Peer reviewed article

Postgraduate training program

Do various learning experiences allow the trainees to achieve cognitive, affective and psychomotor objectives in a well-balanced way?

Christine Beyeler[a,b], *Peter M. Villiger*[a], *Ara Tekian*[c]

[a] Department of Rheumatology and Clinical Immunology/Allergology, University Hospital, Berne, Switzerland
[b] Department of Medical Education, University of Berne, Switzerland
[c] Department of Medical Education, University of Illinois at Chicago, Chicago, USA

Summary

Background: Faculties face the permanent challenge to design training programs with well-balanced educational outcomes, and to offer various organised and individual learning opportunities.

Aim: To apply our original model to a postgraduate training program in rheumatology in general, and to various learning experiences in particular, in order to analyse the balance between different educational objectives.

Methods: Learning times of various educational activities were reported by the junior staff as targeted learners. The suitability of different learning experiences to achieve cognitive, affective and psychomotor learning objectives was estimated. Learning points with respect to efficacy were calculated by multiplication of the estimated learning times by the perceived appropriateness of the educational strategies.

Results: Out of 780 hours of professional learning per year (17.7 hours/week), 37.7% of the time was spent under individual supervision of senior staff, 24.4% in organised structured learning, 22.6% in self-studies, and 15.3% in organised patient-oriented learning. The balance between the different types of learning objectives was appropriate for the overall program, but not for each particular learning experience. Acquisition of factual knowledge and problem solving was readily aimed for during organised teaching sessions of different formats, and by personal targeted reading. Attitudes, skills and competencies, as well as behavioural and performance changes were mostly learned during caring for patients under interactive supervision by experts.

Conclusion: We encourage other faculties to apply this approach to any other curriculum of undergraduate education, postgraduate training or continuous professional development in order to foster the development of well-balanced learning experiences.

Key words: postgraduate training; learning times; educational objectives; assessment

Introduction

Postgraduate medical education follows completion of the basic medical qualification according to specific regulations and rules [1]. It is characterised by the training of junior physicians under supervision by more experienced colleagues towards independent practice of their intended specialty. Learning programs have developed with components of planned clinical placements, expert supervision, theoretical teaching, research experience, systematic assessments and evaluations of trainees and training programs. The apprenticeship nature of professional development requires integration between training and services of patient care in the training institution. It is a permanent challenge to secure a very diverse postgraduate program with integrated practical and theoretical instructions in order to get and keep up a well-rounded physician with respect to knowledge, skills and attitudes.

Learning in the clinical environment has much strength [2]. It is focused on authentic problems in the context of professional practice. The skills of history taking, physical examination, clinical reasoning, decision making, empathy and professionalism can be taught and learnt as an entity. Professional thinking, behaviour and attitudes are usually modelled by clinical teachers. Learners are motivated by its relevance and through active participation. However, time pressures, competing demands, high costs, lack of training in teaching skills

Financial support: There was no external funding for this study.

and poor recognition for clinical teaching undermine implementation of this educational approach with emphasis on interactive learning with experts in a stimulating learning environment. In addition, this individualised learning on the job is usually opportunistic and needs to be complemented by a systematic learning with structured learning opportunities in groups allowing a framework for reflection and discussion. This approach can develop the skills of listening, presenting ideas, persuading and working as part of a team [3]. It also gives the trainees the chance to monitor their own learning and thus to gain a degree of self-direction and independence in their studies.

The issue of junior staff's working hours has received much attention in recent years. In particular, qualitative and quantitative effects of chronic sleep deprivation and fatigue on learning and workplace performance, as well as physical and psychological health have been studied [4–6]. Adverse effects on ability and motivation to learn, interactions with patients, staff and peers, as well as medical errors resulting in detrimental patient outcomes have been reported, especially when tasks dependent upon high levels of vigilance or newly learned procedural skills have been examined.

It is valuable to consider not only the numbers of hours worked by the trainees, but the educational impact of all learning experiences. The faculty of individual programs is responsible for establishing specific learning objectives that are consonant with the expectations set forth by specialty boards and societies, designing and implementing the educational program to meet those objectives, judging the progress of trainees in achieving the established learning objectives, and determining whether the individual trainee has acquired the competencies and demonstrated the professional values and attitudes required for quality medical care [7].

Trainees' objectives include those that relate to learning in the cognitive, affective and psychomotor domain [8]. Objectives related to the cognitive domain of learning take into consideration a spectrum of cognitive functioning relevant to the goals of a curriculum, from simple factual knowledge to higher levels of cognitive functioning, such as problem solving and clinical decision making [9]. Objectives that pertain to the affective domain are frequently referred to as attitudinal objectives. They include specific attitudes, values, beliefs, biases, emotions, or role expectations that can affect learning and performance. Objectives that relate to the psychomotor domain of learning are often referred to as skills or behavioural objectives. They include specific psychomotor tasks or actions that may involve hand movements, vision, hearing, speech, or sense of touch. History taking, patient education, interpersonal communication, physical examination, record keeping, and procedural skills fall into this domain. Often, an objective includes elements from more than one domain. Being aware of the various domains of learner objectives is valuable because it helps to understand the complexity of learning related to any educational objective, to choose the educational methods that will most likely achieve the educational objectives and to aim for an appropriate balance within the training program. This balance can be achieved if all domains of the interdependent learning objectives are covered and if the various learning objectives complement each other in a qualitative and quantitative way.

Individuals have different preferences to learning, referred to as learning styles [10]. Some prefer to hear information, others to have visual aids, or tactile aids. Some learners thrive with organisation and structure; others learn well in an unstructured environment where they discover what is to be learned. The use of different educational methods helps to overcome the problem of different learning styles and to maintain interest over longer time periods. It also reinforces previous learning experiences, which can deepen learning, promote retention, and enhance the application of what has been learned [8]. However, resource constraints may limit the devise of the ideal educational methods that achieve the most educational objectives.

After implementation of a postgraduate training program the question arises what the trainees achieve in their working hours and self studies, and how effectively and efficiently the curriculum is run. Scores have been assigned to the perceived educational value of different educational activities, direct and indirect patient care [11]. However, to our knowledge, this is the first study to analyse various learning activities with respect to their suitability to achieve different educational objectives in a qualitative and quantitative way.

We therefore conducted our study with the following aims:

1 to quantify learning times of various educational activities during the postgraduate training in rheumatology
2 to estimate the suitability of the various learning experiences to achieve different educational objectives
3 to judge the balance of our postgraduate curriculum by calculating learning points with respect to perceived efficacy of the various educational activities

Methods

The department of Rheumatology and Clinical Immunology/Allergology, University of Berne, is permanently assigned various tasks of clinical service, teaching (undergraduate, postgraduate and continuous professional development), and research (basic and applied clinical research). The department is a tertiary centre for the diagnosis and non-surgical treatment of patients suffering from the whole spectrum of rheumatic diseases. The in-patient clinic admits approximately 600 patients per year to 22 beds for inter-professional and interdisciplinary care during ten days, on average. The day clinic treats approximately 680 patients, and the out-patient clinic holds approximately 7600 consultations annually. In addition, the staffs participate in the emergency and advisory service of the University hospital. The department is approved for the postgraduate training in rheumatology of physicians aiming for different specialist certificates according to the requirements of the regulatory body Swiss Medical Association [12]. The equivalent of eight full time appointments is offered to 8–11 physicians for 1–2 years. The present educational strategies include various organised and individual learning experiences.

In 2003, learning times of the junior staff as targeted learners were estimated. The primary author compiled a list of all learning situations and asked the complete junior staff to declare the estimated time spent in each particular situation. Eleven physicians (2 females, 9 males) filled in the list completely (response rate 100%). Seven were working full-time, four part-time; five were aiming for their specialisation in rheumatology, four in internal medicine, one in general medicine and one in physical medicine & rehabilitation, respectively. At the time of the survey they had been working in our department for 9.5 months on average (range 1–23 months) and had a rheumatology specific postgraduate training of 28.4 months on average (range 1–86 months), and a specialty non-specific postgraduate training of 75.5 months on average (range 52–102 months). The various learning times declared by the junior staff were compared to the hours offered by the actual training program in order to confirm plausible figures. The primary author assigned average duration and frequency of all learning experiences based on the compiled figures and the number of organised events within the training program, respectively. Replacements of one specific event by another one were carefully considered. Individual learning experiences were offered during 52 weeks per year. However, organised structured learning experiences, identical for all trainees, were held during 48 weeks per year only due to special clinical services around public holidays. Absences, such as individual holidays, sick leaves and military services, were taken into account according to the department's task plan, resulting in an average individual's presence of 85% of the program time. We deliberately refrained from calculating measures of statistical variation. Reasonable and realistic estimates of the time spent by an average learner are sought. The focus of this program evaluation is to help academic staff to design and adapt their curricula by application of this approach to learning times estimated for their own average learner. Learning times per year were calculated, assuming an activity balanced between the in-patient and out-patient clinic. Finally, the estimated learning times per year were related to the documented working hours according to the personnel department and adjusted for a full-time appointment.

All educational strategies applying various educational methods were investigated with respect to their suitability to achieve cognitive (knowledge, problem-solving), affective (attitudes) and psychomotor goals (competences, performance). The suitability was rated by the primary author on an ordinal scale from zero to three (0 = not recommended; 1 = appropriate as an adjunct to other methods; 2 = good match between educational method and objective; 3 = excellent match) based on published educational concepts [8]. This approach results in different educational impacts of the various educational methods applied. Finally, learning points with respect to efficacy were calculated. The estimated learning times (hours/year) were multiplied by the perceived appropriateness' of the educational strategies (rated from 0 to 3) and then added up for each of the five specified dimensions of learning goals. Z-values were calculated for all five dimensions of learning points (result of one particular dimension minus mean of all five dimensions divided by the standard deviation of all five dimensions). The significance level was set at $P = 0.05$ with one-sided testing. This allowed judging the extent of balance of our postgraduate training curriculum in general and for particular learning experiences. This concept is based on the model of equivalence of learning activities considering time, intensity and relative weight of various educational strategies within a curriculum. It intends to facilitate the comparison between different study programs by relative measures in contrast to absolute measures. Similarly, the European Credit Transfer and Accumulation System ECTS generates credits based on the workload of a typical student required to achieve the program objectives specified in terms of learning outcomes and competencies [13]. The student workload consists of the time required to complete all planned learning activities such as attending lectures or seminars, preparation of projects, self-studies, work experiences and examinations.

Results

The learning experiences of our postgraduate training offered to the junior physicians are listed in table 1. They can be classified as (1) organised learning opportunities (structured according to a blueprint based on the Swiss postgraduate training program in rheumatology [14], and patient-oriented according to the daily clinical work), and (2) as individual learning situations (individual supervision during the routine patient care and self-studies). They include different teaching formats from lectures, interactive workshops and practical courses to discussions in groups and pairs. Several learning experiences allow interactions with physicians from different specialties and backgrounds (private practice, other department, research group), as well as with different professions (nurses, physiotherapists, occupational therapists, laboratory technicians).

Estimated learning times of the junior staff as targeted learners are listed in table 1 and illustrated

Table 1

Learning experiences.

Learning Experience	Educational Method	Duration Frequency (*1)	Number of Participants	Types of Participants	Estimated Individual Learning Time per Year (Hours): Junior Staff		
					In-patient Clinic (*2)	Out-patient Clinic (*2)	Department (*2) (*3)
Organised Learning							
Systematic curriculum of postgraduate training in rheumatology	Lecture (followed by interactive discussion) or workshop	45 min 1x/week	8–20	1a 1b 2a 2b 3	24.5 (= 36 x 0.8 x 0.85) (*4)	24.5 (= 36 x 0.8 x 0.85) (*4)	24.5 (= 36 x 0.8 x 0.85) (*4) (E)
Lectures for practicing rheumatologists	Lecture	total of 12 hours/year	20–250	1a 1b 2a 2b 3 practicing rheumatologists	10.2 (= 12 x 0.85)	10.2 (= 12 x 0.85)	10.2 (= 12 x 0.85)
Lectures for practitioners in internal and general medicine (topics relevant to rheumatology)	Lecture	total of 24 hours/year	50–300	1a 1b 2a 2b 3 practicing physicians of different specialties	20.4 (= 24 x 0.85)	20.4 (= 24 x 0.85)	20.4 (= 24 x 0.85)
Lectures in other departments (topics relevant to rheumatology)	Lecture	total of 12 hours/year	10–50	1a 1b 2a 2b 3 staff of other departments	10.2 (= 12 x 0.85)	10.2 (= 12 x 0.85)	10.2 (= 12 x 0.85)
Lectures for patients	Lecture	6 hours/year	100–150	1a 1b 2a 2b 3 patients	5.1 (= 6 x 0.85)	5.1 (= 6 x 0.85)	5.1 (= 6 x 0.85)
Research meetings	Lecture	60 min 1x/month	10–20	1a 1b 2a 2b 3 researchers	5.1 (= 12 x 0.85 x 0.5) (*5)	5.1 (= 12 x 0.85 x 0.5) (*5)	5.1 (= 12 x 0.85 x 0.5) (*5)
Quick soups, journal clubs	Short presentation	45 min 3x/month	8–20	1a 1b 2a 2b 3	23.0 (= 27 x 0.85)	23.0 (= 27 x 0.85)	23.0 (= 27 x 0.85)
Inter-professional teachings	Workshop	45 min 1x/month	15–25	1a 1b 2a 2b 3 allied health professionals	7.6 (= 9 x 0.85)	7.6 (= 9 x 0.85)	7.6 (= 9 x 0.85)
Courses in physiotherapy and occupational therapy	Practical course by PT and OT	2 hours/year	2–6	1a 1b 2a 2b	2.0 (2)	2.0 (2)	2.0 (2)
Courses in laboratory techniques	Practical course by lab technician	1 hour/year	1–3	1a 1b 2a 2b	1.0 (1)	1.0 (1)	1.0 (2)
Visits of conferences, external workshops or courses	Lecture, workshop, practical course	total of 40 hours/year	variable	1a 1b 2a 2b 3	40.0 (40)	40.0 (40)	40.0 (40)
Plenary discussions (in-patients)	Interactive discussion	15 min 1x/week	8–20	1a 1b 2a 2b 3	10.2 (= 12 x 0.85)	10.2 (= 12 x 0.85)	10.2 (= 12 x 0.85)
Plenary discussions (out-patients)	Interactive discussion	45 min 1x/week	8–20	1a 1b 2a 2b 3 specialists of other departments	30.6 (= 36 x 0.85)	30.6 (= 36 x 0.85)	30.6 (= 36 x 0.85)
Sub-Subtotal (Structured Learning)		**hours/year**			**190**	**190**	**190**
Discussions of x-rays (in-patients)	Interactive demonstration by radiologist	15 Min 5x/week	4–8	1 2 3 radiologist	51.0 (= 60 x 0.85)	0	25.5 (= 30 x 0.85)
Discussions of x-rays (out-patients)	Interactive demonstration by radiologist	30 min 1x/week	4–8	1b 2b 3 radiologist	0	20.4 (= 24 x 0.85)	10.2 (= 12 x 0.85)
Ward rounds with consultant	Interactive discussion	90 min 1x/week	4–6	1a 2a 3 nurse	66.3 (= 78 x 0.85)	0	33.2 (= 39 x 0.85)
Ward rounds with senior staff	Interactive discussion	90 min 1x/week	3–5	1a 2a nurse	66.3 (= 78 x 0.85)	0	33.2 (= 39 x 0.85)
Inter-professional discussions of patients	Interactive discussion	total of 10-40 min/ week	6–12	1a 2a allied health professionals	27.2 (= 32 x 0.85)	6.8 (= 8 x 0.85)	17.0 (=20 x 0.85)
Sub-Subtotal (Patient-Oriented Learning)		**hours/year**			**211**	**27**	**119**
Subtotal Organised Learning		**hours/year**			**401**	**217**	**309**

Table 1

(continued)

Learning Experience	Educational Method	Duration Frequency (*1)	Number of Participants	Types of Participants	Estimated Individual Learning Time per Year (Hours): Junior Staff		
					In-patient Clinic (*2)	Out-patient Clinic (*2)	Department (*2) (*3)
Individual Learning							
Presentations of in-patients to supervising staff	Interactive discussion	180 min/week	2	1a 2a (3)	132.6 (= 156 x 0.85)	0	66.3 (= 78 x 0.85)
Discussions of in-patients with supervising staff	Interactive discussion	150 min/week	2	1a 2a (3)	110.5 (= 130 x 0.85)	0	55.3 (= 65 x 0.85)
Presentations of day-clinic-patients to supervising staff	Interactive discussion	120 min/week	2	1a 3	85.0 (= 100 x 0.85)	0	42.5 (= 50 x 0.85)
Presentations of out-patients to supervising staff	Interactive discussion	210 min/week	2	1b 2b (3)	0	148.8 (= 175 x 0.85)	74.4 (= 88 x 0.85)
Presentations and discussions of emergencies with supervising staff (nights and weekends)	Interactive discussion	30 min/week	2	1a 1b 2a 2b 3	22.1 (= 26 x 0.85)	22.1 (= 26 x 0.85)	22.1 (= 26 x 0.85)
Demonstrations of injection techniques	Interactive presentation	30 min/week	2-3	1a 1b 2a 2b 3	22.1 (= 26 x 0.85)	22.1 (= 26 x 0.85)	22.1 (= 26 x 0.85)
Demonstrations of ultrasound	Interactive presentation	30 min/week	2-3	1a 1b 2a 2b	11.1 (= 26 x 0.85 x 0.5) (*4)	11.1 (= 26 x 0.85 x 0.5) (*4)	11.1 (= 26 x 0.85 x 0.5) (*4)
Sub-Subtotal Individual Supervision		**hours/year**			**383**	**204**	**294**
Self-studies	**Personal targeted reading, e-learning**	**4 hours/week**	**1**	**1a 1b 2a 2b 3**	**176**	**176**	**176**
Subtotal Individualised Learning		**hours/year**			**559**	**380**	**470**
Total Learning Experiences		**hours/year**			**960**	**597**	**779**

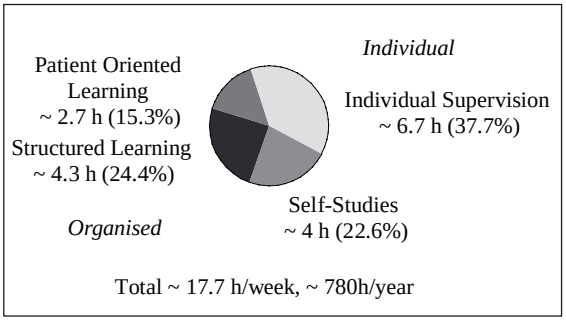
1a junior staff working in the in-patient clinic
1b junior staff working in the out-patient clinic
2a senior staff responsible for the in-patient clinic
2b senior staff responsible for the out-patient clinic
3 consultant
PT physiotherapist, OT occupational therapist

* 1) offered during 48 weeks/year for organised, and 52weeks/year for individual learning experiences, respectively
* 2) taking absences into account, resulting in an average presence of 85% of the program time
* 3) assuming an activity balanced between the in- and out-patient clinic
* 4) replaced by other lectures in 20% of the events
* 5) only half of the learners taking part

E: Explanation of the calculations of one particular example: The structured, organised postgraduate training program is offered during 48 weeks per year (*1). The weekly lecture of the systematic curriculum lasts 45 minutes, resulting in 48 x 0.75 = 36 hours per year. However, in 20% of the weeks the systematic curriculum is replaced by other lectures (*4) and the individual learner is present in only 85% of the program time (*2), resulting in an estimated individual learning time of 36 x 0.8 x 0.85 = 24.5 hours per year.

Figure 1

Estimated learning times: mean hours/week, % of total learning times.



in figure 1. The individual supervision by the senior staff makes up the highest amount of the learning experiences (37.7%), followed by the organised structured learning experiences (24.4%), the self-studies (22.6%), and the organised patient-oriented learning situations (15.3%). There are considerable differences between the out- and in-patient clinics. The junior staff working on the ward enjoys about twice as many hours of learning experiences supervised (factor 1.9) or organised (factor 7.8) by senior staff. We therefore aim to start the postgraduate training in the in-patient clinic and to continue in the out-patient clinic, where individual targeted reading and other forms of self-studies become more and more important. There also exists a major difference between beginners and advanced learners in respect to the

need of individual supervision. Finally, there are huge inter-individual differences with self-reported time spent for self-studies ranging from one to eight hours per week depending on family commitments, forthcoming exams, academic goals and various other factors.

In 2003, the junior staff had been working in the hospital for 2600 hours per year (mean ± SD 180), based on the compulsory documentation of the working hours and extrapolated to full-time appointments. Therefore, a total of 23.2% of the working hours were devoted to individual supervi-

Table 2

Analysis of the present educational strategies with respect to cognitive, affective and psychomotor objectives.

Learning experiences	Cognitive: knowledge	Cognitive: problem-solving	Affective: attitudinal	Psychomotor: skills or competences	Psychomotor: behavioural or performance	Learning time per year hours (%)
Organised Learning						
Structured Learning						
Systematic curriculum of postgraduate training in rheumatology	+++	++	+	+	+	24.5 (3.15)
Lectures for practitioners in rheumatology, internal and/or general medicine (topics relevant to rheumatology)	+++	+	+	+	–	30.6 (3.93)
Lectures in other departments (topics relevant to rheumatology)	+++	+	+	+	–	10.2 (1.31)
Lectures for patients	+++	+	+	+	–	5.1 (0.66)
Research meetings	++	+	+	+	–	5.1 (0.66)
Quick soups, journal clubs	+++	+	+	+	+	23.0 (2.95)
Inter-professional teachings	+++	+	+	+	+	7.6 (0.98)
Courses in physiotherapy, occupational therapy or laboratory techniques	++	+	++	++	++	3.0 (0.38)
Visits of conferences, external workshops or courses	+++	+	+	+	+	40.0 (5.13)
Plenary discussions of in- or out-patients	++	++	++	+	+	40.8 (5.24)
Sub-Subtotal Structured Learning						**190 (24.39)**
Patient-Oriented Learning						
Discussions of x-rays from in- or out-patients)	++	++	+	+	+	35.7 (4.58)
Ward rounds with consultant or senior staff	++	++	+++	++	+++	66.4 (8.52)
Inter-professional discussions of patients	++	++	+++	++	++	17.0 (2.18)
Sub-Subtotal Patient-Oriented Learning						**119 (15.28)**
Subtotal Organised Learning						**309 (39.67)**
Individual Learning						
Individual discussions of in-, out-, day-clinic or emergency- patients with supervising staff	++	+++	+++	++	+++	260.6 (33.45)
Demonstrations of injection techniques or ultrasound	++	++	++	+++	+++	33.2 (4.29)
Sub-Subtotal Individual Supervision						**294 (37.74)**
Self-studies	**+++**	**+**	**+**	**+**	**–**	**176 (22.59)**
Subtotal Individualised Learning						**470 (60.33)**
Total Learning Experiences						**779 (100.00)**

+++ = excellent match between educational method and objective
++ = good match between educational method and objective
+ = appropriate as an adjunct to other educational methods
– = not recommended

Figure 2

Estimated learning points with respect to efficacy for all learning experiences: They were calculated by multiplication of the estimated learning time (hours/year) with the perceived appropriateness of the educational strategies (rated from 0 to 3) for each particular learning experience followed by addition of the figures and plotting of the sums for each dimension of educational objectives; scale 0-2000, interval 400; mean ± SD 1484 ± 264 of all five dimensions. The data illustrate an appropriate balance between the different types of learning objectives for the overall postgraduate training program.

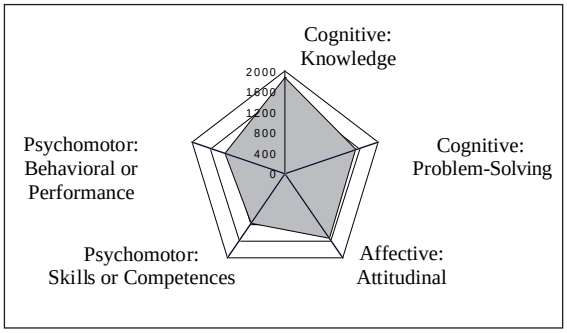
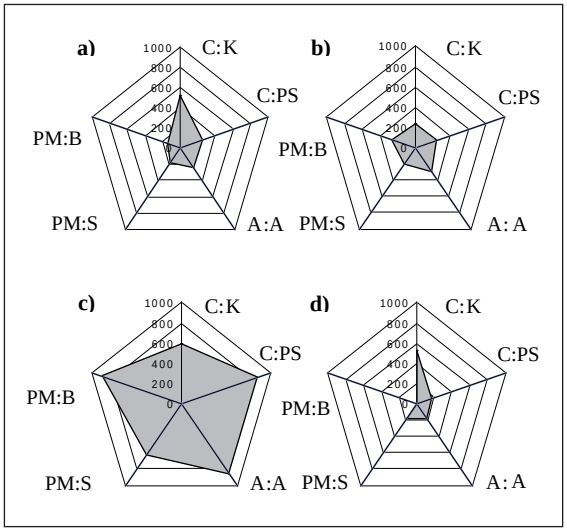


Figure 3

Estimated learning points with respect to efficacy for a) organised, structured learning, b) organised, patient-oriented learning, c) individual supervision, and d) self-studies: They were calculated by multiplication of the estimated learning time (hours/year) with the perceived appropriateness of the educational strategies (rated from 0 to 3) for each particular learning experience, followed by addition of the figures and plotting of the sums for each dimension of educational objectives. C:K = Cognitive: knowledge; C:PS = Cognitive: problem-solving; A:A = Affective: attitudinal; PS:S = Psychomotor: skills or competencies; PS:B = Psychomotor: behavioural or performance. Scale 0-1000, interval 200; mean ± SD of all five dimensions: a) 269 ± 147; b) 247 ± 32; c) 757 ± 141; d) 211 ± 193.
The data illustrate a lack of balance between the different types of learning objectives for some of the particular learning opportunities, stressing the importance of complimentary learning experiences.



sion (11.3%), organised structured learning experiences (7.3%), and organised patient-oriented learning situations (4.6%). The junior staff had been working in the hospital for 59 hours per week on average, assuming 44 working weeks per year on average, due to various absences such as public and personal holidays, sick leaves and military services. Therefore, learning experiences made up 13.7 hours per week during regular working hours plus 4 hours per week during personal free time, resulting in almost 780 hours per year.

The suitability of the different educational settings to meet the cognitive, affective and psychomotor objectives is summarised in table 2. Allocation of estimated learning points is done by multiplication of the estimated learning times (hours/year) by the perceived suitability of the educational experiences (rated from 0 to 3). For example, discussion of emergencies with supervising staff is an excellent teaching method to foster problem solving and suitability is rated with 3. The learners spend an estimated 22.1 hours/year discussing emergencies with supervising staff. Therefore, the calculation results in 66.3 learning points, given to problem-solving as particular cognitive learning objective spent with this particular learning strategy. As shown in Figure 2, the balance between the different types of objectives is appropriate for the whole program. The z-values reveal no statistical significance between the five dimensions analysed. Acquisition of factual knowledge is most pronounced during presentations and discussions of patients supervised by experienced staff, and by personal targeted reading. Problem-solving is learned most frequently during presentations and discussions of patients supervised by senior staff. Attitudinal changes are particularly possible during ward rounds and the caring for patients under supervision. In particular, high attention to the development of professionalism and humanism can be given. Skills and competencies are practiced in particular during diagnostic and therapeutic procedures applied under supervision. Finally, behavioural and performance objectives are aimed for mostly during ward rounds and supervised patient care. As shown in figure 3, the balance between the five different learning objectives is not favourable for all learning experiences, stressing the importance of complimentary offers. However, the staff intensive individual supervision is much more balanced compared to other learning situations. The z-values reveal a statistical significant predominance of factual knowledge acquisition during organised structured learning and a threshold value for self-studies.

Discussion

Our study documents an integrative, self-reported estimation of learning times over one complete year of postgraduate training. In addition, we present an original model dedicated to the analyses of the suitability of various learning experiences to achieve cognitive, affective and psychomotor objectives. It promises interesting insights into the balance of learning environments and their effects on the learning outcome.

Certain limitations need to be addressed in considering the learning times reported in this study. Obviously, as a study of one particular setting at one University hospital in one European country, our findings may not be generalised in relation to other programs and may change over the years due to adjustments of the curriculum. Scheduling patterns, patient volume, senior staff's roles and availability, staffing expectations and educational philosophy all influence how the junior staffs allocate their time to different activities in the clinic. The availability of non-physicians to deliver medical patient care has an effect on the time allocations too [15]. The intensity of supervision naturally varies by specialty, level of training, experience and competence of the individual trainee and the activity of the specific clinical circumstances [7]. Vast differences of learning times between different postgraduate training programs are found in the literature. A systematic review reports data from 16 observational studies including over 1000 residents training in six surgical and non-surgical specialties [16]. Teaching and learning activities were defined to be educational for the resident or to involve a work-related, potentially instructional interaction with a supervisor or colleague, and included library time, attending rounds, conferences, teaching, program planning, speaking with a consultant and providing feedback. These educational activities made up 15% of residents activities, on average (95% confidence interval 10–20%, range 0–31%) during a mean 84.5 hours working week. Our finding of 13.7 hours learning time during regular presence in the department is comparable to the mean 12.7 hours calculated in the systematic review, though related to a considerably lower working time of 59 hours per week. However, differences in the definition of working hours have to be taken into account. For example, in our recordings sleeping whilst being on call is not calculated as working hours, which can explain for a major part the difference.

Our learning times include only faculty-directed educational time, in particular individual supervision, but not peer-directed discussions. The latter can make up additional time of comparable amount according to studies with recordings by trained observers and instantaneously recorded work activities at randomly selected time points [17, 18]. American second-year residents rated contribution to their learning on a 4-point scale from 0 (not at all) to 3 (a great deal). The highest contribution came from other residents (2.4), followed by special patients (2.1), patient rounds (2.0), attending physicians (2.0), reading (2.0), lectures (1.7), grand rounds (1.7), seminars (1.6) and small groups (1.6) [19]. However, this judgment might depend on the ratio of trainees to supervisors. This is outstanding for our curriculum and explains why our junior staffs seek help from the senior staff in the first place.

Trained observers are expensive, limiting the observation period and the number of recorded events, and reducing reliability of time estimates in case of an uneven distribution of the organised learning experiences over the year, as it is the case in our curriculum. Nevertheless, junior staff's estimates of the proportion of time spent in different activities are inaccurate representations of the work day [20]. Interestingly, comparison of the self-declared estimates by interns and residents rotating on the general medicine service at a University hospital with the results of formal random work-sampling time analyses revealed an overestimation of personal reading activities, but an underestimation of discussing patient care and ward rounds resulting in an underestimation of supervision by senior staff of 8.3 hours per week [20]. Therefore, our figures of the individual learning experiences might be too small. However, our 11% of working hours dedicated to individual supervision are comparable to the 12.5–14.5% for discussing patient care, assessed by observational random work sampling [17]. In addition, a considerably higher proportion of time was spent on patient focused education than on any other educational activity in agreement to a cross-sectional, observational study of the activities of first year residents during rotations in emergency medicine, internal medicine and surgery [18].

Quantification of organised, structured learning experiences with defined beginning and end with little interruptions is easier than estimation of individual learning experiences spread out over the whole week including nights and weekends. Therefore, variations between reported organised learning times are far more attributable to real differences between programs than methodological shortcomings. For example, our 4.3 hours/week of lectures, workshops, courses, journal clubs, research meetings and plenary discussions are high in relation to a survey of specialist registrars in rheumatology in the United Kingdom, where only 19.3% reported about a formal teaching of 4 or more hours/week [21].

The year of training has an impact on the number of interactions with the supervising staff according to an observational study about activities of residents in internal medicine during their outpatient continuity clinics, reflecting the growing clinical independence of the trainees [22]. In addi-

tion, light patient loads produce fewer opportunities for staffing based strictly on perceptions of clinical necessity. Heavy patient loads, on the other hand, reduce the time available for staffing [22]. Further, time spent with attending physicians by a random sample of second year residents of all specialties showed wide variations (mean 2.5 ± SD 2.3 hours/day) [19]. Finally, time spent with attending physicians varied by specialty, with residents in surgery (3.1 hours/day), family practice, radiology and pathology (3.0 hours/day) reporting the most time, while transitional-year residents (2.3 hours/day) and residents in psychiatry (1.9 hours/day) averaged the least [19].

The postgraduate training program requires its trainees to develop competencies in different areas, such as patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice [23]. Toward this end, programs define the specific knowledge, skills and attitudes expected, and provide educational experiences as needed in order to demonstrate the competencies. Evaluation closes the loop of the curriculum development cycle and provides information to guide ongoing improvements [8]. Traditionally, answers are searched for the critical question whether the specific measurable curricular objectives had been met with respect to "who did how well of what by when." Alternatively, we approach the question whether the educational objectives had been met with respect to a balance between the cognitive, affective and psychomotor objectives. Our model was designed specifically for our particular curriculum but can be applied to any other curriculum of undergraduate education, postgraduate training or continuous professional development, because the underlying educational concepts remain the same during the process of life-long learning. It allows to compare equivalent curricula carried out in different settings, or to contrast dissimilar training programs realised in similar settings. Training of several experts in the allocation of the suitability of various educational strategies to reach different educational goals, followed by an expert consensus process based on the judgements of multiple participants increases reliability of its application. However, the gain has to be balanced with the feasibility and appropriateness of additional efforts involved in such a formative program evaluation process.

At present, the medical profession is confronted by an explosion of technology, changing market forces, problems in health-care delivery and globalisation. As a result, physicians find it increasingly difficult to meet their responsibilities to patients and society. Under these circumstances, reaffirming the fundamental and universal principles and values of medical professionalism becomes all the more important [24]. Providing the best quality of education to our trainees by offering a balanced training program is fundamental for sustaining medicine's contact with society. Giving a trainee the opportunity to learn does not ensure that he will learn. In addition, the structure and process of a training program does not necessarily correlate with the desired eventual educational outcomes. Nevertheless, only a well-balanced program will promote professionalism which can be assessed in various ways [25].

Academic experiences such as amount of didactic teaching and faculty supervision in patient care are far more important than financial issues such as salary, employee benefits and supplemental income opportunities for the postgraduate training program selection [26]. However, over the last few decades more emphasis has been put on the quality of the work environment reflected by the level of sensitivity, collegiality and satisfaction that trainees and faculty have towards each other and their own professional appointments. This increased emphasis on the work environment appears to parallel a decreased emphasis on the academic experience. Nevertheless, overall satisfaction with the postgraduate training is enhanced by positive learning experiences [19]. In addition, increased educational opportunities and role modelling are suggested as beneficial interventions against training stress that may foster professionalism [27, 28].

In conclusion, our original model as one approach to program evaluation assesses the balance between cognitive, affective and psychomotor objectives as basis for the training of competent professionals and guidance of ongoing program improvements. Further outcome research is welcome to study the impact of the model on professional competencies and performance, as well as on program changes.

Correspondence:
Prof. Dr. med. Christine Beyeler
Department of Medical Education
University of Berne
Inselspital 37a
CH-3010 Berne
Switzerland
E-Mail: christine.beyeler@iml.unibe.ch

References

1 World Federation for Medical Education. WFME global standards for quality improvement. www.sund.ku.dk/wfme/
2 Spencer J. Learning and teaching in the clinical environment. BMJ. 2003;326:591–4.
3 Jacques D. Teaching small groups. BMJ. 2003;326:492–4.
4 Veasey S, Rosen R, Barzansky B, Rosen I, Owens J. Sleep loss and fatigue in residency training. JAMA. 2002;288:1116–24.
5 Baldwin Jr DC, Daugherty SR, Tsai R, Scotti Jr MJ. A national survey of resident's self-reported work hours: thinking beyond specialty. Acad Med. 2003;78:1154–63.
6 Papp KK, Stoller EP, Sage P, Aikens JE et al. The effects of sleep loss and fatigue on resident-physicians: a multi-institutional, mixed-method study. Acad Med. 2004;79:394–406.
7 Association of American Medical Colleges. AAMC policy guidance on graduate medical education: assuring quality patient care and quality education. October 2001. www.aamc.org/hlthcare/gmepolicy/gmepolicy.pdf
8 Kern DE, Thomas PA, Howard DM, Bass EB. Curriculum development for medical education. A six-step approach. The Johns Hopkins University Press, Baltimore and London, 1998.
9 Bloom BS, Mesia BB, Krathwohl DR. Taxonomy of Educational Objectives (two volumes: The Affective Domain & The Cognitive Domain). David McKay, New York, 1964.
10 Kolb DA. Experiential Learning: Experiences as the Source of Learning and Development. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1984.
11 Dresselhaus TR, Luck J, Wright BC, Spragg RG, Lee ML, Bozzette SA. Analyzing the time and value of house staff in patient work. J Gen Intern Med. 1998;13:534–40.
12 Swiss Medical Association Foederatio Medicorum Helveticorum FMH. www.fmh.ch
13 European Credit Transfer and Accumulation System. ECTS users' guide 2005. www.ec.europa.eu/education/programmes/socrates/ects/doc/guide_en.pdf
14 Swiss postgraduate training program in rheumatology. www.fmh.ch/shared/data/pdf/rheumatologie_07_2004_version_internet_d.pdf
15 Knickman JR, Lipkin Jr M, Finkler SA, Thompson WG, Kiel J. The potential for using non-physicians to compensate for the reduced availability of residents. Acad Med. 1992;67:429–38.
16 Boex JR, Leahy PJ. Understanding resident's work: moving beyond counting hours to assessing educational value. Acad Med. 2003;78:939–44.
17 Guarisco S, Oddone E, Simel D. Time analysis of a general medicine service. J Gen Intern Med. 1994;9:272–7.
18 Magnusson AR, Hedges JR, Ashley P, Harper RJ. Resident educational time study: a tale of three specialties. Acad Emerg Med. 1998;5:718–25.
19 Daugherty SR, Baldwin Jr DC, Rowley BD. Learning, satisfaction, and mistreatment during medical internship: a national survey of working conditions. JAMA. 1998;279:1194–9.
20 Oddone E, Guarisco S, Simel D. Comparison of house staff's estimates of their workday activities with results of a random work-sampling study. Acad Med. 1993;68:859–61.
21 Dubey SG, Roberts C, Adebajo AO, Snaith ML. Rheumatology training in the United Kingdom: the trainee's perspective. Rheumatology. 2004;43:896–900.
22 Malone ML, Steele DJ, Jackson TC. What do senior internal medicine residents do in their continuity clinics. J Gen Intern Med. 1993;8:185–8.
23 Accreditation Council for Graduate Medical Education: Outcome Project. www.acgme.org/outcome/comp/compFull.asp
24 Blank L, et al. Medical professionalism in the new millennium: a physicians' charter. Lancet. 2002;359:520–2.
25 Lynch DC, Surdyk PM, Eiser AR. Assessing professionalism: a review of the literature. Medical Teacher. 2004;26:366–73.
26 Nuthalapaty FS, Jackson JR, Owen J. The influence of quality-of-life, academic, and workplace factors on residency program selection. Acad Med. 2004;79:417–25.
27 Mareiniss DP. Decreasing GME training stress to foster residents' professionalism. Acad Med. 2004;79:825–31.
28 Reynolds PP. Reaffirming professionalism through the education community. Ann Intern Med. 1994;120:609–14.

Established in 1871

Formerly: Schweizerische Medizinische Wochenschrift

Swiss Medical Weekly

Official journal of the Swiss Society of Infectious diseases, the Swiss Society of Internal Medicine and the Swiss Respiratory Society

The many reasons why you should choose SMW to publish your research

What Swiss Medical Weekly has to offer:

- SMW's impact factor has been steadily rising. The 2005 impact factor is 1.226.
- Open access to the publication via the Internet, therefore wide audience and impact
- Rapid listing in Medline
- LinkOut-button from PubMed with link to the full text website http://www.smw.ch (direct link from each SMW record in PubMed)

- No-nonsense submission – you submit a single copy of your manuscript by e-mail attachment
- Peer review based on a broad spectrum of international academic referees
- Assistance of our professional statistician for every article with statistical analyses

- Fast peer review, by e-mail exchange with the referees
- Prompt decisions based on weekly conferences of the Editorial Board
- Prompt notification on the status of your manuscript by e-mail
- Professional English copy editing
- No page charges and attractive colour offprints at no extra cost

We evaluate manuscripts of broad clinical interest from all specialities, including experimental medicine and clinical investigation.

We look forward to receiving your paper!

Guidelines for authors:
http://www.smw.ch/set_authors.html

EMH FMH Schwabe
Editores Medicorum Helveticorum

All manuscripts should be sent in electronic form, to:

EMH Swiss Medical Publishers Ltd.
SMW Editorial Secretariat
Farnsburgerstrasse 8
CH-4132 Muttenz

Manuscripts:	submission@smw.ch
Letters to the editor:	letters@smw.ch
Editorial Board:	red@smw.ch
Internet:	http://www.smw.ch