

## **Learning objectives in logbooks as indicators of problems in teaching hospitals**

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### **Abstract**

Logbooks are used to grade, document, and establish the structure of clinical clerkships, but a logbook can also be used as an instrument to maintain uniform teaching between medical universities and teaching hospitals. In this study, logbooks of 109 students were collected and learning objectives ( $n = 141$ ) were analyzed upon the achieved skill levels. Analyses revealed differences in teaching between university and a single teaching hospital. In this teaching hospital students missed more learning objectives and had lower amounts of upgrades onto a higher skill level than demanded by the logbook. As we have shown, logbooks can even be used as an aide to maintain uniform teaching in medical universities and teaching hospitals.

### **Introduction**

Logbooks are commonly used in medical education in order to structure clinical clerkships for documenting, grading and evaluating undergraduate curricula.<sup>1</sup> Their design and structure may be based on the pre-arranged learning objectives, as well as the mode of issuing affirmations, or the format (handwritten, optically scanned, electronic). Learning objectives may be defined as compulsory, core, or optional, thus offering different ways for students to document what they have experienced.<sup>2,3</sup> The students' performance with reference to learning objectives may be assigned by the teacher in the immediate setting or entries in the logbook may be made after a discussion between the teacher and the student.<sup>4,5</sup> According to the Liaison Committee on Medical Education (LCME)<sup>6</sup> "The school should specify, for those courses and clerkships the major disease states/conditions that students are all expected to encounter. They should also specify the extent of student interaction with patients and the venue(s) in which the interaction will occur."

Teaching hospitals are established by many medical schools with the dual aim of improving resource allocation and enhancing the taught spectrum of disease entities, as well as their clinical presentation. Covering all epidemiological aspects in a certain geographic area of a medical school and training of competencies for the work in a primary or secondary care setting are two parts of most quality profiles of medical schools. As these aims can only partly be achieved in a university setting, the training in teaching hospitals is becoming more and more an indispensable part of undergraduate curricula.

Designing a curriculum with such a broad spectrum of services offered in various teaching hospitals is in conflict with the aim of setting up certain quality standards with minimum levels of services that have to be achieved by all students. Insufficient communication between the university and the peripheral sites and differences in working habits are major problems.

Structured timetables for all teaching hospitals, a mix of learning at the university and the remote sites, or uniform learning materials (books, syllabi, learning software) are various instruments used to homogenize such a learning environment. A logbook with uniform competencies might be a solution, but little is known about the potential for logbooks to serve as a steering instrument between medical university hospitals and teaching hospitals in order to establish minimum levels of teaching within curricula.<sup>7</sup> Therefore, we investigated if a logbook could also be used as a steering instrument between medical university hospitals and teaching hospitals by analyzing the level of actual skill reached in the learning objectives stated in the students' logbooks.

### **Materials and Methods**

#### ***Materials and Participants***

The usefulness of a logbook for achieving certain levels of competency was evaluated in a prospective study at three new teaching hospitals. A newly implemented undergraduate curriculum at three teaching hospitals with approximately 1800 beds was included in this study. The data from 109 students (70.6% female) in their fifth year of medical education (first year of clinical bed side teaching) were evaluated.

The logbook was designed as a list of learning objectives for which each student was expected to achieve a minimal level of competency (Fig. 1). The development of learning objectives was performed by enrolling a select group of expert clinicians and physicians practicing in primary or secondary care units, as well as students working in a team. Following Miller’s pyramid for assessing clinical competence, four levels of competence were defined as follows: have heard (level 1); have seen (level 2); demonstrates on a phantom (level 3a); demonstrates on a patient (level 3b); and reliable performance (level 4).<sup>8</sup> If a competence of less than level 4 is required, students may then earn upgrades voluntarily. For example, one learning objective is defined as “Urinary catheter in men and women” at level 3b. This would mean the student has to perform a successful catheterisation at least once and be observed by the physician in order to reach the requirement. If the student reaches a level of confident performance, the teacher may assign a level 4 i.e. The student will then be upgraded one level.

## Surgery I and II

3.1 content: analysis of blood glucose level onto the ward		
skill level	date	teachers' signature
1 have heard		
2 have seen		
3a simulates		
3b demonstrates		
4 reliable		

3.2 content: fluid balance		
skill level	date	teachers' signature
1 have heard		
2 have seen		
3a simulates		
3b demonstrates		
4 reliable		

3.3 content: urinary catheter for men and women		
skill level	date	teachers' signature
1 have heard		
2 have seen		
3a simulates		
3b demonstrates		
4 reliable		

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**Figure 1.** Sample page of the logbook (3rd edition) with learning objectives and skills levels.

**Note:** Skill levels in light blue state the required level the students’ have to achieve in order to pass the learning objective.

The purpose here is to motivate students not only to “collect” learning objectives but also to achieve a higher level of skill. For example, the panel at the Department of Emergency Medical Aid and Intensive Care was assigned skill level 3b of the learning objective “performance and interpretation of emergency ECG.” In other words, the student had to see a patient in the emergency unit, perform an ECG, and interpret the ECG in at least one case. If the student is able to perform the procedure routinely then the teacher may affirm skill level 4 (i.e., earning one upgrade level). It is important here to emphasize that every procedure is performed under a teacher’s supervision.<sup>9</sup>

Students can miss levels if they don’t reach the required levels of competence. The number of missed levels does not have an impact on grading nor on the rotation’s assessment. Students are told that there are opportunities to acquire competencies that extend beyond requested marks. In order to maintain consistent evaluation criteria for the teachers in the teaching hospitals and the university hospital, the logbook was implemented in the form of a two-day educational course.

Teachers have to approve of the students’ achieved skill level immediately in the logbook. This is important in order to ensure that only those learning objectives which have been actually witnessed and practiced are completed. If the student has achieved all of the required learning objectives in a certain department, then a student coordinator, who is usually a clinician at the respective department, must check all the signatures and make certain that no inappropriate entries are made.

## **Procedure**

The logbooks of all 109 medical students after their first clinical year were collected. The achieved skill levels of the 141 learning objectives that the students had to accomplish in their first clinical year were analyzed. This resulted in 15369 single skill levels which constituted the basis for further analyses. The logbooks were then returned to the students.

The data were collected with the following aims: (1) to test how the logbook was accepted by teachers and students, (2) to show how many students were able to achieve the minimum levels of competency and (3) to indicate whether the logbook enhanced the motivation for self-directed learning.

## **Teaching hospitals**

Students had to complete their clinical clerkships at a university medical hospital and in teaching hospitals. At the moment of data collection three teaching hospitals had a contract with our medical school.

Teaching hospitals A and C are in the same city as the medical school (5 to 10 kilometers away). Teaching hospital B is somewhat far away (45 kilometers), but very easy to reach by official transport systems. Teaching hospital A is a medium-sized hospital (8 wards, ~600 beds). Teaching hospital B is a small size hospital (10 wards, ~200 beds). Teaching hospital C is a large size hospital (17 wards, ~ 1,000 beds).

Students completed their clinical clerkship in internal medicine in one of the three teaching hospitals and their surgical internships in either one of the three teaching hospitals or in the medical university hospital.

## **Statistical analysis**

Means were used accompanied by standard deviations ( $\pm$ SD). The number of upgraded and missed skill levels between hospitals was compared by one-way analysis of variance (ANOVA). The homogeneity of variances was tested with the Levene test. Statistical analyses were performed with the SPSS, version 15.0 (SPSS Inc., Chicago, IL, USA). The level of statistical significance was set at  $P < 0.05$ .

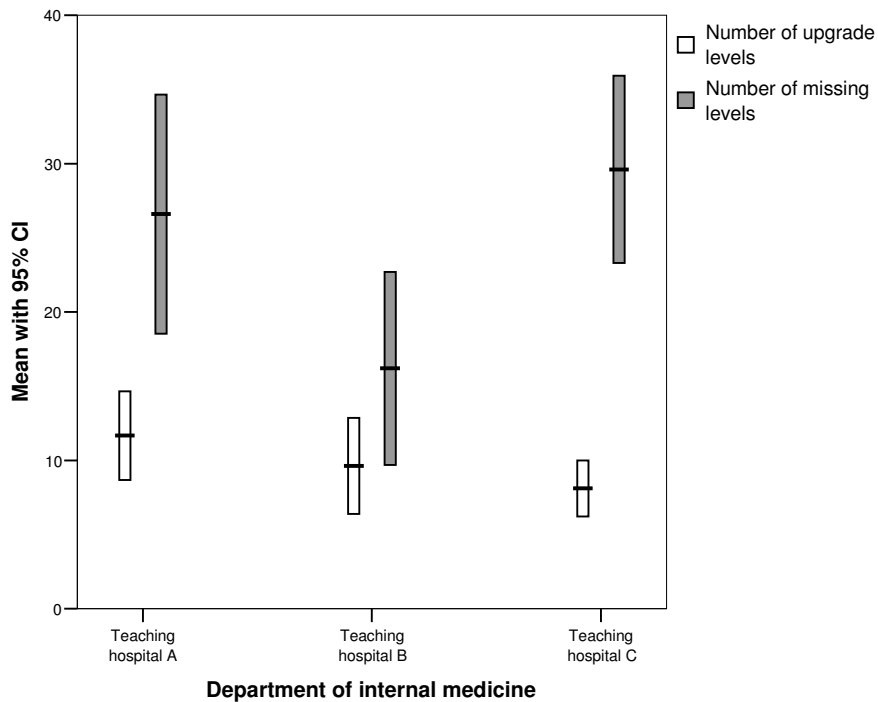
## **Results**

### **Predefined skill level**

Forty students missed at least one learning objective (out of 141). On average, each student missed  $1.5 \pm 3.6$  learning objectives. All students had at least one upgraded learning objective. On average each student had  $33 \pm 17$  upgraded levels. In other words, if a student achieved a skill level 4 (i.e., performed confidently on a patient) for a specific learning objective assigned the predefined skill level 1 (heard about in a lecture) the student had achieved 3 upgrade levels. Each student missed an average of  $41 \pm 36$  skill levels while attempting to reach the required skill level of all 141 learning objectives.

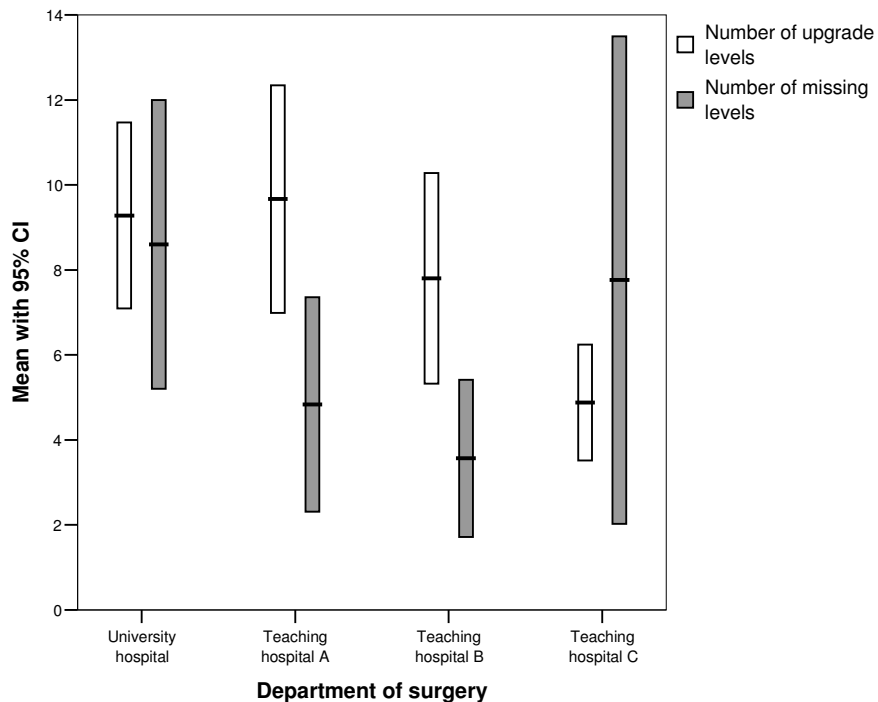
### **Teaching between hospitals**

The results showed that students in the Department of Internal Medicine achieved nearly the same number of upgrades ( $F[2,102] = 1.81$ ,  $P = 0.169$ ), but had difficulties in achieving the required skill level (i.e., had more missing levels) of the learning objectives in the teaching hospitals A and C (Fig. 2). Missing levels in teaching hospital C were significantly different from B ( $F[2,102] = 4.45$ ,  $P = 0.014$ ; Scheffé mean difference = 14.07,  $P = 0.015$ ). For example, the learning objective 'Broncoscopy' had to be reached on the skill level 1 (have heard). In teaching hospitals A and B no student missed this objective, but earned upgrades (A: 33%, B: 67%). In teaching hospital C, 13% missed this learning objective but 58% also earned upgrades. So why did 13% miss this learning objective when upgrading was obviously possible? In general, the number of missed levels was greater than the number of upgrades. This suggests that the skill levels prescribed for the learning objectives associated with internal medicine were too high.



**Figure 2.** Mean and 95% CI of achieved and missed skill levels of learning objectives taught in internal medicine, separated by teaching hospitals.

In the department of surgery the number of upgrades achieved by the students was higher than the number of missing levels, except in teaching hospital C where the opposite was true (Fig. 3). The very large confidence interval for teaching hospital C with regard to the number of missing skill levels is remarkable. This suggests that something was mismanaged in teaching hospital C. Some students had a very small number of missing skill levels while others had a very large number. The variances were not homogeneous between hospitals (Levene test:  $F[3,105] = 3.19$ ,  $P = 0.027$ ). In general students in the department of surgery in the university hospital and teaching hospital A achieved significantly more upgrades than in hospital C ( $F[3,105] = 3.81$ ,  $P = 0.012$ ; Scheffé mean difference<sub>university,C</sub> = 4.79,  $P = 0.045$ ; mean difference<sub>A,C</sub> = 4.79,  $P = 0.033$ ). The missed skill levels revealed no significant differences ( $F[3,105] = 2.15$ ,  $P = 0.098$ ) except for the aforementioned inhomogeneity of variance.



**Figure 3.** Mean and 95%-CI of reached and missed skill levels of learning objectives taught in surgery, separated by hospitals.

## Discussion

After comparing the actual reached skill levels in the logbook of all 109 students, we found that there are differences between the medical university hospital and teaching hospitals. This formed the basis of further discussion and was used to adjust and modify skill levels. The reasons why some learning objectives could not be achieved, and why upgrading was more difficult in some hospitals than in others, also became clear. Analysis of the achieved skill levels of the learning objectives in the first year of clinical clerkship showed that logbooks could be used as a steering instrument between university and teaching hospitals in order to maintain a uniform level of teaching.

Moreover, the achieved skill levels provided insight into what students actually do know. This touches upon the problem of 'hidden' curricula.<sup>10</sup> The 'declared' curriculum of universities may well differ from what is actually taught. The latter is termed the 'taught' curriculum. Other aspects not taught by the teachers may be used by the students in order to pass exams. This is termed the 'learned' curriculum. Thus, the 'hidden' part of a curriculum is the knowledge and skills acquired by students but not taught by teachers or declared by the university. In the present investigation we gained some insight into aspects included in the curriculum but not learned by students. But it remains unknown whether the respective knowledge and skills are taught or learned.

Our results are limited by the fact that we can say little about the reasons why students missed some skill levels. This is because of the unobtrusive nature of the chosen method by using a logbook which is basically used to structure clerkships and document students' efforts and not to evaluate teaching outcomes. Reasons can be of a qualitative nature (e.g., teachers not being motivated) or organizational (e.g., the skill level defined by the advisory board was set too high). For us the results were the basis for further talks with teaching hospitals in order to clear up the problems. Based on the results alone, conclusions about the quality of teaching are not possible. Nevertheless the present logbook proved to be a useful steering instrument which is easy to administer. It revealed differences between hospitals in terms of teaching and learning objectives. This is especially important for maintaining a uniform level of teaching for all students and giving hospitals feedback regarding their efforts.

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