Implementation of a structured learning environment

A structured OT visit for preclinical students

Implementierung einer strukturierten Lernumgebung

Ein strukturierter OP-Besuch für vorklinische Studierende

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Zusammenfassung:

Hintergrund: Im vorklinischen Abschnitt haben Medizinstudierende in Deutschland kaum Gelegenheit, OP-Erfahrungen zu machen; später werden diese meist in unstrukturierter Form vermittelt.

Vorhaben: Der Kurs "OP Besuch für Vorkliniker" soll die vertikale Integration in strukturierter Lernumgebung verbessern. Wir prüften Machbarkeit, Akzeptanz und mögliche Schwachpunkte.

Methode: Der Kurs besteht aus 3 Teilen. 1. Vorbereitungsaufgaben. 2. OP-Besuch. 3. Kurze Reflexion und Feedback.

Ergebnisse: 36 vorklinische Studierende nahmen teil, wir erhielten mündliches Feedback von allen und schriftliches Feedback von 24 Studierenden. Insgesamt war die Akzeptanz gut bis sehr gut. Die Machbarkeit für Studierende wie für Lehrer ist gegeben. Einige Studierende fanden die Vorbereitungsaufgaben nur "zufrieden stellend", und einige fanden die Anforderungen "etwas zu hoch".

Schlussfolgerung: Aufgrund seiner Akzeptanz und Machbarkeit sollte der Kurs im Curriculum regelmäßig angeboten werden. Die Vorbereitungsaufgaben müssen noch optimiert werden. Wir müssen Hilfestellung anbieten, damit die große Menge neuer Eindrücke im OP besser verarbeitet werden kann. Wir sollten den Kurs einer größeren Studierendenzahl anbieten können.

Schlüsselwörter: Strukturierte Lernumgebung, Vertikale Integration, Kardioanästhesie, OP-Hospitation

Abstract:

Background: During the preclinical period German medical students have little or no opportunities to make experiences in the operating theatre (OT); later these experiences are often provided in an unstructured way.

Purpose: The course "OT visit for preclinical students" is planned to improve vertical integration within a structured learning environment. We checked the project for feasibility, acceptance and flaws.

Method: The course consists of 3 parts: 1. Pre-course assignments. 2. The OT visit. 3. A short reflection and feedback.

Results: 36 preclinical students participated in the course, we received oral feedback from all students and 24 written evaluation forms. Overall acceptance both by teachers and students was good or very good. We found the course to be feasible both for teachers and students. Some students found the pre-course assignments only "satisfactory" and some found the demands "slightly excessive".

Conclusion: In terms of acceptance and feasibility, we should implement the course into our regular curriculum. We have to improve our pre-course assignments and offer some help for handling the huge amount of new impressions in the OT. We should look for a way to offer structured OT visits for a higher number of students.

Keywords: structured learning environment, vertical integration, cardiac anesthesia, operating theatre courses

Introduction

Integration of basic sciences and clinical application is a demand in modern medical curricula [8], [12], [4]. Basic sciences like anatomy or physiology are applied in the operating theatre (OT), but clinical learning environments are often not well structured. Students appreciate more structured learning environments [13], [14], [15], [10], and consequently our "structured OT visit for preclinical students" aims at the integration of selected basic science topics and their clinical application within a structured learning environment.

Method

• Structure of the course and target population

The high standardization of our cardiac procedures has been an important prerequisite. With the consent of the surgical collegues we taught the students in the OT in groups of 2.

The structure of the course is described in table 1. All phases of the course are well aligned, since alignment is also a demand in curriculum development [3].

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Table 1: Structure of the course

Phase	Who?	When?	What?	How?	Time need (approx.)
Preparation	Students	Some days before the OT visit	Selected readings. Written questions.	Working alone or in groups on given assignments with given resources (articles, books, readings, written questions)	2 hours
OT visit	Students Anesthetist	During the OT visit	Predefined objectives	2 students guided and supported by the anesthetist.	4 hours
Reflection and feedback	Students Anesthetist	At the end of the visit	Written questions. Formative feedback.	2 students work on reflection questions, receiving short oral feedback by their tutor	15 minutes

We announced the course as an elective for first-year students, because then lectures in physiology and anatomy are offered, both of them teaching relevant topics for cardiac procedures. 2 of our anesthetists, both of them experienced clinical teachers, participated as tutors. By offering the course only once a week we could compensate for course dates we had to cancel because of "unsuitable" operations or other reasons.

We asked the patients for oral consent during the preoperative visit or immediately before the operation.

• Theoretical framework for the course concept

In order to offer more than just a "sightseeing tour", we used some elements of cognitive psychology [1]: Activating prior knowledge, giving relevance, and elaborating on the learning material in the professional context. The pre-course assignments together with the first-year lectures in anatomy and physiology safeguard the knowledge base; the OT visit activates the knowledge, imparts clinical relevance and helps elaborating on the knowledge in the clinical context.

Building up a prior knowledge base is rated positively by students [14]; but the transfer of the knowledge into the practical situation is in no way guaranteed [11]. The tutor has to support the transfer, e. g. by means of open questions. The students´ sensitivity to role models has also to be kept in mind by the tutors [7], [9].

• Content aspects, pre-course assignments, learning objectives and reflection questions

The *content aspects* are chosen from the lectures in anatomy or physiology, all of them with practical relevance in the OT (see table 2).

Table 2: Content aspects

Anatomy	Mediastinal organs and structures - Heart valves and valve activity during heart cycle - Heart shape during heart cycle - Heart vessels
Physiology	Breathing and airways - Electromechanical coupling - Phases of heart cycle - Blood pressure and circulation

The obligatory *pre-course assignments* (readings and questions) serve as theoretical basis for the OT visit. As readings we offer the surgical and the anesthesiological patient information forms and some relevant chapters from basic science standard books. The written questions refer to the readings (see table 3).

Table 3: Examples for written questions in the pre-course assignments

Anatomy	Denominate on the presented blank pictures mediastinal structures, main coronary vessels and heart valves with their correct anatomical terms.
Physiology	Define the term "oxygen saturation" and write down the corresponding norm values. Denominate the phases of the heart cycle and describe corresponding blood flow. How is the cellular excitability influenced by varying extracellular potassium levels?

The learning objectives are described in table 4; here, the demands must not become overdemanding neither for the tutors nor for the students.

Table 4: Objectives of the OT visit

Objectives during induction of general anaesthesia: The students...	Objectives during operation: The students...
... apply oxygen via mask and give reasons for change in oxygen saturation.	... denominate structures during surgical preparation.
... denominate inspiration, expiration, respiratory arrest by thoracic excursions.	... denominate visible main coronary vessels.
... auscultate breathing sounds after endotracheal intubation.	... show on echo screen mitral and aortic valve, left and right ventricle, direction of blood flow (after definition of left atrium position by the tutor)
... palpate and count pulse at radial artery.	... denominate changes in heart shape in full/empty ventricle, in different contractility states (if applicable).
... show systole, diastole, blood pressure amplitude on the monitor, denominate deviations of normal values.	... denominate cardioplegic heart arrest as consequence of high extracellular potassium level.
... categorize heart rhythm as „regular/irregular", „slow/fast" and denominate deviations from normal rate.	

The formative *reflection questions* are to be answered in written form at the end of the visit. We proposed two pre-formulated questions (see table 5), but in fact the tutor is free to formulate questions that fit best to the focus of each OT visit. The tutor should give a short feedback to the students´ work.

Table 5: Examples for reflection questions at the end of the OT visit

Anatomy	Why is a stenosis of the coronary main stem so dangerous?
Physiology	Which measures did you see to reduce the oxygen consumption of the heart?

Results

36 first-year students participated from December 2003 until June 2004.

The overall oral feedback given by the students was enthusiastic. Some students suggested to make, already in the pre-course assignments, the link between theory and practice more transparent .

We got back 24 written evaluation forms. In the beginning we asked to send them back to the secretary (and 12 students didn´t); later we collected the forms at the end of the visit. The results are summarized in table 6 and table 7.

Table 6: Evaluation results. The grades are school grades with 1=excellent, 2=very good, 3=satisfactory, 4=sufficient, 5=poor, 6=unsatisfactory

Evaluation grade	1	2	3	4	5	6	n
How helpful are the precourse assignments in the context of the course?	11	9	4	0	0	0	24
How well was the integration of preclinical theory and practical application achieved by the course?	16	4	4	0	0	0	24
How helpful are your today´s experiences in the context of your studies?	24	0	0	0	0	0	24
What overall grade do you give to the course?	20	4	0	0	0	0	24

Table 7: Rating of the course´s demands by the students (n=24)

How do you rate the course´s demands?						
Extremely too low	Somewhat too low	Slightly too low	Adequate	Slightly too high	Somewhat too high	Extremely too high
0	0	0	16	8	0	0

Both tutors have been satisfied with the course. They consider the course to be feasible in terms of additional stress during the procedure they performed. None of our patients refused his consent to the students´ participation.

Discussion and perspective

Our project shows that it is possible to create structured learning environments in the context of highly standardized operating procedures, and that the preclinical students appreciate such an offer. The outstanding evaluation might be biased by factors like: very enthusiastic clinical teachers, the high motivation of preclinical students to get into the "real life" and the wish to appreciate this type of curricular innovation; and last but not least the small number of students involved.

The "satisfactory" grade only given by some students for the contribution of the pre-course assignments could possibly be improved by making more transparent the practical implication of the assignments in a little "preparation guide". The fear that the demands of such a course would be excessive proved to be not justified. The majority ranked them as "adequate"; the "slightly too high" rank from some students might be caused by the overwhelming impressions of the OT, beyond the learning objectives we actually aimed at. In an improved "preparation guide" we should indicate that it is not expected to understand the procedure in all its details, and that concentrating on the learning objectives is helpful to handle the huge amount of new impressions.

It seems to be worthwhile to offer the course for a higher number of students. So we should invite other colleagues performing OT procedures with high frequency and high standardization. Having in mind the importance of "alignment" and of "common ownership" [2], [3], [5], we then should be ready to train the colleagues and to create a common steering function for the course.

Conclusion

We should offer the course on a regular basis within the elective part of our first-year curriculum. To compensate for some minor flaws in the pre-course phase and in the intraoperative demands we should offer a "preparation guide", showing the relevance of the pre-course assignments and preparing the students to concentrate on the learning objectives. To be able to offer the course for a higher number of students we should include other disciplines performing procedures with a high degree of frequency and standardization. To safeguard the course´s quality we have to train the new tutors, focussing on two main points: integration of basic sciences and clinical application on one hand, and keeping "aligned structuring" within the course on the other.

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