developed with reference to foreign standards. These criteria were designed to be as practical and clear as those in other countries and to be suitable for Korean society.

STANDARDS OF SKEN ENDOVASCULAR NEUROSURGICAL TRAINING AND CERTIFICATION

Supplement includes document contents (online).

I. Endovascular neurosurgeon

1. Regulations to certify an endovascular neurosurgeon

A. Objective

This regulation includes the requirements for the endovascular neurosurgery qualification process.

B. Definitions

A “certified endovascular neurosurgeon (EN)” is a regular member of the SKEN who has varied experience in the field of endovascular neurosurgery and is qualified and certified by the SKEN to have the ability to conduct special quality medical treatment in the fast-progressing field of endovascular neurosurgery.

C. Qualification process

Training program

- 1) Physicians who want to become EN certified must take the training program at a training hospital designated by the SKEN.
- 2) At least 1 year of training after acquiring qualification for board certification is required to apply for the qualification test.
- 3) The training year is from March 1 to the end of February the following year. If training was started after completing military or alternative service, the training year is from May 1 to the end of February the following year.

D. Qualification process

Applicants for the certified EN qualification must complete the following documents for the Certification Committee. The Certification Committee evaluates the qualifications of the certified EN by judging the application.

- 1) Certified EN application in accordance with the format of accompanying document 1.
- 2) Certified EN training certificate in accordance with the format of accompanying document 3.
- 3) Copy of the board certification license.
- 4) Continuing medical education (CME) record in accordance with the format of accompanying document 5.
- 5) Individual endovascular reports and operative records in accordance with the format of accompanying document 8.
- 6) Individual cerebral angiography reports and records in accordance with the format of accompanying document 9.
- 7) Director’s confirmation of assistance with operations in accordance with the format of accompanying document 4.
- 8) Copies of published articles.

E. Qualification requirements

Participated as a regular member of the SKEN for at least 1 year and fulfills the following requirements :

- 1) At least 150 cases of diagnostic cerebral angiography and at least 80 cases as a first assistant in endovascular neurosur-

gery procedures at a certified training institution.

- 2) At least 40 of the 80 case reports must include the following operations :
 - a. Endovascular treatment of cerebral aneurysms.
 - b. Extracranial and intracranial angioplasty and stenting.
 - c. Intra-arterial thrombolysis.
- 3) At least 10 CME points from training lectures or conferences recognized by the SKEN.
- 4) At least one study authored in the *Journal of Cerebrovascular and Endovascular Neurosurgery* during training.

F. Validity of the qualification

The certified EN’s license is valid for 5 years from the certification date.

2. Recertification

G. Qualification

- 1) At least 5 years have elapsed since the original EN certification and the applicant has acquired 25 CME points from the training and studies designated by the society in the previous 5 years.
- 2) The relevant period is excluded for those who stayed abroad for the purpose of academic research and clinical training. Such persons should submit references in accordance with document 7 to the president of the SKEN.

H. Means of recertification

Recertification is conducted by examining the candidate’s career documents and reporting the results to the president of the SKEN after individual screening by the Certification Committee. The SKEN president renews the certification after inspection by the SKEN executive directorate.

I. Submission

A physician who wishes to be recertified needs to submit an application including the following documents to the committee before the end of the qualification expiration year.

- 1) Copy of the certified EN’s license.
- 2) CME record in accordance with document 5.
- 3) CME report in accordance with document 6.

J. Training education courses

Applicants must have completed the training education courses and complied with the CME and the regulations of the Endovascular Neurosurgery Qualification Process and Training Education.

3. Academic activity and training education

A. Subject

The subject of academic activity and training education is a physician who has acquired the certified EN license or is willing to renew certification.

B. Training education session

The training education session is from March 1 to the end of February the following year.

C. Training education institution

Academic activity and the training education institution should be relevant to :

- 1) The SKEN.
- 2) Other authorized society or affiliated local society.
- 3) Foreign society in the field of endovascular neurosurgery.
- 4) Foreign training education in the field of endovascular neurosurgery.

D. CME points

- 1) Points are received by participating in training education, domestic and foreign conferences, and practice and presentation at conferences. The points for each are provided below.
 - a. The annual SKEN conference is 3 points.
 - b. Conference of another authorized society is 3 points.
 - c. Conference of a foreign endovascular neurosurgery-related society is 2 points.
 - d. Conference of an affiliated local society or affiliated study group is 1 point.
- 2) Submit a copy of the CME record cards, documentation and evidence of participation at the conference, and submit an attendance card for participation in a study group. Presenters and researchers at the society's regular conference receive an additional 1 point. If a thesis is published in a journal, the author receives an additional 1 point.
- 3) Applicants can be exempted from acquisition of CME points by society consent if in the middle of a foreign stay longer than 6 months. The society can deliberate on other causes for CME exemption. Only authorized domestic and foreign conferences are eligible.

4. Special regulations for the first certified endovascular neurosurgeons

A. Objective

This is a temporary and restrictive regulation to certify regular members of the SKEN as certified ENs before undergoing the endovascular neurosurgery qualification process.

B. Definition

The "Special regulations of the first certified endovascular neurosurgeons (special regulations)" are the first regulations to certify ENs and are intended to certify regular members of the SKEN who fulfill the qualifications required for certified ENs as authorized by the SKEN.

C. Subjects

- 1) Physicians who have completed a training process equivalent to the certified EN training program before March

2013, and who joined the SKEN before applying for their first EN certification.

- 2) Physicians who are not subject to special regulations based on the second EN certification.

D. Qualification process

- 1) Qualification process
 - a. Certified EN application following the format of accompanying document 1.
 - b. Copy of the board certification license.
 - c. Individual endovascular reports and operative records in accordance with the format of accompanying document 8.
 - d. Individual cerebral angiography reports and surgical records in accordance with the format of accompanying document 9.
 - e. Research thesis and results that prove research experience related to endovascular neurosurgery.
 - f. Abstract of an academic presentation related to endovascular neurosurgery.
 - g. The Endovascular Neurosurgery Certification Committee may require operative records or procedural records and conduct an actual inspection of the applicant's hospital, if necessary.

E. Qualification requirements

Participated as a full member of the SKEN and fulfills the following requirements :

- 1) At least 150 cases of diagnostic cerebral angiography and at least 80 cases of first assistance in endovascular neurosurgery experience from a training institution.
- 2) At least 40 of the 80 case reports must include the following operations :
 - a. Endovascular treatment of cerebral aneurysms.
 - b. Extracranial and intracranial angioplasty and stenting.
 - c. Intra-arterial thrombolysis.
- 3) Those who make a proactive effort for qualitative improvement in the academic field.
- 4) Physician with a recognized endovascular neurosurgery career.

F. Validity of the qualification

- 1) The certified EN license is valid for 5 years from the certification date.
- 2) Certified physician qualification must be renewed every 5 years. Specific regulations regarding renewal will be provided separately.

II. Endovascular neurosurgery institution

1. Regulations for a certified endovascular neurosurgery institution

A. Definitions

A "certified endovascular neurosurgery institution (certified

institution)”) is an institution that conducts endovascular neurosurgery and meets the SKEN requirements showing that it has the ability to conduct high-quality medical treatment in the rapidly progressing field of endovascular neurosurgery.

B. Qualification requirements

The followings are the requirements for qualification as a certified institution. The Certification Committee may conduct a field investigation of the applying institution, if needed.

- 1) A certified institution should be a superior general hospital or general hospital that is approved by the Certification Committee, and have neurosurgery specialists who specialize in cerebrovascular disease and certified ENs. It must have performance abilities, facilities, and personnel that are approved by the SKEN.
- 2) Facilities and equipment
 - a. At least one angiography room and angiography equipment must be installed.
 - b. Must be capable of open cerebrovascular surgery and have an intensive care unit to treat cerebrovascular patients.
- 3) Personnel
 - a. At least one certified EN.
 - b. At least one neurosurgery specialist capable of open cerebrovascular surgery.
 - c. At least one radiological technician and nurse in all angiography rooms.
- 4) Performance

Conduct at least 40 cases of endovascular neurosurgery per year (The number of operations can be adjusted at the discretion of the Certification Committee and with approval by the SKEN executive directorate).
- 5) Education
 - a. Must conduct a specialized endovascular neurosurgery education program, periodic evaluations, and education in preparation for emergencies.
 - b. Radiological technicians and nurses are limited to those who completed their education from the SKEN or other related society.

C. Institution certification process

Applicants for certified institution qualification and recertification should complete the following documents for the Certification Committee. The Certification Committee evaluates the qualifications of the institution by judging the application.

- 1) Institutional certification (recertification) application in accordance with document 2.
- 2) Angiography room facilities and equipment certificate in accordance with document 12.
- 3) Endovascular neurosurgery staff list and other related references listed below.
- 4) Report of the number of open cerebrovascular surgery cases during the year prior to the certified institution applica-

Table 1. Requirements for institution certification

Classification	Reference
Certified EN	Affiliated hospital's original copy of employment Copy of the board certificate's license Copy of the certified EN license
Neurosurgery specialist	Affiliated hospital's original copy of employment Copy of the board certificate's license
Nurse and radiological technician	Affiliated hospital's original copy of the employment certificate and copy of the 1-year educational qualification prior to the certified institution application

tion, in accordance with document 10.

- 5) Report of the number of endovascular neurosurgery cases during the year prior to the certified institution application, in accordance with document 11.

D. Validity of the qualification

- 1) The certification is valid for 5 years from the certification date.
- 2) The institutional certification must be renewed every 5 years. Specific regulations regarding renewal will be provided separately.

2. Recertification

A. Subject of recertification

At least 5 years must have elapsed since being certified as an endovascular neurosurgery institution (certified institution).

B. Qualification requirements

- 1) Facilities and equipment

Same as regulation II-1-B-2)
- 2) Personnel

Same as regulation II-1-B-3)
- 3) Performance
 - a. Conduct at least 40 cases of endovascular neurosurgery in total per year of education.
 - b. Same as regulation II-1-B-4)

C. Institution certification process

Applicants for institution recertification should complete the following documents for the Certification Committee. The Certification Committee evaluates the qualifications of the certified institution using the documents provided.

- 1) Same as regulation I-1-C-1), 2), 3)
- 2) Report of the number of open cerebrovascular surgery operations during the 5 years after certification, in accordance with document 10.
- 3) Report of the number of endovascular neurosurgery cases during the 5 years after certification, in accordance with document 11.

III. Endovascular neurosurgery training institution

1. Regulations for certified endovascular neurosurgery training institutions

A. Objective

This regulation is intended to regulate the requirements for the certified endovascular neurosurgery training institution qualification process.

B. Definitions

A "Certified endovascular neurosurgery training institution (training institution)" is an institution that conducts endovascular neurosurgery and is certified by the SKEN to have the ability to educate certified ENs to conduct high-quality specialist medical treatment in endovascular neurosurgery.

C. Qualification requirements

The following are the requirements for qualification as a training institution. The Certification Committee may conduct a field investigation of the institution, if necessary.

- 1) The training institution should be a subspecialty training hospital approved by the Minister of Health and Welfare of Korea and have a director who is approved by the SKEN. It must have facilities and personnel approved by the society.
- 2) Facilities and equipment
 - a. At least one angiography room with angiography equipment must be installed. This equipment must provide digital subtraction angiography capable of high-resolution roadmap, biplane, and three-dimensional functions.
 - b. Must be capable of open cerebrovascular surgery with an intensive care unit suitable for treating patients with cerebrovascular disease.
 - c. Must have high-quality computed tomography and magnetic resonance imaging equipment.
 - d. Must have ultrasound in the angiography room that can be used at any time.
 - e. Must have equipment for emergency resuscitation, which must be in the angiography room.
 - f. Must have patient-monitoring devices and a room capable of general anesthesia. Additionally, general anesthesia should be provided in an angiography room.
- 3) Personnel
 - a. At least one endovascular neurosurgery training director (director). The ratio of trainers to trainees should not exceed 1:2.
 - b. Must have a neurosurgery specialist capable of open cerebrovascular surgery.
 - c. At least one radiological technician and one nurse in all angiography rooms.
- 4) Endovascular neurosurgery training director
 - a. Director formulates and maintains the education program for residents and fellows and is responsible for

their education and supervision.

- b. Director provides research conditions for the trainees and secures research facilities. Additionally, the director plans training time, guides research work, and provides technical support.
- c. Director's qualifications
 - i. The director's qualifications are checked once per year. The specific date is announced 3 months beforehand by the SKEN president.
 - ii. Must have at least 5 years of work experience in the endovascular neurosurgery field, and at least 3 years' participation as a regular member of the SKEN.
 - iii. Specialist must actively engage in the performance of endovascular neurosurgery and at least 50% of their practical work must be related to endovascular neurosurgery in the affiliated hospital.
 - iv. Experience of at least 200 cases of endovascular neurosurgery.

[Minimum standard]

- a) Thirty cerebral aneurysm embolization cases.
- b) Five cases of cerebral arteriovenous malformation embolization (including arteriovenous malformation, arteriovenous fistula, and dural arteriovenous fistula).
- c) Twenty cases of extra-intracranial angioplasty and stenting.
- d) Twenty intra-arterial thrombolysis cases.
- e) Five tumor embolization cases.
 - v. Must have delivered at least 10 oral presentations at a domestic or foreign endovascular neurosurgery conference and have published at least three papers in a SCI(E)-level journal.
 - vi. Director-to-trainee ratio should be less than 1:2.
 - vii. Director qualifications are valid for 5 years from the date of certification.
 - viii. Director must be recertified every 5 years. Recertification is decided by the Certification Committee with the approval of the SKEN executive directorate.
- 5) Performance
 - a. Must conduct at least 80 cases of endovascular neurosurgery per year.
 - b. At least 40 of the 80 cases should include the following:
 - i. Cerebral aneurysm embolization.
 - ii. Extra- and intra-cranial angioplasty and stenting.
 - iii. Intra-arterial thrombolysis.
- 6) Education
 - a. Must conduct a specialized endovascular neurosurgery education program and periodic evaluation and education in preparing for an emergency.
 - b. Radiological technicians and nurses fulfilling the personnel requirement specified in clause 4 are limited to those who completed their education in the SKEN or other related society.

D. Institution certification process

Applicants for training institution qualification and recertifi-

cation should complete the following documents for the Certification Committee. The Certification Committee evaluates the qualifications of the training institution using the documents provided.

- 1) Training institution certification (recertification) application in accordance with document 2.
- 2) Angiography room facilities and equipment possession certificate in accordance with document 12 (Table 2).
- 3) Certified EN list and other related references listed below.
- 4) Report of the number of open cerebrovascular surgery cases treated during the year prior to application for institution certification, in accordance with document 10.
- 5) Report of the number of endovascular neurosurgery cases treated during the year prior to application for institution certification, in accordance with document 11.

E. Validity of the qualification

The training institution qualification is valid for 5 years from the certification date.

2. Recertification

A. Subject of the recertification

If at least 5 years have passed since the institution was certified as an endovascular neurosurgery training institution (training institution), recertification is required.

- 1) Facilities and equipment
Same as regulation III-1-C-2)
- 2) Personnel
Same as regulation III-1-C-3)
- 3) Performance and verification
Must have conducted at least 80 cases of endovascular neurosurgery annually during the previous 5 years.
- 4) Education
Same as regulation III-1-C-6)

B. Submission

Applicants for training institution recertification must complete the following documents for the Certification Committee in accordance with document 2. The Certification Committee evaluates the training institution qualifications using the documents provided.

- 1) Same as regulation III-1-D-1), 2), 3)
- 2) Report of the number of open cerebrovascular surgery cases treated during the 5 years since the certified institution application, in accordance with document 10.
- 3) Report of the number of endovascular neurosurgery cases treated during the 5 years since the certified institution application, in accordance with document 11.

CONCLUSION

ENS has become a prevalent subspecialty field within neuro-

Table 2. Requirements for training institution certification

Classification	Reference
Director	Affiliated hospital's original copy of employment certificate Copy of the board certificate's license
Neurosurgery specialist	Affiliated hospital's original copy of employment certificate Copy of the board certificate's license
Nurse and radiological technician	Affiliated hospital's original copy of employment certificate and copy of the 1-year educational qualification prior to the certified institution application.

surgery; therefore, an authorized and reliable certification system for ENS in Korea was needed. The SKEN has established standard ENS training programs and a certification system; these are expected to advance ENS and so enhance public health and safety.

• Acknowledgements

The authors thank Hye-Jung Kim (Yonsei University student) for the English translation of "Standards for Endovascular Neurosurgical Training and Certification of the Society of Korean Endovascular Neurosurgeons 2013".

This work was supported by the Society of Korean Endovascular Neurosurgeons and Soonchunhyang University Research Fund.

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