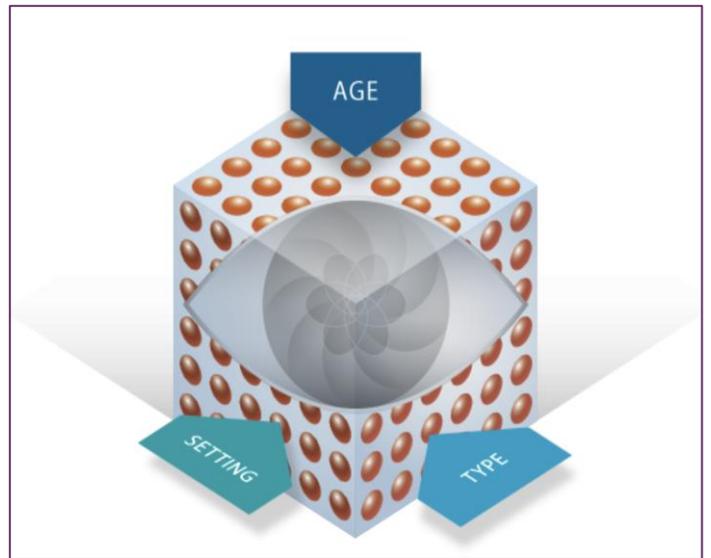


PROFILES

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An implementation guide for the Swiss medical schools

By the Swiss Group for Implementing PROFILES
and the Vice-Deans of Education

Foreword

PROFILES represents the third version of the framework of reference that defines what a resident needs to know and needs to be able to do on his/her first day of residency. Anchored in the Federal Act on the University Medical Professions (MedBG/LPMéd) it also defines the contents of the Federal Licensing Examination (FLE). As such, it represents a binding document for all Swiss undergraduate schools of medicine. From the first version in 2002 to the actual version, the framework progressively shifted to a competency-based approach of medical training, in accordance to the international changes in the field. The last version completes this shift and represents a profound change in the way undergraduate medical training has to be conceived.

To better take up this challenge, the vice-deans of the medical schools decided to create a Working Group for Implementing PROFILES. The present guide represents the first step of this collective effort. It sums up the actual understanding of how to implement the CanMEDS roles and the EPAs in an undergraduate curriculum based on the actual available literature on the topic, numerous encounters with international representatives involved in similar processes and internal discussions to propose the best possible approaches for our Swiss schools.

As its title implies, it is a guide and by no means a rule-book. It presents the ideal approaches, explains the underlying principles and exposes the best practices. It is meant to inspire and suggest ideas, as well as to support the medical schools in their way to define their own approach to PROFILES.

This implementation guide was written mainly with two readerships in mind: the members of the local school groups in charge of implementing PROFILES and the teams of professional educators supporting the implementation process. It nevertheless will be useful to any person involved in the process, teachers, students or administrative staffs. A fair understanding of PROFILES is expected from the reader before diving into this guide.

Chapter A "PROFILES implementation in a nutshell" offers a quick overview of the key messages proposed in the guide for the busy reader. The chapters B to E will detail the different implications of PROFILES for the curriculum organization, the assessment approach, the teachers' training and finally, the implementation strategy.

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These concepts have been presented and discussed in a larger group including representatives of students, universities and hospitals involved in new master programs, and SIWF, on December 11th, 2018.

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A. PROFILES implementation in a nutshell

What is PROFILES ?

PROFILES¹ is the successor of the Swiss Catalogue of Learning Objectives for Undergraduate Medical Training (SCLO) which has been in use since 2002. The Joint Commission of the Swiss Medical Schools (SMIFK/CIMS) decided to revise the SCLO in a fundamental way in order to adapt the medical curricula in Switzerland to the evolution in the fields of medicine and of medical education. PROFILES will be the reference for the Federal Licensing Exam (FLE) starting in 2021. It will therefore be the relevant framework for medical students starting their Master program from 2018 onwards.

PROFILES defines what a resident must know and be able to do on her/his first day of work. By taking a patient-centered view it promotes a movement shifting from the teaching of discipline-related objectives towards the teaching of medicine in an integrated, interdisciplinary way. PROFILES describes a medical practice committed to addressing the health needs of the population and providing patient care in interprofessional teams. Its introduction is also an opportunity to think about what kind of doctors we will have to train in the future by integrating notions related for example to demographic changes and personalized medicine.

PROFILES is composed of three main sections described below.

General objectives: CanMEDS competencies

The general objectives based on the CanMEDS framework were already introduced in the second version of the SCLO. This framework is based on the idea that each physician exercises 7 generic roles during clinical activities: Medical Expert, Communicator, Collaborator, Leader/Manager, Health Advocate, Scholar and Professional. In the

¹ PROFILES: Principal Relevant Objectives and Framework for Integrated Learning and Education in Switzerland for the training of medical students

PROFILES document, these roles are expressed as specific competencies that the students have to acquire during their undergraduate training.

Entrustable professional activities: EPAs

PROFILES defines nine generic professional tasks, called “entrustable professional activities” (EPAs), a resident has to be able to perform autonomously.

A key novelty of the concept of EPAs lies in the “entrustability”: an explicit decision to trust a trainee to perform a given professional activity with or without supervision. In other words, the trainee has been “certified” to have attained the level of proficiency necessary to carry out a specific clinical task autonomously. Within the context of PROFILES, the aim is the performance of the EPAs at least under distant, on demand supervision.

Situations as starting points for learning: SSPs

PROFILES lists 265 generic situations which cover the common circumstances, symptoms, complaints and findings that a resident should be able to manage. The SSPs thereby delimit the range of PROFILES by providing the clinical context. In this way, PROFILES promotes a patient-centered view focusing on a holistic approach to patient care.

SSPs may apply to any age group (baby, child, adolescent, young and middle-aged adults, old and very old persons), to any set of circumstances (prevention, acute, rehabilitation, chronic and palliative care) and to any type of setting (ambulatory, hospital, long-term and community).

PROFILES: 1 + 1 + 1 = 1

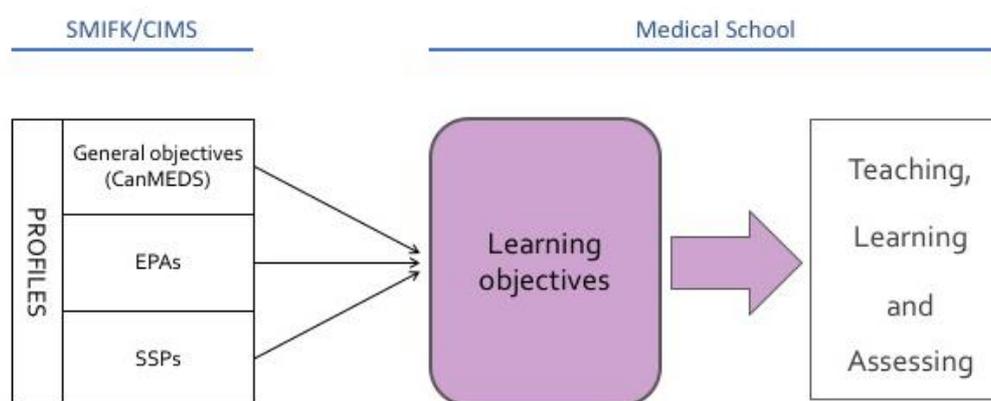
Although the three sections of PROFILES could be viewed separately, it is important to keep in mind that medical practice always integrates competencies, EPAs and SSPs.

Which aspects of a curriculum are important to integrate PROFILES ?

The ability to perform an EPA requires the mastery of a combination of several competencies within the context of a clinical situation. Although competencies may be trained independently during the curriculum, students have to be able to integrate them into the management of a complex clinical task. This type of learning is strongly promoted by a **curriculum that is organized around a set of competencies** the students should master, rather than a catalog of content that should be taught.

To allow students to learn in a way that is coherent with the way they use their knowledge, skills and attitudes in clinical practice, they have to be exposed to an **integrated curriculum**² (1) rather than a curriculum built on a discipline-based structure. This integration should already start at the level of the basic sciences taught during the preclinical years.

The **learning objectives** within the different medical schools have to be verified and if necessary adapted/redesigned to make sure that each learning activity will be aligned with PROFILES. Their description should specify how they cover or support one or several dimensions of PROFILES.



In addition to the alignment of the individual learning activities, the undergraduate medical curriculum as a whole should cover all the essential components of PROFILES. A systematic approach of **curriculum mapping**, linking curricular content and learning activities to the learning objectives, provides transparency and enables students, teachers and the medical school to know what is taught and/or should be learned by when and how. Different software tools are available; but the most important element is a clearly defined mapping process.

What is the role of assessment in a PROFILES-based curriculum ?

PROFILES provides a generic description of competency-driven learning goals. The achievement of these objectives will depend to a large extent on the assessment approaches put in place, rather than just the content and organization of the curriculum.

² An integrated curriculum is an "education that is organized in such a way that it cuts across subject matter lines, bringing together various aspects of the curriculum into meaningful association to focus upon broad areas of study."

Importantly, the choice of assessment content and methods must consider all the three components of PROFILES: CanMEDS competencies, EPAs and SSPs. Consequently, an appropriate **blend of different assessment methods** is required to capture the full spectrum of the knowledge, skills and attitudes acquired by the students. In order to make sure that all components of PROFILES are sufficiently covered, a thoroughly designed **assessment plan** encompassing the entire curriculum has to be developed and aligned with the curriculum. Keeping in mind that **assessment drives learning**, the assessment should be strategically used to promote the desired learning effects. In particular, the efficient use of formative assessment will contribute to promote a focus on meaningful learning rather than just passing the exams.

The successful implementation of a competency-based curriculum combined with multi-dimensional assessments (mainly in the context of the clinical exposure) requires that students become active players in their learning. The longitudinal integration of a personal learning tool such as an **e-portfolio**, supported by a mentoring program, is thought to be necessary for the students to be able to monitor and guide their individual learning process.

What are the implications of the concept of “entrustment” for assessment ?

The entrustment of professional activities, by definition, occurs in the clinical environment; and the assessment of the entrustment level of a trainee can only be assessed through direct observation in authentic clinical activities.

An entrustment decision cannot be made based on a single data point or observation; it rather requires a process of **repeated and longitudinal observations** that is based on two-stage approach.

(1) Clinical supervisors provide **ad hoc formative assessments of entrustment** that are limited in scope to their specific clinical context. The entrustment is expressed as the level of supervision a student requires. (2) The aggregation of these multiple *ad hoc* assessments, across various contexts and different examiners, provides the medical school (e.g. a student progress committee) with the necessary data to make a **summative entrustment decision** for a particular student. PROFILES expects students to be entrusted for all EPAs at least at the level of distant supervision.

This two-step approach allows the necessary separation of the teaching role of the clinical supervisors from the summative entrustment decision made by the medical school.

Why is faculty development key for the introduction of PROFILES ?

Faculty development is considered to be one of the rate-limiting steps for the introduction of competency-based education. The successful implementation of PROFILES therefore requires the deployment of a **well-structured, longitudinal faculty development program** taking into account all institutional stakeholders, and providing opportunities for cumulative learning, practice and feedback from peers. Given the multiple roles attributed to the teachers and clinicians, efficient training will need the faculty development programs to be specifically tailored to the different target publics.

How to monitor the quality of the curriculum ?

The implementation of PROFILES will lead to significant changes within the curricula of the different Faculties and medical schools, and also have an impact on the institutional teaching and learning culture. In order to monitor and further improve the quality of the resulting training programs it is important to implement efficient **quality assurance procedures** early in the process. While student evaluation of teaching is already frequently used, additional **outcomes from other stakeholders** must be considered, such as teachers, other health care providers and patients.

How to successfully implement PROFILES ?

The introduction of PROFILEs requires a clearly defined **governance structure**. The implementation, but also the subsequent phase of maintenance, need to be led and coordinated by a multidisciplinary group including students. It will be essential to get all stakeholders on board, and actively involve the key members of the faculty in all the phases of curriculum design and maintenance. This includes the representatives of the disciplines and members of the different teaching and assessment committees, to name but a few.

Given the significant changes introduced by PROFILES, as well as the ambitious planning, the faculty directly involved in the organization of the curriculum, the students and the teachers/clinical supervisors have to be informed and prepared. An **efficient communication process** will be key to coordinate all information on PROFILES within the individual Medical Schools.

B. Curriculum organization

This chapter discusses some conditions and curriculum characteristics that will support and facilitate the implementation of PROFILES. These recommendations are derived from the concepts of competence-based medical training and EPAs (2) as well as generic recommendations for any curricular changes (3,4) and recent pilot experience in selected medical schools in the USA (5).

Competency-based versus content-based curriculum ?

In essence, the ability to perform an EPA requires the mastery of a combination of competencies. These competencies may be trained independently during the curriculum before they are applied to a specific task. For example, students may be trained specifically to perform pleural tapping, and this competence will then be embedded into CANMEDS competencies such as clinical reasoning and communication skills when it comes to manage a patient with pleural effusion. Thus, a curriculum organized by competence, particularly during the clinical years may ease the application of the EPA approach (Figure 1).

Integrated versus discipline-based curriculum ?

One major issue of the EPA approach is to assess if the students are able to perform some tasks with a certain degree of autonomy for a series of clinical situations. However, the majority of tasks are not discipline-specific but rather require the mobilization of knowledge, skills, and attitudes from different sources. For example, being able to take the history (EPA 1) or perform the physical examination (EPA 2) of a patient with abdominal pain (SSP 52) requires basic knowledge (anatomy, physiology, etc.), clinical knowledge pertaining to different disciplines (internal medicine, surgery, gynecology, psychiatry, etc.), clinical skills, and communication skills with the patient. Training the students to learn in an integrated way is thus closer to the way they will have to use their competences in practice. This integration

should already start at the level of preclinical years (bachelor) when the basic sciences are learned (6).

Longitudinal clinical exposure

The entrustment of professional activities occurs in the clinical environment. This reinforces the need for students to be immersed in a clinical, real, authentic environment. An early and longitudinal contact with the clinical setting has several recognized benefits (7). It reinforces the cognitive dimensions: not only will the student know about a disease but will see a patient suffering from this disease, and even be partly responsible for the management of such a patient. These characteristics are useful to reinforce learning, particularly if they are accompanied by reflective practice (Kolb, Schön). The authentic setting also helps the student develop his/her professional identity (“to think, act, and feel like a physician”) (8) if he/she is implicated in patient management under guided supervision. Clinical preparation should start early in the curriculum, with a longitudinal program of clinical competences during the Bachelor years, so that the students can benefit immediately from their first immersion into the real clinical environment. In this regards, envisioning the medical cursus as a whole and not as two separated, independent entities – Bachelor-Master – is an advantage.

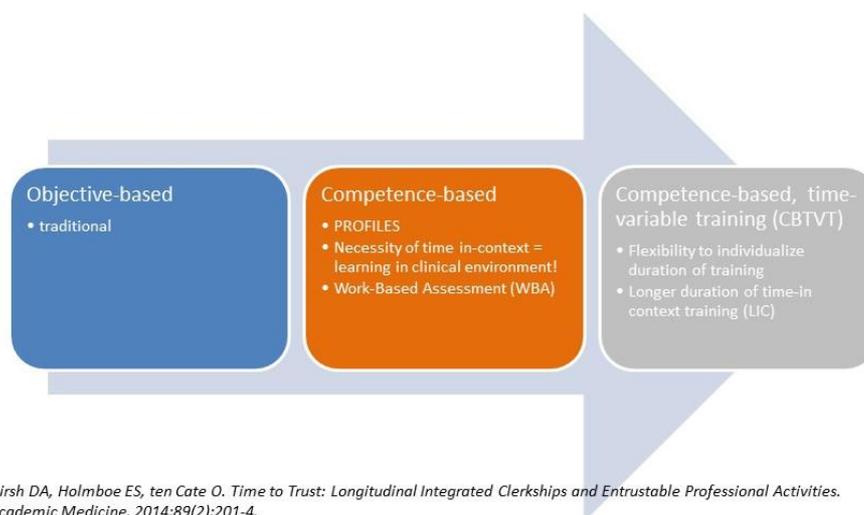
Given the nature of EPA training and assessment, a prolonged and intense immersion in real, different clinical environments is essential. A model in which the acquisition of clinical science is integrated with clinical practice will ease the application of EPAs. A strong program of simulated practice may be an adjunct for activities the students will not meet often in practice or may not be able to perform safely.

Learning in a clinical environment comes with another condition: to be supervised by trained and competent clinical teachers (9,10). To assess whether a student can be “entrusted” for one activity, repeated and longitudinal observation becomes necessary, so that the supervisor may gain the necessary knowledge about his/her learner. Some medical schools have implemented the principle of Longitudinal Integrated Clerkship (11), in which the student stays in the same discipline for 6-12 months (usually family medicine) and rotates to other disciplines to reach objectives by following his/her own patients. The same preceptors follow these students during the whole clerkship. This favors a personal follow-up of competences, without penalizing performances at exams (12). In other contexts, it may be easier to organize

some clerkships sequentially, so that the students have a sense of the track followed by some patients through different services, for example internal medicine-surgery-anesthesiology-intensive care.

Competence-Based, Time-Variable Clinical Training (CBTVCT) (13,14) is going even a step further. Students are not only trained in real context, but the duration of their training may differ, depending on how fast they acquired the necessary competences and are considered autonomous for the expected activities (they are “entrusted” for the expected professional activities). Although the introduction of this principle appears to be difficult in our actual context, we can already take in to account that some students acquire autonomy faster than others, and may be offered additional clinical responsibilities (acting as substitute resident for example) at the end of the curriculum (15).

Figure 1 represents the progression of a curriculum.



Hirsh DA, Holmboe ES, ten Cate O. Time to Trust: Longitudinal Integrated Clerkships and Entrustable Professional Activities. *Academic Medicine.* 2014;89(2):201-4.
 Teunissen PW, Kogan JR, ten Cate O, Gruppen LD, Lingard LA. Learning in Practice: A Valuation of Context in Time-Variable Medical Training. *Academic Medicine.* 2018;93:S22-6.

To ensure that the elective year of clerkship is aligned with the requirements of PROFILES, the students have to be guided in their planning and the follow-up of their learning progress. In this respect, the introduction of a learning portfolio, as previously mentioned, would provide an essential tool for the medical school and for the students.

Teaching-learning formats enhancing active learning

Active learning is recognized as more effective than traditional teaching to increase students' knowledge and competences (16). Several formats may increase student involvement in learning, such as problem-based learning, flipped classrooms or team-based learning (17,18). However, making the students active may also be possible with traditional lectures, provided that the teacher uses well described techniques to do so (19). Many faculties tend to use too much time to transmit information students can get by themselves in another way, while contact time with students would be more efficient if used to apply knowledge, discuss specific difficult points, contextualize, synthesize, compare, contrast, or illustrate specific content. Active learning seems thus to represent a necessary condition and support to fulfill many of the expected competencies of PROFILES (see General objectives for example).

C. Assessment and PROFILES

PROFILES provides a generic description of competence-driven learning objectives and builds the basis for all medical curricula in Switzerland. Whether these objectives will be achieved not only depends on the curricula but to a large extent on the assessment. This chapter introduces the key principles guiding the development of high-quality assessment systems, and presents how these concepts are specifically applied to the three components of PROFILES: CanMEDS Roles, Entrustable Professional Activities (EPAs), and Situations as Starting Points (SSPs).

To support competency-based education assessment has to fulfil three main purposes:

Purpose	Type of exams	Educational aim
1. optimize learning for an individual student	formative assessment multiple formats	assessment for learning
2. ensure trustworthy decision about an individual student	summative (high-stake) assessment multiple formats	assessment of learning
3. enable curriculum development and quality assurance	different types of assessment clustered from an institutional perspective	program evaluation

The purpose of assessment influences the design and form of the assessment (20). For example, a licensing examination designed to meet the need for accountability of medical graduates does not produce detailed feedback that would guide future learning but ensures equity, reproducibility and consistency. Whereas formative assessment that is embedded in the authentic clinical setting will hardly meet these criteria, but will produce rich feedback for learning.

Different stakeholders will have different perspectives on assessment. **Medical students** will care a lot about fairness in a summative setting, whereas formative

assessment that fosters student engagement and learning will require information rich feedback and a psychologically safe environment. For **patients** and **licensing bodies** (e.g. BAG/OFSP), however, summative assessment is the main concern since these stakeholders have a primary interest in a trustworthy assurance of patient care safety.

What are the basic tenets of assessment?

How can assessment promote learning?

Assessment culture influences what and how students will learn (21). This holds true not only for the content (competencies that are not assessed run the risk of being neglected) but also for the format and the purpose of assessment (22). Assessment that feeds back specific details about individual strength and areas to improve offers the possibility to let students work on their competency development. Feedback use is promoted by the quality/specificity of the feedback, the credibility of the source, by learner's reflection and by follow up (23). Feedback is especially powerful if it is an integral part of a mentoring system (24). Assessment cultures that facilitates such types of feedback carry the potential to promote excellence (25). These types of learning cultures aiming at excellence are well established in music and athletics education whereas this notion of excellence is far less adopted in medicine (26,27). In contrast, students feel little incentive to address their weaknesses in systems that focus to a large extent on pass/fail decisions, even if they passed just minimally (22).

⇒ *Use assessment strategically to promote desired learning effects.*

Which method is best to assess medical competence?

Miller proposed a framework of assessment with four different levels: knows, knows how, shows how and does. More recently, Cruess and al. (28) added a fifth level named "Is", where the learner constantly demonstrates the attitudes, values, and behaviors expected from a given profession.

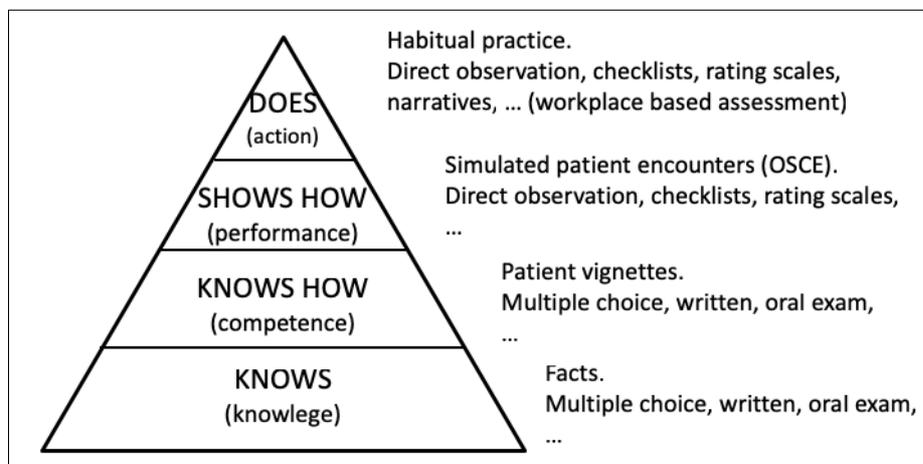


Fig. 2: Miller's pyramid (Miller 1990 (29) + Vleuten 2010 (30))

This framework ascertains that there is "no single assessment method that can provide all the data required for judgment of anything so complex as the delivery of professional services" (29). Any individual assessment method will always involve a compromise with inherent tensions about the purpose that can be reached, the content that can be covered, the trustworthiness of data, the cost etc. Based on these considerations, single assessments should not be viewed in isolation, but as part of a whole system. Just like a curriculum is based on a plan, assessment has to be based on such a plan as well. The alignment of the curriculum and assessment is essential in this respect. Ideally, the curriculum and the assessment are integrated in one single master plan. Alignment of *learning goal - teaching - assessment* is vital in this respect (31).

⇒ *Develop a master plan for assessment and vary in use of methods in order to capture the full spectrum of medical competence*

Why is a system approach of assessment important for PROFILES?

The majority of medical training programs use already different assessment methods to assess the competence of their trainees. However, these assessments are often applied in isolation. A system of assessment explicitly blends single assessments to achieve the different purposes (assessment for/of learning) for a variety of stakeholders (students, faculty, patients, regulatory bodies) (30,32). Figure 3 highlights the difference between a program that uses multiple isolated assessments and one that embraces a system of assessment approach. In a program with multiple but isolated assessments (Fig. 3 a.) there is no attempt to integrate assessment data: this results in an incomplete and fractioned picture of student performance. In contrast a system of assessment (Fig 3 b.) offers the opportunity for triangulation

based on complementary information and provides a more comprehensive picture of the student's overall performance.

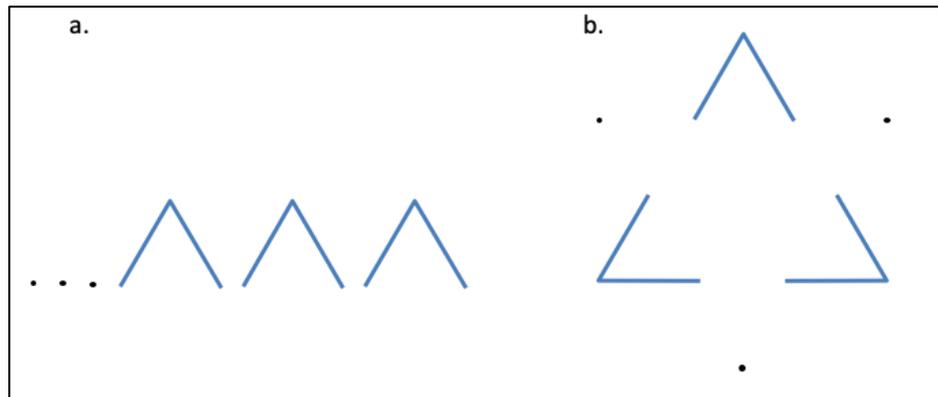


Fig. 3 Use of multiple data points of assessment: a. in isolation, b. in a system

Van der Vleuten proposed a model for assessment in action, which simultaneously optimizes assessment for learning and assessment for decision making about learner progress (33). In such a system of assessment, the individual assessment serves to provide information on the learner's performance, not primarily to make pass/fail decision. Learners reflect on their performance (feedback), and ideally are supported in that process by a mentor. High-stake decisions, like promotion to the next year, are done at the program level when many assessments (data-points) are collated and meaningfully aggregated across competencies. The concept of sampling as well as the notion of trustworthy expert judgement on the level of the individual assessment event is fundamental to deal with the subjectivity of this type of judgment (30). High-stake decisions are usually taken by a committee of experts (e.g. student progress committee). For the vast majority of learners, this decision-making will be a swift process. But for a few students this will require a more extensive deliberation by the committee. In any case, the decision taken has to be justified by the committee. The need for reproducibility, objectivity and fairness to achieve sound and defensible decision about student performance on the one hand and the need for authenticity, narrative feedback and a psychologically safe environment to optimally foster learning on the other will inevitably lead to tensions that are not straightforward to reconcile. However, rather than opting for one purpose of assessment only and neglecting the other, it seems more promising to acknowledge these tensions and incorporate both perspectives to meet the needs of medical students, faculty and teaching institutions as well as society.

How to assess the CanMEDS roles?

The CanMEDS framework offers a model of physician's competency that emphasizes the central role of biomedical expertise but also stresses additional roles of a physician (34). Not all CanMEDS roles can be assessed with the same approach and equally well. The assessment of Medical Expert competencies is well established with decades of expertise. Assessment of other roles represents still a challenge in terms of current strategies for assessment (and for teaching) and require faculty development and dedicated resources (35,36). A table derived from the CanMEDS Assessment Tools Handbook (37) shows suitable methods for each role. However, assessment of roles in isolation will be artificial when removed from clinically relevant contexts. It is therefore important to acknowledge the intricate associations between the expert role and all other intrinsic roles (34).

	Medical Expert	Communicator	Collaborator	Leader/ Manager	Professional	Health Advocate	Scholar
Portfolio	++	++	+	++	+++	+++	+++
Workplace based Assessment	++	+++	+++	+++	+++	+	+
OSCE, Standardized Patients	+++	++	+		+	+	
Written Test (Multiple Choice and Short Answer Questions)	+++	+	++	+	+	++	++
Oral Exam	++	+	+		+	+	

Table 1: appropriateness of assessment methods for the different CanMEDs roles (36)

As all individual assessment formats are limited in scope it is not sensible to assess a specific competency domain with a single instrument. Each competency domain should be informed from various assessment sources and each assessment source should be used to inform about several competency domains (38).

In the following, **strengths and pitfalls** of some common assessment formats are highlighted.

Most medical programs already have ample experience and supporting structures for creating well-designed *Written Tests* (especially Multiple Choice) and *OSCEs*, which are particularly well suited to assess the central role of Medical Expert. However, the other intrinsic roles (e.g. professional, collaborator, etc.) are less well captured with these highly standardized and focused assessment methods.

Oral Exams carry the potential to assess higher order thinking. This format is especially popular as it allows faculty to interact with students. However, insufficient sampling of content and limited number of raters do not allow to generalize the results of oral exams and to infer the student's global competence (39).

Workplace-Based Assessment (WPBA) is well suited to assess several intrinsic roles, measures higher-order behaviors in the authentic settings and offers the opportunity to give performance feedback to students. WPBA tools require sound structuring and well-educated faculty in order to obtain trustworthy assessment results. The seriousness and rigor with which the assessment is conducted defines the quality and value of the assessment. Particular attention must be paid to the dual role of faculty as coach (support student in their learning) and as judge (evaluate performance against defined standards). A number of specific methods have been developed for assessing student performance in the workplace. Table 2 provides a brief overview and description of the essential features and purposes of the most widely known and frequently used methods (40).

Tool	Feature/Deployment	Purpose
Mini-CEX (41) Mini-clinical examination exercise	A supervisor directly observes a student during the interaction with a patient when conducting a history taking, physical examination or counseling. Duration is roughly 15 minutes directly followed by short structured feedback. Students are expected to be evaluated several times with different patients and by different supervisors during a defined training period	Provide structured feedback to help students develop essential patient-physician interaction skills such as history taking, physical examination and counseling.
DOPS (42) Direct observation of procedural skills	A supervisor directly observes a student during the interaction with a patient when performing a practical procedure. The list of procedure to be mastered must be adapted to the level of training and should be defined in advance.	Ensure that trainees are given specific feedback based on direct observation so as to improve their procedural skills.

	The deployment of the DOPS is similar to the mini-CEX.	
CbD (43) Case-based discussion	A supervisor selects a patient note (written by the student) for discussion and explores aspects of the case, including: clinical assessment, investigation, treatment and follow-up. Students are expected to be evaluated several times by different supervisors during their training period.	Evaluate the clinical reasoning of students so as to understand the rationale behind decisions made in authentic clinical practice
MSF (42) Multi-Source Feedback	This method represents a systematic collection of performance data of an individual student, using structured questionnaires completed by a number of different supervisors and co-workers (peers, other health-care professionals) and sometimes also patients. Assessment forms are collated and individual feedback is prepared for students. Numerical data are provided as well as comments are included verbatim, but they remain anonymous. Depending on the training period this process is conducted once or repeated twice yearly.	Differ from the methods presented above in that they reflect routine performance over a prolonged period of time, rather than performance during a specific patient encounter. Students review the feedback derived from MSF with their supervisor and work together on developing an action plan

Table 2: workplace based assessment methods

Learning *Portfolios* are often used to collect the multitude of formal and informal assessments of a student. They are capable of capturing all CanMEDS roles and offer many additional advantages due to their longitudinal perspective. There is no established method to make a defensible pass/fail decision based on Portfolios (44). To become a powerful learning tool, a portfolio has to come with a mentoring program (45) that implies a certain investment in faculty time (46).

How to assess EPAs?

Entrustable Professional Activities (EPAs) represent a fairly new concept compared to the CanMEDS Roles. Professional Activities are very intuitive; they represent a clinical “unit of work” (2). PROFILES identifies 9 EPAs. EPAs are closely linked to the CanMEDs roles: to perform an EPA the clinician needs to make use of the 7 roles and their competencies. But as intuitive the concept of Professional Activity is, as challenging the assessment of Entrustability (the E of EPA) becomes. Two main

reasons contribute to this difficulty. The first reason is related to the notion of “entrustability”. The second reason has to do with the gap that exists between the generic description of an EPA (e.g. “taking a medical history”) and the application in the clinical reality with its immense variety of contexts and different disciplines (general internal medicine, cardiology, neuro-surgery, pedopsychiatry, ...), different type of patients (young, old, allophones, anxious, ...) etc.

What is entrustability?

The term “entrustable” is a neologism based on the concept of entrustment describing an **explicit decision to trust a trainee to perform a given Professional Activity given a certain level of supervision**. In other words, the trainee has been “certified” to have attained a level of proficiency to carry out a specific activity autonomously. Simply put he or she has the “driving license” for this specific EPA. Usually, assessment is about measured certainty (and reliability, validity etc.) but not about trust, this subjective qualification that a supervisor gives to a student because he/she seems qualified to do something in the future. This process is more akin to a risk assessment of what happens in the future than measuring what has been learned.

How do EPAs apply in different contexts?

The obvious self-explaining generic description of an EPA gets quite tricky once one considers the sheer infinity of possible situations and contexts (SSPs) in which this EPA can be carried out. For example, if we take EPA₁ ‘taking a medical history’. When should a student be entrusted for EPA₁? Is it after 2 or 10 observations? Or is it after having been observed in three different clerkships? What if the clerkship of internal medicine is not part of these three different observations? And what about taking the history with a talkative patient, or an anxious one or even an angry one? It becomes obvious that a quantitative approach with an arithmetical sum of the observations will not suffice to decide if a given student is entrustable or not. A rigorous interpretation of enough observations is needed to assess the complexity and diversity of performing an EPA taking into account some of the infinite number of possible influencing variables.

The solution: assessing EPAs in a two-step approach

To overcome the challenges raised by the nature of assessment of the EPAs it becomes important to separate the formative assessment process from the

summative high-stakes decision process. This is possible with a two-stage approach ensuring a rigorous and valid evaluation procedure (47).

	First stage	Second stage
Who	Clinical supervisor	Student progress committee
When	At one point in time	Covering a longer period of clinical training
Data source	Direct observation in a certain context and SSP	Aggregate of all documented observations in different contexts and SSPs
How	Subjective (conscious and unconscious), formal (observation tools), informal	Rigorous qualitative evaluation process
Output	Ad hoc entrustment Narrative of student's assessment	Entrustment decision
Purpose	Formative (low-stake)	Summative (middle or high-stake)

Table 3: the two-stage assessment of EPAs

First stage of EPA assessment: the formative assessment at the bedside. The entrustment level of a trainee can only be assessed through direct observation in authentic clinical activities (48). The first stage takes place at the level of the clinical supervisor and consists of a formative evaluation of entrustment based on direct observation. The entrustment can be more easily measured if based on the supervisor's **subjective appreciation** of the **level of supervision** he/she needs to establish to guarantee the patients' safety when the student performs this activity in this given context (table 4). The main objective of this direct observation is to ensure meaningful feedback to the student for promoting their learning (45) and to inform the student progress committee (see second stage) for the summative decision.

1. Not allowed to practice EPA	a. Inadequate knowledge/skill (e.g., does not know how to preserve sterile field); not allowed to observe b. Adequate knowledge, some skill; allowed to observe
2. Practice EPA only under direct supervision	a. As coactivity with supervisor b. With supervisor in room ready to step in as needed
3. Practice EPA only under distant supervision	a. With supervisor immediately available, all findings double checked b. With supervisor immediately available, key findings double checked c. With supervisor distantly available (e.g., by phone), findings reviewed
4. Practice EPA unsupervised	Student performs independently without contact to supervisor

5. Allowed to supervise others in practice of EPA	Student supervises junior students
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Table 4: level of entrustment expressed in terms of level of supervision a student **needs to be allowed to perform** a specific EPA (based on Chen (49)).

This subjective judgment of entrustment is influenced by many factors that are conscious or not. They can be grouped into five determinants (50,51) (see Figure 4). (1) The first determinant is the *Trainee* with his/her personal characteristics (attitude, personality, believability, ...) and clinical attributes (medical knowledge, professionalism, response to feedback, anticipated specialty, ...). (2) The second determinant is the *Supervisor* with his/her personal characteristics (audacity, patient safety, accountability, ...) and clinical attributes (educational obligation, clinical and supervision experience and expertise, familiarity with clinical context, ...) and pattern of observation (double-checking, language cues, litmus test). (3) The third determinant is the *relationship* between the supervisor and the trainee (shared expectations, amount of contact, interference with assessment, ...). (4) The *Task* represent the fourth determinant with its clinical characteristics (case complexity, ethical dilemma, case specificity, ...). (5) Finally, *Context* makes up for the fifth determinant (time of day, institutional and team culture, workload, philosophy of education, ...).

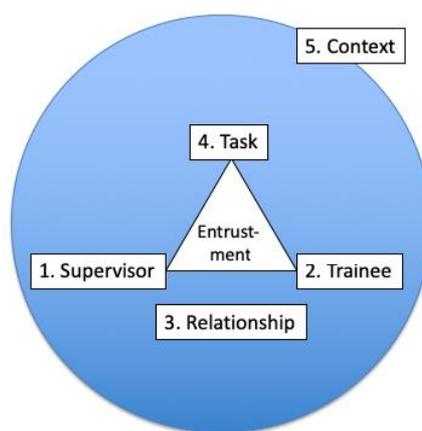


Fig. 4: the five determinants influencing the judgement of ad hoc entrustability

Second stage of EPA assessment: the deliberative middle or high-stake entrustment decision by a progress committee. The multiple facets and the variability of an EPA means that for a summative decision it must be based on an aggregated view of all available observations of the student performing the EPA

collected during the first stage (often grouped in a portfolio). This will cover various context from multiple observers over a certain period of time. To avoid the loss of information these observations are not reduced to grades but are kept as a (if possible rich) narrative description by the clinical supervisors. The subjective nature of the entrustment decision means it has to be deliberated among a group of assessors, usually a student progress committee. The resulting entrustment decision represents a prediction of how the student will be allowed to perform an EPA in the future, like a driving license. The accountability of the committee taking this decision is quite different than just assessing what was learned in the past. Hence, the decision process of such a committee has to be rigorous, transparent and defensible. It will be driven by processes that are well known in the field of qualitative research (triangulation, saturation, thread of evidence, ...).

A proper judgment of entrustability will also need a careful planning at the curriculum level (long period of observation, multiple contexts, multiple assessors) and well-trained clinical assessors and committee members that understand the decision process and the nature of the decision.

Assessment and the Situations as Starting Points (SSPs)?

The third component of PROFILES besides the CanMeds and the EPAs are the SSPs. Those situations as starting points are not assessable per se. They represent the clinical context in which the CanMEDS roles and EPAs have to be situated. Dealing with a situation requires a specific knowledge, certain professional activities (EPAs) and the embodiment of certain roles (CanMEDS). So SSP will be assessed through the assessment process of the CanMEDS and EPAs.

For example, depending on the purpose of the assessment, assessing a student on the management of severe acute blood loss (SSP 215) could encompass the following issues:

- knowledge aspects on this topic in an MCQ exam, or
- ability to perform emergency procedures (EPA 6) and to communicate with other health professionals (CanMEDS role Communicator) in an OSCE, or
- level of awareness to call for help (CanMEDS role Collaborator) in the context of direct observation in the clinical setting

Due to its nature, SSPs need to be properly tracked to inform the school and the students on how they cover the range of the 265 situations. This is done for example through a process of curriculum mapping (i.e. what the curriculum proposes) and a learning portfolio (i.e. what the students experiment) offering the possibility to code the various entries for SSPs or for the formal assessments, by having the SSPs as one dimension of the blueprint.

⇒ *Use the SSPs as context of each assessment and track their experimentation by the students.*

D. Teaching the teachers (Faculty development)

Faculty development, or “teaching the teachers”, is considered to be one of the rate-limiting steps for the introduction of competency-based education (52) . The successful implementation of PROFILES therefore requires the deployment of a well-structured and efficient Faculty development program taking into account all institutional stakeholders (53).

The core competencies a medical teacher should possess have been extensively described (54,55). However, these core competencies will not be sufficient to support the comprehensive implementation of a PROFILES-based curriculum: The Faculty must also be able to situate their teaching activity within a global vision of the curriculum, have a solid understanding of the concepts underlying PROFILES (in particular the CANMEDS framework and EPAs) and also embrace their role as evaluators in the new context built around the notion of “entrustability”.

Why is it important to put Faculty development into an institutional perspective?

Before developing the aspects relevant for the training of the teachers and clinical supervisors in more detail, it is important to take a step back and to put the question of Faculty development into an institutional perspective. In addition to the obvious goal of improving the quality of teaching, the development needs of the different stakeholders have to be analysed and addressed based on other domains such as leadership and management, academic and career development and organizational change (56) . Depending on the curricular structure there might be additional stakeholders to be taken into account, apart from students, teachers, clinical supervisors and the governance (dean/vice-dean/head of medical school etc.), such as entrustment committee members (57).

In addition, the introduction of competency-based education is often supported by the use of a learning portfolio associated with a mentoring program, in order to support the students’ learning trajectories and assess their progress. In this case there

will be a strong need to train the involved Faculty in their role as Portfolio coach/mentor/advisor helping the students to structure their learning path, think about their learning progress and identify specific objectives for the future clinical learning experiences.

It was also recently pointed out that Faculty training programs should actively promote the development of the future generation of educational leaders who will play key roles in the design and administration of the respective educational programs (58).

The introduction of PROFILES should therefore not only focus on curriculum design and Faculty development, but also on the overall learning and teaching culture. Importantly, this also stresses the importance to think about “student development”: the move towards EPAs and entrustability requires the students to take more responsibility of the learning process, to document and think about their learning progress, and to actively look for feedback and learning opportunities.

⇒ *Design the Faculty development program as a catalyst of organizational change.*

What are the training dimensions specifically relevant for an EPA-based curriculum?

Favreau and colleagues propose a model for Faculty development that has been developed based on their experiences during the Core EPAs pilot project (59). They state that “the ultimate goal of an entrustment decision is to predict learner’s future behaviours and assess their potential to competently care for patients”. This implies that the supervisors must have the necessary skills to observe the students and analyse their behaviour, and also possess sufficient self-awareness and experience to make the relevant judgements. As a consequence, their model is based on four different dimensions that should be fostered by Faculty development:

1. Observation skills in authentic settings
2. Feedback and coaching skills
3. Self-assessment and appropriate role modelling
4. Peer-support developed through a community of practice

In our context, a fifth dimension is represented by the sufficient understanding of PROFILES and its implications.

It will be important to provide training which is adapted to the specific roles of each teacher/supervisor within the teaching program, ranging for example from providing formative feedback during clinical supervision to making summative entrustment decisions. As described elsewhere in this document the evaluation of entrustability is by definition multidimensional. While it is important to provide a rich and informative environment to assess trust based on a diverse group of supervisors, it is essential to train particularly well the heterogenous group of educators involved in making summative entrustment decisions.

⇒ *Tailor the Faculty development activities to the specific needs of the different target publics.*

What do we know about the characteristics and efficiency of different approaches to Faculty development?

A recent analysis by Steinert et al (60) has shown that formal, structured activities in group settings remain the most commonly used format in Faculty development. While these formats remain an important part of any Faculty development program, it is becoming increasingly clear that the following approaches are required to prepare Faculty sufficiently for their role as teacher and evaluator:

- Develop programs that extend over time, allowing for cumulative learning, practice and feedback
- Move Faculty development directly into the workplace allowing more easily for experiential learning "on the job"; such informal learning relies less on predefined scheduling but still needs a thorough planning that includes guided reflection, peer-guidance and mentorship

Probably one of the most important elements contributing to successful Faculty development is to secure institutional support and recognition: making sure that the teaching efforts of all Faculty is appropriately valorised, and that the time necessary for a high-quality involvement in teaching is protected. The commitment of Faculty to implement change after a training course depends on several elements such as baseline motivation, but also significantly on organizational barriers such as lack of time/competing priorities, lack of buy-in and limited resources (61). These observations clearly show that in order to have the expected impact all Faculty

development programs must be accompanied by appropriate changes in organisational culture.

⇒ *Efficient Faculty development happens increasingly in the workplace and requires institutional support and recognition.*

How can we prepare the clinicians for their role as assessor of student performance?

The key aspects relevant for the assessment of a performance in an unstandardized environment, such as the clinical setting, are described in the “Assessment” section. Assessment has to be considered as a domain of expertise on its own which requires not only content knowledge but also a solid understanding of the observation and recording tasks necessary to the assessor role (62). Several different techniques have been successfully used in the field of assessor training. However, the most important aspect for effective training is a longitudinal structure allowing for multiple practical experience and refinement over time, and feedback and guidance from more experienced colleagues.

Which are the recent trends concerning the structure and content of Faculty development activities?

Several initiatives have recently been described in the literature that approach the issue of Faculty development from specific angles that seem of potential interested to us.

Co-Learning: pair Faculty and learner development to promote the development of a culture of shared entrustment (59,63) .

Use of EPAs for teachers in medical education (58,64): such a list of EPAs for teachers could not only be used to provide guidelines for the assessment of their teaching competencies, but more importantly also to construct a shared understanding of the fundamental teaching activities and to guide the structure & content of Faculty development workshops. The active use of teaching EPAs in these workshops will facilitate the understanding of the concept of EPAs as used in PROFILES.

Could we pool our resources at the national level with respect to Faculty development?

Although most of the Faculty development efforts will have to be locally organised within the different Faculties, there are a number of concepts that could and should be elaborated in a coordinated manner, such as:

- Development of teaching material (e.g. the concepts underlying PROFILES, assessment of student performance in a clinical setting, ...)
- Joint elaboration of a framework of “fundamental teaching activities” (as described in Walsh et al.) (58).

The development of a Swiss-wide collection of teaching tools that could be used for face to face teaching but also in an e-Learning context should be considered. We also suggest to analyse the possibility to establish a Swiss-wide Training-Team composed of members from several Faculties. Such a team could organise training workshops for local Faculty developers, in medical Faculties and in regional hospitals, who would then be in charge to train the teachers of their respective institutions.

E. Strategies to implement PROFILES

This chapter highlights important aspects of the implementation strategy that will facilitate the integration of PROFILES and the related changes involved.

How to inform and communicate about PROFILES?

PROFILES defines what a resident must know and be able to do on her/his first day of residency. In the year 2021, the content of the FLE will be for the first time based on PROFILES. Given such a short timeline students and faculty have to be efficiently informed on the implications that the changes will have for the FLE, and with respect to what is expected from them. The communication has to happen in parallel to the ongoing development of implementing PROFILES within the curriculum.

In addition, the major curricular changes resulting from the transition of the SCLO to PROFILES should be communicated and explained to all stakeholders involved in the curriculum, in a depth adjusted to each target group. In the following part two major perspectives (faculty and students) will be addressed.

Faculty perspective

All faculty involved in teaching or organizing teaching activities from 2018 onwards need to know what PROFILES is, how it impacts the local curriculum and what is expected from their side. This is a minimum requirement that can be accomplished for example with a newsletter, a roadshow on "Implementing PROFILES" through departments and clinics, faculty meetings etc. A regular communication on the work in progress and future changes should allow faculty members to participate and take ownership of the modifications resulting from the implementation of PROFILES.

Since students spend several months in their 5th or 6th year clinical clerkships in hospitals all over Switzerland or in foreign countries as well as in private practice, all supervisors/attendants in charge need to know about and understand the

implications of PROFILES, especially those who observe students in clinical contexts and therefore need to understand and apply the concept of entrustment.

It is necessary to coordinate all communication initiatives related to PROFILES within the Medical School. Attention should be paid to the fact that PROFILES is not only represented by EPAs: the other two chapters (CanMEDS competencies and SSPs) are equally important and need the same attention.

Given the competency-oriented nature of PROFILES, faculty members, and especially basic scientists, may fear that this approach will lessen the importance of basic sciences. They must be reassured. To reach the level of mastery described in PROFILES, students must understand basic sciences as an essential foundation of their learning process. PROFILES is explicit about this requirement which will have to be taken into account during the curriculum mapping.

Student perspective

The student perspective on PROFILES has a different focus. At the beginning of their undergraduate studies they should be informed on the main principles of PROFILES. In order to understand what, when and how they should learn, the students have to get a good idea of the overall goal (endpoint) of their curriculum. The majority of first year undergraduate students come from traditional school systems, and they are not familiar with a more longitudinal approach to learning and assessment.

Special attention should be paid to students who started their undergraduate studies with the SCLO as a reference framework and start in 2018 or 2019 their master degree program where PROFILES becomes the valid framework.

Curriculum governance and monitoring

The implementation of PROFILES implies a detailed analysis of the curriculum with respect to the CanMEDS competencies, EPAs and SSPs, followed by an appropriate revision (5). Such an evolution needs to be led and coordinated by a multidisciplinary steering group including students: during the phase of implementation but also later during the phase of maintenance. Student representation is important since they have a good overview of the curriculum (the theoretical part, but also the clinical setting) and its effective implementation.

The steering group should classically have representatives of the basic and clinical curricula, as well as graduate education and medical education specialists. Some medical schools have also included partner patients (53).

To monitor quality, a systematic approach to program evaluation should be reinforced or created and should also include a quality program for the assessment. While evaluations made by the students are classically used to monitor the program, additional outcomes from other stakeholders must be considered, such as teachers, other health care providers, and patients. The results of the FLE and evaluations made during the first residency years will provide additional data that can be used to evaluate the quality of the curriculum.

Acknowledgement of the process of change

The modifications induced by the implementation of PROFILES have to be considered as a global process of change implicating a specific management. Several models of change management may be used (65–67) to define the different important steps. Change is a cycle involving initiation, implementation, and follow-up, combined with the involvement of stakeholders and the identification of barriers. During the process the initial stakeholder's involvement may drop until a steady state is reached. These specific characteristics are inherent to any institutional change process and must be acknowledged and shared.

Compliance with, or change of regulations and rules

As with any major changes in our institutions, the corresponding internal rules have to be adapted in accordance with the ongoing developments.

Link to graduate education

Competency-based education and EPAs will also be implemented during graduate education in some disciplines. The exposure of the students to these principles during their undergraduate training will ensure that they are already familiar with the future requirements of graduate training. Additionally, clinical teachers and supervisors are often involved in both undergraduate as well as in graduate training: faculty development will therefore serve at the same time both contexts. Some tools used during undergraduate training may also be valuable during graduate education, such as a portfolio or curriculum mapping tools. Further discussions with the SIWF/ISFM

and medical specialties are necessary to make the transition as easy as possible for the future residents, and to share ideas and experiences.

F. References

1. Shoemaker BJE. Integrative education : a curriculum for the twenty-first century /. Eugene, Or. : Oregon School Study Council,; 1989. (OSSC bulletin, 0095-6694 ; v. 33, no. 2).
2. ten Cate O, Chen HC, Hoff RG, Peters H, Bok H, van der Schaaf M. Curriculum development for the workplace using Entrustable Professional Activities (EPAs): AMEE Guide No. 99. *Med Teach.* 2015 Nov 2;37(11):983–1002.
3. Mcleod P, Steinert Y. Twelve tips for curriculum renewal. *Med Teach.* 2015 Mar 4;37(3):232–8.
4. Malik AS, Malik RH. Twelve tips for developing an integrated curriculum. *Med Teach.* 2011 Feb 1;33(2):99–104.
5. Lomis K, Amiel JM, Ryan MS, Esposito K, Green M, Stagnaro-Green A, et al. Implementing an Entrustable Professional Activities Framework in Undergraduate Medical Education: Early Lessons From the AAMC Core Entrustable Professional Activities for Entering Residency Pilot. *Acad Med J Assoc Am Med Coll.* 2017 Jun;92(6):765–70.
6. Mejicano GC, Bumsted TN. Describing the Journey and Lessons Learned Implementing a Competency-Based, Time-Variable Undergraduate Medical Education Curriculum: *Acad Med.* 2018 Mar;93:542–8.
7. Yardley S, Teunissen PW, Dornan T. Experiential learning: AMEE Guide No. 63. *Med Teach.* 2012 Feb;34(2):e102–15.
8. Merton R. Some preliminaries to a sociology of medical education. In: *The Student Physician: Introductory Studies in the Sociology of Medical Education.* Harvard University Press; Cambridge, Mass: Merton RK, Reader LG, Kendall PL; 1957. p. 3–79.
9. Kilminster S, Cottrell D, Grant J, Jolly B. AMEE Guide No. 27: Effective educational and clinical supervision. *Med Teach.* 2007 Jan;29(1):2–19.
10. Stalmeijer RE, Dolmans DHJM, Wolfhagen IHAP, Scherpbier AJJA. Cognitive apprenticeship in clinical practice: can it stimulate learning in the opinion of students? *Adv Health Sci Educ.* 2009 Oct;14(4):535–46.
11. Hirsh DA, Ogur B, Thibault GE, Cox M. "Continuity" as an organizing principle for clinical education reform. *N Engl J Med.* 2007 Feb 22;356(8):858–66.
12. Myhre DL, Woloschuk W, Jackson W, McLaughlin K. Academic Performance of Longitudinal Integrated Clerkship Versus Rotation-Based Clerkship Students: A Matched-Cohort Study. *Acad Med.* 2014 Feb;89(2):292–5.

13. Hirsh DA, Holmboe ES, ten Cate O. Time to Trust: Longitudinal Integrated Clerkships and Entrustable Professional Activities. *Acad Med.* 2014 Feb;89(2):201–4.
14. Teunissen PW, Kogan JR, ten Cate O, Gruppen LD, Lingard LA. Learning in Practice: A Valuation of Context in Time-Variable Medical Training. *Acad Med.* 2018 Mar;93:S22–6.
15. Gruppen LD, ten Cate O, Lingard LA, Teunissen PW, Kogan JR. Enhanced Requirements for Assessment in a Competency-Based, Time-Variable Medical Education System: *Acad Med.* 2018 Mar;93:S17–21.
16. Freeman S, Eddy SL, McDonough M, Smith MK, Okoroafor N, Jordt H, et al. Active learning increases student performance in science, engineering, and mathematics. *Proc Natl Acad Sci.* 2014 Jun 10;111(23):8410–5.
17. McLaughlin JE, Roth MT, Glatt DM, Gharkholonarehe N, Davidson CA, Griffin LM, et al. The Flipped Classroom: A Course Redesign to Foster Learning and Engagement in a Health Professions School. *Acad Med.* 2014 Feb;89(2):236–43.
18. Persky AM, McLaughlin JE, School E. The Flipped Classroom – From Theory to Practice in Health Professional Education. *Am J Pharm Educ.* 2017;11.
19. White G. Interactive lecturing. *Clin Teach.* 2011 Dec;8(4):230–5.
20. Norcini J, Anderson MB, Bollela V, Burch V, Costa MJ, Duvivier R, et al. 2018 Consensus framework for good assessment. *Med Teach.* 2018 Nov 2;40(11):1102–9.
21. Harrison CJ, Könings KD, Dannefer EF, Schuwirth LWT, Wass V, Vleuten CPM van der. Factors influencing students' receptivity to formative feedback emerging from different assessment cultures. *Perspect Med Educ.* 2016 Oct 1;5(5):276–84.
22. Harrison CJ, Könings KD, Schuwirth L, Wass V, Vleuten C van der. Barriers to the uptake and use of feedback in the context of summative assessment. *Adv Health Sci Educ.* 2015 Mar 1;20(1):229–45.
23. Sargeant J, Bruce D, Campbell CM. Practicing physicians' needs for assessment and feedback as part of professional development. *J Contin Educ Health Prof.* 2013;33 Suppl 1:S54-62.
24. W DE, Karlijn O, M van der VCP. Get yourself a mentor. *Med Educ.* 2011 May 1;45(5):438–9.
25. Heeneman S, Schut S, Donkers J, Vleuten C van der, Muijtjens A. Embedding of the progress test in an assessment program designed according to the principles of programmatic assessment. *Med Teach.* 2017 Jan 2;39(1):44–52.
26. Christopher W, Erik D, M VCP, Lorelei L. Learning culture and feedback: an international study of medical athletes and musicians. *Med Educ.* 2014 Jul 1;48(7):713–23.
27. Christopher W, Erik D, M VCP, Meredith V, Lorelei L. Music lessons: revealing medicine's learning culture through a comparison with that of music. *Med Educ.* 2013 Aug 1;47(8):842–50.
28. Cruess RL, Cruess SR, Steinert Y. Amending Miller's Pyramid to Include Professional Identity Formation: *Acad Med.* 2016 Feb;91(2):180–5.

29. Miller GE. The assessment of clinical skills/competence/performance. *Acad Med J Assoc Am Med Coll.* 1990 Sep;65(9 Suppl):S63-67.
30. van der Vleuten CPM, Schuwirth LWT, Scheele F, Driessen EW, Hodges B. The assessment of professional competence: building blocks for theory development. *Best Pract Res Clin Obstet Gynaecol.* 2010 Dec 1;24(6):703–19.
31. Biggs J. Aligning teaching and assessing to course objectives. *Int Conf Teach Learn High Educ New Trend Innov.* 2003 Jan 1;2.
32. Vleuten C van der, Sluijsmans D, Brinke DJ. Competence Assessment as Learner Support in Education. In: *Competence-based Vocational and Professional Education [Internet].* Springer, Cham; 2017 [cited 2018 Apr 16]. p. 607–30. (Technical and Vocational Education and Training: Issues, Concerns and Prospects). Available from: https://link.springer.com/chapter/10.1007/978-3-319-41713-4_28
33. van der Vleuten CPM, Schuwirth LWT, Driessen EW, Dijkstra J, Tigelaar D, Baartman LKJ, et al. A model for programmatic assessment fit for purpose. *Med Teach.* 2012;34(3):205–14.
34. Whitehead C, Martin D, Fernandez N, Younker M, Kouz R, Frank JR, et al. Integration of CanMEDS Expectations and Outcomes. [Internet]. Members of the FMEC PG consortium; 2011 [cited 2019 Jan 13]. (Members of the FMEC PG consortium; 2011). Available from: https://afmc.ca/pdf/fmec/15_Whitehead_CanMEDS.pdf
35. Puddester D, MacDonald CJ, Clements D, Gaffney J, Wiesenfeld L. Designing faculty development to support the evaluation of resident competency in the intrinsic CanMEDS roles: practical outcomes of an assessment of program director needs. *BMC Med Educ.* 2015 Jun 5;15(1):100.
36. Chou S, Cole G, McLaughlin K, Lockyer J. CanMEDS evaluation in Canadian postgraduate training programmes: tools used and programme director satisfaction. *Med Educ.* 2008;42(9):879–86.
37. Bandiera G, Sherbino JM, Frank JR. The CanMEDS assessment tools handbook. An introductory guide to assessment methods for the CanMEDS competencies. Ottawa: The Royal College of Physicians and Surgeons of Canada; 2006.
38. Schuwirth LWT, Van der Vleuten CPM. Programmatic assessment: From assessment of learning to assessment for learning. *Med Teach.* 2011;33(6):478–85.
39. Ponnampereuma GG, Karunathilake IM, McAleer S, Davis MH. The long case and its modifications: a literature review. *Med Educ.* 2009;43(10):936–41.
40. Norcini J, Burch V. Workplace-based assessment as an educational tool: AMEE Guide No. 31. *Med Teach.* 2007 Jan;29(9–10):855–71.
41. Norcini JJ, Blank LL, Duffy FD, Fortna GS. The Mini-CEX: A Method for Assessing Clinical Skills. *Ann Intern Med.* 2003 Mar 18;138(6):476.
42. Wragg A, Wade W, Fuller G, Cowan G, Mills P. Assessing the performance of specialist registrars. *Clin Med.* 2003 Jan 3;3(2):131–4.

43. Maatsch J, Huang R, Downing S, Barker B. Predictive validity of medical specialist examinations. Final report for Grant HS 02038-04, National Center of Health Services Research. Office of Medical Education Research and Development. East Lansing, MI: Michigan State University; 1983.
44. Oudkerk Pool A, Govaerts MJB, Jaarsma DADC, Driessen EW. From aggregation to interpretation: how assessors judge complex data in a competency-based portfolio. *Adv Health Sci Educ.* 2018 May 1;23(2):275–87.
45. van der Vleuten CPM, Schuwirth LWT, Driessen EW, Govaerts MJB, Heeneman S. 12 Tips for programmatic assessment. *Med Teach.* 2014 Nov 20;1–6.
46. van Schaik S, Plant J, O’Sullivan P. Promoting self-directed learning through portfolios in undergraduate medical education: The mentors’ perspective. *Med Teach.* 2013 Feb;35(2):139–44.
47. Dannefer EF, Henson LC. The portfolio approach to competency-based assessment at the Cleveland Clinic Lerner College of Medicine. *Acad Med J Assoc Am Med Coll.* 2007 May;82(5):493–502.
48. Dornan T, Boshuizen H, King N, Scherpbier A. Experience-based learning: a model linking the processes and outcomes of medical students’ workplace learning. *Med Educ.* 2007 Jan;41(1):84–91.
49. Chen HC, van den Broek WES, ten Cate O. The Case for Use of Entrustable Professional Activities in Undergraduate Medical Education: *Acad Med.* 2015 Apr;90(4):431–6.
50. Hauer KE, Cate O ten, Boscardin C, Irby DM, Iobst W, O’Sullivan PS. Understanding trust as an essential element of trainee supervision and learning in the workplace. *Adv Health Sci Educ.* 2014 Aug 1;19(3):435–56.
51. Cate O ten, Hart D, Ankel F, Busari J, Englander R, Glasgow N, et al. Entrustment Decision Making in Clinical Training: *Acad Med.* 2015 Dec;1.
52. Holmboe ES, Ward DS, Reznick RK, Katsufakis PJ, Leslie KM, Patel VL, et al. Faculty development in assessment: the missing link in competency-based medical education. *Acad Med J Assoc Am Med Coll.* 2011 Apr;86(4):460–7.
53. Boucher A, Ste-Marie L-G, Université de Montréal, Centre de pédagogie appliquée aux sciences de la santé. Pour un cursus d’études médicales axé sur les compétences: cadre de formation. 2013.
54. Hatem CJ, Searle NS, Gunderman R, Krane NK, Perkowski L, Schutze GE, et al. The educational attributes and responsibilities of effective medical educators. *Acad Med J Assoc Am Med Coll.* 2011 Apr;86(4):474–80.
55. Srinivasan M, Li S-TT, Meyers FJ, Pratt DD, Collins JB, Braddock C, et al. “Teaching as a Competency”: competencies for medical educators. *Acad Med J Assoc Am Med Coll.* 2011 Oct;86(10):1211–20.
56. Steinert Y. Faculty Development in the Health Professions: A Focus on Research and Practice [Internet]. Springer Netherlands; 2014 [cited 2018 Jun 1]. (Innovation and Change in Professional Education). Available from: [//www.springer.com/de/book/9789400776111](http://www.springer.com/de/book/9789400776111)

57. Lupi CS, Ownby AR, Jokela JA, Cutrer WB, Thompson-Busch AK, Catalozzi M, et al. Faculty Development Revisited: A Systems-Based View of Stakeholder Development to Meet the Demands of Entrustable Professional Activity Implementation. *Acad Med*. 2018 May;1.
58. Walsh A, Koppula S, Antao V, Bethune C, Cameron S, Cavett T, et al. Preparing teachers for competency-based medical education: Fundamental teaching activities. *Med Teach*. 2018 Jan;40(1):80–5.
59. Favreau MA, Tewksbury L, Lupi C, Cutrer WB, Jokela JA, Yarris LM, et al. Constructing a Shared Mental Model for Faculty Development for the Core Entrustable Professional Activities for Entering Residency. *Acad Med J Assoc Am Med Coll*. 2017 Jun;92(6):759–64.
60. Steinert Y, Mann K, Anderson B, Barnett BM, Centeno A, Naismith L, et al. A systematic review of faculty development initiatives designed to enhance teaching effectiveness: A 10-year update: BEME Guide No. 40. *Med Teach*. 2016 Aug;38(8):769–86.
61. Kogan JR, Conforti LN, Yamazaki K, Iobst W, Holmboe ES. Commitment to Change and Challenges to Implementing Changes After Workplace-Based Assessment Rater Training. *Acad Med J Assoc Am Med Coll*. 2017 Mar;92(3):394–402.
62. Lockyer J, Carraccio C, Chan M-K, Hart D, Smee S, Touchie C, et al. Core principles of assessment in competency-based medical education. *Med Teach*. 2017 Jun;39(6):609–16.
63. Wong BM, Goldman J, Goguen JM, Base C, Rotteau L, Van Melle E, et al. Faculty-Resident “Co-learning”: A Longitudinal Exploration of an Innovative Model for Faculty Development in Quality Improvement. *Acad Med J Assoc Am Med Coll*. 2017 Aug;92(8):1151–9.
64. Dewey CM, Jonker G, Ten Cate O, Turner TL. Entrustable professional activities (EPAs) for teachers in medical education: Has the time come? *Med Teach*. 2017 Aug;39(8):894–6.
65. Berwick DM. Disseminating Innovations in Health Care. *JAMA*. 2003 Apr 16;289(15):1969.
66. Kotter JP. *Leading Change: Why Transformation Efforts Fail*. Harvard Business Review; 1995.
67. Fullan M. *The New Meaning of Educational Change*. Teachers College Press; 2015.