

Fellowship in Interventional Cardiology in Switzerland

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Summary

Invasive and interventional cardiology has become a specific subspecialty of cardiology. It requires dedicated training after the training in general cardiology. In Switzerland, ten teaching centres have been selected. This article describes recommendations for specific training in invasive and interventional cardiology. The Working Group on Interventional Cardiology and Acute Coronary Syndrome, the Swiss Society of Cardiology and the FMH (Swiss Medical Association) endorse these recommendations.

Key words: training; invasive and interventional cardiology; working group Swiss Society of Cardiology

Historical summary and current status of invasive and interventional training in Switzerland

Modern invasive cardiology is dedicated to the catheter-based diagnosis of cardiovascular disease. It includes right and left cardiac catheterisation, assessment of valve function, shunt detection, selective coronary angiography, aortography and LV angiography. It was introduced in Switzerland in 1963 by A. Essinger, a radiologist working at the cantonal hospital of Lausanne.

Interventional cardiology focuses on catheter-based cardiovascular procedures. Modern interventional cardiology was born in Switzerland with the first successful coronary balloon angioplasty by Andreas Grüntzig on September 16, 1977, at the University Hospital of Zurich. The technique was upgraded with the introduction of coronary stenting by Ulrich Sigwart in collaboration with Medinvent in Lausanne in March 1986. At that time, invasive and interventional cardiology techniques were learnt "on the job".

Since then tremendous progress has been made in the development of diagnostic and interventional equipment, and of antithrombotic therapy. The short- and long-term results of percutaneous coronary intervention (PCI) have dramatically improved over time and, as a consequence, the indications for PCI have expanded. Progressively, the

exposure to diagnostic coronary angiography, and right and left cardiac catheterisation, became part of the general training of all cardiologists, with a minimum number of procedures indicated in the FMH (Swiss Medical Association) curriculum. In the current era of *ad hoc* PCI, it is the opinion of the Board of the Working Group that the distinction between invasive and interventional cardiology is obsolete from a training standpoint, and that no future Swiss cardiologist should have a formal training solely in invasive diagnostics. Although interventional cardiology is to be considered a subspecialty that requires dedicated training, at present in Switzerland there is no recommendation for training requirements. During the 2006 business session of the annual meeting of the Swiss ACS/PCI Working Group held at Bern, the plenary assembly decided to limit this training to ten centres (University Hospital Basel, University Hospital Bern, University Hospital Zurich, University Hospital Lausanne, University Hospital Geneva, Kantonsspital Aarau, Kantonsspital St.Gallen, Cardiocentro Lugano, Kantonsspital Luzern, Triemli Hospital Zurich), in order to ensure both quality of patient care and clinical excellence in interventional cardiology. More recently (2010) the board of the WG has asked the authors of the present document to draft the basis of a formal, two-year training in interventional cardiology in Switzerland.

In 2010, more than 42,000 coronary angiograms and 20,000 PCIs were performed in Switzerland by 180 invasive and/or interventional cardiologists, representing the highest density of operators in Europe. Moreover, bilateral agreements within the European Union allow free movement of specialists within Europe, and so it appears essential to create a Swiss interventional cardiology training programme that matches the rest of Europe. Therefore, the following proposal is mainly

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based on the formal, two-year training in interventional cardiology proposed by the European Association of Percutaneous Cardiovascular Interventions (EAPCI). (see: http://www.escardio.org/communities/EAPCI/Documents/Accredit_wg10_DiMario.pdf)

Completion of the training programme according to the EAPCI curriculum will improve patient care, the international credibility of Swiss interventional cardiology, and the mobility of future interventional cardiologists.

Rationale and aims of the curriculum

In accordance with EAPCI Objectives of Learning (EOL), completion of a formal, two-year training programme is required. This must include in depth knowledge of:

- cardiovascular anatomy and physiology
- vascular biology and pathology
- pathophysiology (with clinical applications: intracoronary imaging, quantitative coronary angiography...)
- pharmacology (including antithrombotic and thrombolytic therapy, contrast agents)
- radiological imaging and radioprotection
- patient selection for an invasive/interventional procedure
- indications, limitations and complications of the commonly performed diagnostic and interventional procedures
- design and performance of interventional devices
- mastery of the commonly performed interventional techniques
- mastery of in-laboratory complications
- clinical management and strategy, before and after the procedure

Structure of the programme

As a general rule, basic training in internal medicine and general cardiology must be completed before starting the interventional cardiology fellowship. Exceptions may be made for outstanding candidates or for organisational reasons (such as an unplanned opening in an interventional position).

Learning objectives for the interventional cardiology fellowship

- a) To select patients appropriately for coronary angiography, with optimal and cost-effective use of the available resources.
- b) To acquire the theoretical knowledge and practical skills needed to perform diagnostic procedures (such as coronary angiography, LV angiography, aortography, right and left cardiac catheterisation) in adults as an independent primary operator.
- c) To identify appropriately the optimal revascularisation strategy, to be able to understand, explain

and discuss the individual options of medical, percutaneous or surgical treatment with patients, patients' relatives, referring physicians, other cardiologists and cardiac surgeons.

- d) To select patients appropriately for percutaneous coronary revascularisation and identify the optimal timing for the procedure, applying evidence-based medicine and current guidelines to the individual patient's needs and characteristics.
- e) To acquire the theoretical knowledge and practical skills needed to perform PCI in adults as an independent primary operator.
- f) To be familiar with different vascular accesses (femoral, radial, brachial) for both diagnostic and interventional procedures.
- g) To plan preprocedural, intra-procedural and post-procedural patient management with particular emphasis on adjunctive pharmacological treatment, selection of vascular access, control of haemostasis and prevention of bleeding complications, and prevention of allergic reactions and renal insufficiency.
- h) To identify the optimal strategy for interventional treatment including device and technique selection, development of alternative plans in case of failure of the approach chosen initially, and handling of complications.
- i) To plan long-term clinical follow up including secondary prevention and pharmacological treatment.

Learning methods

Apprenticeship

Apprenticeship learning is the mainstay of the training process in interventional cardiology. Candidates will be required to be involved in procedure planning, assessment of indications and contraindications, establishing specifically the individual patient's risks based on clinical and angiographic characteristics.

The trainee should:

1. Handle patient admission to the ward, obtain informed consent, prescribe preprocedure drug therapy, and organise appropriate noninvasive testing.
2. Perform supervised angioplasty procedures with a progressively increasing level of involvement on the basis of increasing operator experience and case complexity. The trainees must discuss the procedure with their educational supervisors, who will ensure appropriate tutorship in the catheterisation laboratory.
3. The trainee must be involved in postprocedural management, including timely preparation of the report and monitoring of the patient status with special attention to complications at the catheter entry site, heart and renal failure, bleeding and recurrent myocardial ischaemia. The trainee should participate in the selection of pharmacological treatment before, during and after the procedure,

on the basis of established protocols and after discussion with the supervisor.

4. The trainee must participate in cardiology night and weekend on-call in order to optimise exposure to acute interventional treatment in the setting of acute myocardial infarction and other emergency cardiology conditions.
5. Every trainee must be exposed to techniques of intravascular imaging and the functional assessment of lesion severity (intravascular ultrasound, optical coherence tomography, intracoronary pressure and flow measurement).

Typically, the two-year programme is divided into four stages and should include activities in the ward and in the catheterisation laboratory. The stages are time-variable and depend on individual skills and institutional organisation. The minimum duration of each period should be three months. The programme is divided as follows:

- 1st stage: the trainees mainly prepare the patient for the intervention, perform diagnostic angiography under supervision, and assist experienced interventionalists performing angioplasty procedures.
- 2nd stage: the trainees may perform coronary angiography independently (depending of the local institutional rules), start working as primary operators for simple angioplasties under close supervision and assist in more complex angioplasty procedures (bifurcations, thrombus-containing lesions, chronic occlusions, diffuse disease, severe calcification, etc.).
- 3rd stage: the trainees perform simple angioplasty procedures as independent operators, either assisted at the table or with the supervisor still available to plan the procedure, judge the results and advise in the case of complications (depending of the local institutional rules). The trainees will start performing complex procedures assisted at the table.
- 4th stage: if the trainees have developed appropriate competencies, they will work as primary or independent operators (depending on the local institution rules) in both simple and complex coronary interventional procedures. It is left to the discretion of the institution whether they will be working as sole doctor at the table or not. At this time they may also be involved with on-call duty, according to the local institutional rules.

During stages 3 and 4, the trainee may undertake elective, advanced training in specific fields of interventional cardiology such as structural (valvular and congenital) interventions, peripheral interventions, carotid artery stenting and renal denervation procedures. We encourage the trainee to function as “Oberarzt/Chef de Clinique/Capo Clinica” during stage 4.

Formal Learning

General remarks:

- Formal learning will be organised at the local level by the accredited institution, at the national level by the working group, and at the European level by the EAPCI.
- The training programme must ensure that trainees have the required cognitive knowledge-base in all the subjects included in the syllabus.
- In the two years, trainees will be required to attend at least 30 full days (240 hours) of accredited formal sessions, locally, nationally or abroad.
- Formal learning should include attendance at study days and postgraduate courses, and national and international courses in interventional cardiology, including live courses.
- Learning through journals, textbooks and the internet should be part of the training process.
- Attendance at journal clubs and conferences on specific new techniques should be encouraged.
- All trainees should be exposed to clinical research in interventional cardiology. Participation as coinvestigator in single centre or multicentre trials, handling data collection or participation in the analysis, presentation of results and attendance at investigator meetings is expected from all trainees. A statistical background sufficient to allow independent interpretation of results is strongly recommended.
- The minimal output expected from all trainees is presentation of one complication case per year at the winter meeting, and submission of at least one abstract per year at the annual meeting, of the Swiss Society of Cardiology.
- Attendance of a structured, certified simulator course in PCI is strongly recommended.

Logbook and minimal requirements

Trainees will be required to provide documentation of attendance at accredited formal training courses. Copies should be maintained in the records of the trainee (logbooks).

During stages 1 and 2, the trainee should perform at least 500 coronary angiograms and 100 PCI, two-thirds as primary operator and one-third in the setting of acute coronary syndromes (ACS).

During stages 3 and 4, the trainee should perform at least 300 PCIs as primary operator, with at least one-third in the ACS setting. Moreover, the trainee should take part at least 50 procedures on structural heart intervention (valve, congenital), complex coronary cases requiring special techniques (chronic total occlusions, rotational atherectomy, etc.), or peripheral interventions (carotid, renal, iliac, lower limb). At these stages, the trainee may participate in cardiology night and weekend on-call.

The procedure logbook will be reviewed and signed off on a quarterly basis by the training director.

Directly observed procedural skill assessment

Directly observed procedural skill assessment is an established assessment method, which must be employed at regular intervals during the two-year program. Ideally this should be performed by an experienced, independent trainer who observes the trainee performing an interventional procedure. In practice it is expected that the assessor will come from within the training centre.

Evaluation by the programme director

Final evaluation must be signed by the programme director and involve all consultants supervising the trainee. The appraisal should take into consideration observations from other team members (surgeons, cardiologists, senior catheterisation-laboratory nurses, chief radiographer and cardiac technicians, as well as junior staff members, cardiology registrars in training).

The programme director should testify that the trainee can perform adequate revascularisation procedures as an independent operator and deliver postprocedural

care. Analytical evaluation of the complexity of the interventions performed as primary or secondary operator should be included, with particular attention to the incidence of complications, and their cause and competent handling.

The final assessment should report the trainee's ability to interact with catheterisation laboratory staff and colleagues, attention to minimising patient risk and discussing complex procedures with more expert colleagues, ability to make appropriate choices independently and to cope with emergency situations.

Knowledge of devices, drugs and materials, handling of x-ray and other catheterisation laboratory equipment, attention to achieving results with minimal contrast injections / x-ray exposure to the patient should also be considered in the final training assessment.

If the final assessment is not positive, the estimated duration and characteristics of the additional training considered necessary to achieve the ability to work as an independent operator should be clearly specified.

Examination

An examination will be held at the end of the training, under the auspices of the EAPCI.