

Surgical teaching at the Medical School of Otto-von-Guericke University in Magdeburg – basic conceptual description

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ABSTRACT:

Teaching in surgery, one of the classical vast clinical and main disciplines beside internal medicine, also needs to be associated with great attention in regard to a valuable final result at the end of the study of human medicine. Surgery is not only the subject of a large number of lectures; it also represents one third (four months) of compulsory internship (practical year – in German, „Praktisches Jahr“) at the end of the study of medicine. Therefore, medical teaching of students should always be a part of serious and steady attempts to optimize the curriculum and contents as a component of guiding activities that focus on substantial improvement of the study of medicine. In detail, the classical and traditionally established type of teaching, i.e., the (oral) lecture, requires to be further developed and reasonably completed by numerous interactive and practice-oriented teaching, learning and examining modalities (obligatory or facultative seminars/courses, training in [very] small groups of students, bed-side teaching, individual practical exercises within the SkillsLab, groups of young researchers, research projects in teaching, scientific publications on topics and recommendable experiences of teaching that include students, „Teach-the-teacher“ projects etc.). Although many novel concepts have been inaugurated and considerable advances have been achieved, there is a steady need for further improvement. In the presented representative, but medical school-specific overview, the current complex surgical teaching concept, which has been continuously optimized over the last couple of years at the Otto-von-Guericke University Medical School with a University Hospital of Magdeburg (Germany) is described as a scientific and systematizing document as well as a manuscript associated with ongoing preparation of an institutional “Teaching Manual” on surgical teaching and training for medical students. It should – last but not least – provide the basis for a public discussion, which might hopefully and possibly result in further structural reforms of (surgical) teaching in the near future.

KEYWORDS:

Surgical teaching – Lecture – Seminar – clinical bed-side teaching – (4th year of the study of medicine) – General / specialized surgery – Surgical internship as a medical student of the sixth year

INTRODUCTION

Surgical teaching and training can be considered one of the three columns of a clinician's work at the University Medical School with a University Hospital in addition to patient care and research, but it can be also considered a “second leg to stand on” for Teaching Hospitals. Despite this well-recognized statement, it has to assert itself on a sovereign position, and it is spread only on the shoulders of a few teaching enthusiasts and appointees. While the mandatory steps of a residency seem to be generally accepted, the obliging teaching approach of each physician independently on a hierarchic level still needs to be established in a much better manner in the future. This can be considered a general demand for each hospital either profile of care, which is envision itself as teaching hospital.

The aim of this overview is to illustrate single institutional/institution-specific components of surgical teaching and training at the Magdeburg's Otto-von-Guericke University Medical School with a University Hospital and to explain them in the light of published concepts, which are selectively discussed.

CURRICULAR TEACHING

Main lectures (oral lecture series)

Oral lectures belong to the “most traditional” types of, in particular, academic teaching, which was already used at the universities of the middle ages [1]. During that time, lectures were generated, since books were extremely rare and not available for everybody, which lead to the fact that an available book needed to be read loudly for several listeners. Even as part of present teaching, lectures still represent a central and indispensable component. The main surgical course (of a lecture) is usually held for the students of human medicine in their 4th year (7th semester) during the winter semester (foot note *) to notice: In Magdeburg, there is a start of the study of human medicine only in the fall). This course is subdivided into parts “General surgery” and “Special surgery” and comprises 17 hours in a week. “General surgery” illustrates topics such as types and treatment of wounds, medical history and clinical investigation from a surgical point of view, patient's consent form, perioperative management and others ([LINK 1 – excerpt from the course plan of surgical disciplines – anonymized with regard to lecturers](#)). Hereafter, the course part “Special surgery” follows, in which relevant

disease pictures and injuries as well as their surgical management are presented. As a specific characteristic of the Magdeburg's Otto-von-Guericke University Medical School, the main surgical course (oral lecture series) has been widely presented according to establishing trends and students' advocacy as:

1. organ-related (and)
2. integrative lecture with other medical disciplines for approximately 3 years. The disposition was scheduled according to various organ systems such as:
 - "Heart, blood circulation and lung",
 - "Endocrine system",
 - "Gastrointestinal tract",
 - "Hepatobiliary system",
 - "Peripheral and central nervous system" (and)
 - "Musculoskeletal system".

A completing section is dedicated to:

- "Plastic and reconstructing surgery" (and)
- "Pediatric surgery".

The subject matter is presented to the students as an integrative approach together with other medical disciplines, i.e., during surgical lectures docents from disciplines such as Internal Medicine (Cardiology, Angiology, Pneumology, Nephrology, Endocrinology) and Pathology participate ([LINK 2 – Interdisciplinary course plan, anonymized](#)) are integrated.

The winter semester is finished by a "First Surgical partial written exam", which is performed in order to test:

- theoretical knowledge and, thus, the fulfilled prediction of the students to take part in the subsequent "Surgical Clinical Practice" (and)
- competent clinical bed-side approach to a surgical patient.

An additional part of the main surgical course (oral lecture series) takes place during the summer semester accompanying the "Surgical Clinical Practice" and pursuing the following topics and aspects such as:

- New trends in surgery,
- Current research data from surgery (published in international scientific literature),
- Interdisciplinary concepts,
- Surgery in an out-patient clinic setting,
- Interdisciplinary topic areas,
- (e.g., vascular surgical aspects in general and abdominal surgery) (and)
- Studies.

with a limited lecture time contingent of overall 16 "lecture hours" of 45 min each. Even this part of the main surgical course with an oral lecture series is given as integrative and, increasingly, an interactive approach ([LINK 3 – Plan of the "Main surgical course" with an oral lecture series of the summer semester, anonymized](#)). "Surgical Clinical Practice and Practical Training" (in German, "Blockpraktikum") Surgical Clinical Practice:

- comprises 56 lecture hours (45 min each),
- takes place during the summer semester of the 4th year of the study of human medicine (8th semester) (and)
- extends 2 weeks of the year (in particular, 4 days / week),

for which the 200-220 medical students of each age group are subdivided into 8 main groups and further, into 5 small groups (of each main group) according to the specific organizing requirements (such as rotations, combinations) of other medical disciplines with regard to their "Practical Trainings". The intended number of students in each small group is 5-6; however, the original intent as part of reforming efforts focused on a more ideal number of only 3 (-4) students, which could not be further pursued in the light of the steadily increasing overall number of medical students each year. In relation to a single student, there are 3 teaching units of 6 x 45 min (Monday to Wednesday) and 1 teaching unit of 10 x 45 min (Thursday) – possibly with the integration of medical students already in the morning round on single wards as part of their general integration into daily surgical practice over the whole time of the Surgical Clinical Practical Training (remaining individual decision of each surgical discipline) but realizing a rotation through 5 surgical disciplines taking part in the Surgical Clinical Practical Training:

- General, Abdominal and Vascular surgery (3 wards, 1 surgical ICU)
- Pediatric surgery (1 ward)
- Heart and Thoracic surgery (2 wards, 1 ICU)
- Plastic, Reconstructing and Hand surgery (1 ward)
- Traumatology (1 ward).

As part of the demanding and coordinating efforts in the organization of the "Surgical Clinical Practical Training", a possible stay of the students at one rotating position for 2-3 days (most likely at wards of the Dept. of General, Abdominal and Vascular Surgery) is intended, in particular, to follow specific patient courses ([LINK 4 – exemplary rotation plan, anonymized](#)).

At the beginning of the semester and/or Surgical Clinical Practical Training, an introductory lecture (with interactive options), in particular, with regard to the organizing aspects of the "Surgical Clinical Practical Training", is given.

Structuring of the Surgical-Clinical-Practical-Training contents is individual and sovereign responsibility of each surgical discipline.

In the Dept. of General, Abdominal and Vascular Surgery, the student groups are further – if it is realistic to do so on the specific day of "Surgical Clinical Practical Training" – subdivided to maximize individuality of a clinical and bed-side teaching and practical training. Topic-related contents of the "Surgical Clinical Practical Training" are adjusted to individual students' wishes – the students are asked to express their specific ideas. In addition, there are ward-specific teaching plans on possible contents to be presented and trained as an orientation according to the preferred profile of:

- patient care at each ward (and)
- each surgeon working at the specific ward ([LINK 5 – exemplary ward-specific topic profile](#)).

In detail:



Fig. 1. In the SkillsLab, medical students are offered to practice the laparoscopic approach using the „Pelvi-Trainer“ under supervision (Dept. of General, Abdominal and Vascular Surgery).



Fig. 2. The basic knot and suture techniques are exercised during the „Knot-and-Suture course“ (Dept. of Plastic, Aesthetic and Hand Surgery – images from the SkillsLab).

* On the 1st day of the “Surgical Clinical Practical Training“ (on Monday), students undergo an introductory seminar including the so-called “OP cinema“ to screen OP videos on basic surgical interventions such as appendectomy, cholecystectomy and thyroidal resection.

* On the subsequent day (on Tuesday), students train “Behavior in the operating room“, e.g.,

- With regard to sterility incl. hand disinfection,
- To put on sterile gloves sterile and a sterile scrub,
- Position of the patient (and)
- To prepare / disinfect / cover the operating area, (and)
- Moving in the operating room.

* On the on day (on Wednesday), “Surgical Clinical Practical Training“ focuses specifically on surgically relevant imaging based on typical images from:

- Conventional X-ray,

- CT scan,
- MRI,
- DSA,
- PET-CT.

* On the last day of the 4-day “Surgical-Clinical-Practical-Training“ week (on Tuesday), students of the rotating groups have the opportunity to practice laparoscopic interventions using the “Pelvitrainer“ at the SkillsLab [2].

In the afternoon of this 4th day, a surgical seminar of the Dept. of General, Abdominal and Vascular Surgery is held by surgical docents of the Magdeburg’s Otto-von-Guericke University Medical School, who have a teaching assignment (surgical “Venia legendi“) and work as employees clinically at other hospitals.

The seminar extends 2 double teaching hours (2 x 90 min) – the selection of surgical topics is left to the docent but, again, topics are adjusted to individual students’ wishes – the students are asked to express their specific ideas. Thus, this approach allows to achieve a reasonable compromise of bilateral benefit,

- on one hand, it puts into effect an active and diversified transfer of knowledge on aspects of
- daily surgical practice, (and)
- on the other hand, it allows that surgical docents can give surgical lectures and seminars according to their teaching assignment.

As part of the rotation during the “Surgical Clinical Practical Training“, surgeons from the Dept. of Plastic, Reconstructing and Hand Surgery perform a “Knot-and-Suture class“ over 6 teaching hours (6 x 45 min), teaching suture techniques such as single-not suture, ongoing suture, surgical knots by hand or by instrument (needle holder). In addition, basics of surgical wound care are presented.

The colleagues of the Dept. of Traumatology perform a class on traumatological physical examination and specific traumatological aspects and diagnoses. In addition to this, wound dressing and cast techniques are demonstrated and students can extensively practice these techniques – in total, over 6 teaching hours (6 x 45 min).

Each day of the “Surgical Clinical Practical Training“ was assessed by the students according to the requirements of the “Landesprüfungsamt“ (German District Examination Office) Saxony-Anhalt in Halle (Germany). These assessments ranged from “good“ to “excellent“ based on the partially enthusiastic acceptance of the “Surgical Clinical Practical Training“ by the students. Efforts to objectify the assessment focus on:

- from now on, on the results of the written exam, which constitutes proof of knowledge transferred and mediated by the Surgical Clinical Practical Training (as well as)
- in the future (from the next age group [4th year of the study of human medicine] on), on the introduction of surgical “objective structured clinical examination“ (OSCE) (see also below section “Outlook“) which, however, requires elaborate preparation (see also relevant publications).

Laparoscopic exercises using the “Pelvi-Trainer“ (**Fig. 1**), “Knot-and-suture class“ (**Fig. 2**) as well as “Wound-dressing-and-cast class“



Fig. 3. Wound dressing and cast techniques can be practiced during the “Wound Dressing and Cast Technique course” in addition to the traumatological examination aspects (responsible for course organization and supervision, Dept. of Traumatology).

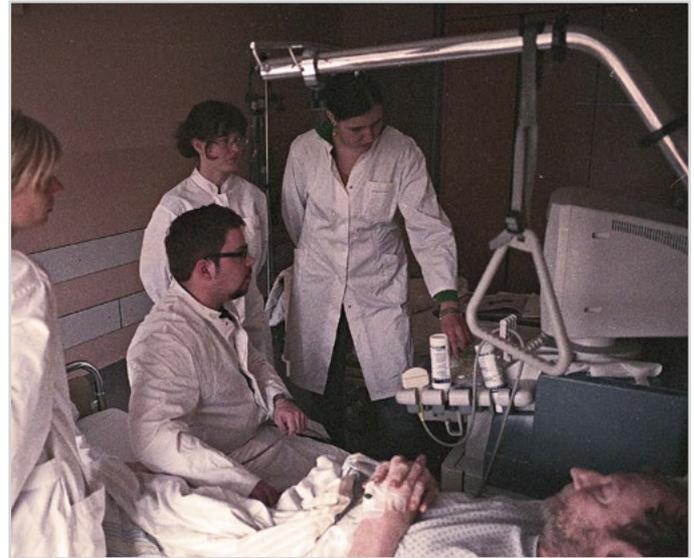


Fig. 4. Snapshot from the facultative seminar „Bed-Side Teaching and Surgical Lectures” held by the Dept. of General, Abdominal and Vascular Surgery.



Fig. 5. Snapshot from the facultative seminar „Bed-Side Teaching and Surgical Lectures” held by the Dept. of General, Abdominal and Vascular Surgery.



Fig. 6. Situational impression - seminar „Surgical Quality Assurance”.

(**Fig. 3**) are performed in the “SkillsLab” called “MAMBA” (“Magdeburger Ausbildungszentrum für Medizinische Basisfertigkeiten” – “Magdeburg’s Training Center for Basic Medical Skills”) which:

- has been established and continuously optimized for years ([3] and manuscript in preparation),
- is open for further use – also in the short run – such as:
 - individual teaching appointments,
 - facultative seminars (see below) (as well as)
 - small scientific symposia,
 - oral presentations (or)
 - hands-on courses.

Numerous individual talks with students provide evidence for the favorable acceptance of the “Surgical-Clinical-Practical-Training” concept based on diversity and the rotation principle (opinion of numerous surgical colleagues representing teaching) versus alternative conceptual ideas (stay on one specific ward during the

whole practical training) of other clinical disciplines but this is not yet adequately reflected by the questionnaire-associated students’ assessment results mainly due to only moderate attendance (see below).

Surgical teaching and training is finished with a conclusion of a written exam at the end of the summer semester, which:

- has been extended by specific “Surgical-Clinical-Practical-Training” questions since this year (and)
- is usually included with 60 % in final score on surgery.

FACULTATIVE TEACHING OFFERS

Beside main surgical lectures and practical training, which needs to be completed with a certificate (see above), the surgical disciplines of the Magdeburg’s Otto-von-Guericke University Medical School with University Hospital offer several further learning programs

(in the majority of cases on Wednesday or according to an individual agreement) in addition to curricular teaching, in particular, for the students of the 4th year of their study of human medicine, but also for students of older or younger age groups. In detail:

1. Approximately twice a month, a one- to two-hour “Surgical Ultrasound Class” takes place according to the individual teaching needs of the participants and individual agreement of the participants with a tutor (**Fig. 4**). This class provides specific knowledge and practical training of surgical and emergency ultrasound; it extends over two semesters. The class is open for all students independently of their year of study of human medicine but, in particular, for students of the 4th year. With small groups of 5-7 students, ultrasound is trained bed side using a mobile ultrasound device. Hereby, the students learn early to link information obtained from medical history, physical examination (palpation and auscultation) with that from the ultrasound-based imaging. In addition, a physician-patient interaction (e.g., consent for performing ultrasound, patient’s position, respiratory maneuvers etc.) is trained. The Surgical Ultrasound Class has been created an enthusiastic echo in students; for the class, a further tutor has become necessary to match the students’ needs so far. The class was almost invariably accepted with a positive response by the students.

2.) Furthermore, one seminar per months is offered which is called (original title) “Bed-side teaching and surgical lectures” - **Fig. 5**), the oldest facultative seminar, which has been in the spectrum of teaching appointments and has enjoyed a large clientele for 11 years. The participating students get the option to prepare for a scientific or clinical stay in an English-speaking country.

3.) A combination of a theoretical seminar and possible practical training is the teaching offer for “No fear in case of an acute abdomen” (**LINK 6 – designed as a seminar**). Within this class, the term “Acute Abdomen” and its theoretical content is extensively characterized and associated with surgical disorders, also various diagnoses are explained with regard to symptomatology, clinical pictures and surgical care based on publications, images and videos, for which there is usually less time left in regular lectures. This teaching appointment is considered a reasonable addition and a course review to the main surgical lecture. The specific aim is characterization and consolidation of the possible procedural steps / approach in case of a (simulated) patient with an acute abdomen but also practicing the examination of test persons and models.

The following aspects are trained by the participants, in detail:

- Medical history,
- Clinical overview,
- i.v. access (on a model) / infusions / analgetic therapy (substances and doses),
- Aspects of physical examination and its variants depending on specific clinical situations,
- Practical training of inserting a gastric tube (on a model),
- Clinical decision-making to set up a suspected diagnosis by each participant
- Simulated decision for further clinical/surgical care (whether required),
- Pictures of the intraoperative situs or videos.

4.) Seminar series “Learning by repeating – Understanding by seeing” This series focusses, in particular, on image-guided demonstration (videos, images) of teaching contents and, based on this, on image-dependent understanding of various disorders. The seminar course is interactive at all times (the tutor introduces only the seminar) meaning that the presentation can be interrupted at all times and at each point of the presentation. Currently, course presentations of the tutor comprise the most frequent surgical disorders and interventions such as:

- Appendicitis,
- Hernia,
- Gastric surgery (and)
- Colorectal surgery.

The extension to more complex topics such as hepatobiliary and pancreas surgery as well as organ transplantation, is planned (**LINK 7 – “Understanding by Seeing”**).

5.) Seminar “Surgical Quality Assurance” This monthly one-hour seminar over the whole semester has been derived from the great traditions of the Otto-von-Guericke University at Magdeburg with regard to surgical quality assurance and characterizes extensively surgical disorders with clinical signs and symptoms as well as surgical interventions to treat them (as additional part of the main surgical lecture series), in which quality assurance is mandatory at presence such as:

- Desobliteration of the internal carotid artery,
- Cholecystectomy,
- Extraclinically acquired pneumonia.

In addition to this, the known profile of the Institute of Quality Assurance at the Magdeburg’s Otto-von-Guericke University comprising disorders and procedures such as:

- Colorectal cancer surgery,
- Surgical care of gastric cancer,
- Surgical interventions at the pancreas,
- Hernia surgery,
- SILS-based interventions

is the subject of the presentations and discussions during the seminar. Even the establishment of a reasonable error culture is promoted during the seminar [4].

6.) Accompanying surgical service (2-3 students) A further facultative teaching offer provides the option to take part in a surgical service as a member of a surgical team (general and abdominal surgery; pediatric surgery) during the time period from 4:00 p.m. to 07:00 a.m. of the next day if a team of surgeons is on call. Entry to the surgical service is possible at all times (recommendable at the time of taking over; also on weekends and holidays). Simultaneously, the duration can be scheduled by individual choice. Hereby, students can become acquainted with surgically relevant injuries and surgical disorders, which, in particular, occur during the time periods of surgical service and which can be explained by the surgeons being on call. This can be used as reasonable preparation of the first students’ own services in the clinic after the state exam, finally to facilitate entry into their professional lives.

7.) Voluntary assistance in surgical interventions Since 2009, there has been a voluntary option for students, in particular, during their 4th year of the study of human medicine, to assist as a member of the operating team. This is an additional offer, which is provided externally of each other curricular teaching event and time point such as “Main surgical lecture series“ and “Surgical Clinical Practical Training“. One to two students need to be at the surgical ICU in the morning of the operating day after former coordination in the whole group of interested students for final arrangements of the definitive operating program and among the members of the operating teams integrating 1-2 students. Thus, the students have the opportunity to take part in surgical interventions of a tertiary center of general, abdominal and vascular surgery (the name-giving profile of the reporting department of surgery) as well as to learn and initially practice the required abilities for a physician prior to their 6th year of the study of human medicine.

8.) SkillsLab ([3] and manuscript submitted) On 2009, Otto-von-Guericke University Medical School with University Hospital at Magdeburg established an interdisciplinary “SkillsLab“, in which practical abilities and medical courses of action can be demonstrated using appropriate models. SkillsLab-based courses such as:

- Clinical examination course,
- Knot-and-suture course,
- Emergency medicine,
- Venous puncture (and)
- POL(Problem-Oriented Learning)-courses, e.g., on:
 - Pathophysiological mechanisms,
 - Oncology (and)
 - Pain

are offered independently of the obligatory surgical teaching contents.

The following sessions and courses can be voluntarily attended as part of the broad interdisciplinary spectrum:

- Advanced-life-support course (ALS) I and II
- ALS training
- Airway Management I and II
- Basic-life-support course (BLS) I and II
- ECG course
- Free auscultation on a (SAM) heart and lung simulator
- Gynecological examination course
- Lumbar puncture
- Orthopedic-examination course
- Ophthalmological-examination course
- Venous puncture I - III
- Knot-and-suture course (continued)
- Operative-hygiene course
- Ultrasound course (non-surgical).

TEACHING MANUAL

As part of this systematic teaching documentation of the conceptual and event spectrum, the idea of a “Teaching manual“ was generated, which meticulously summarizes and demonstrates the traditional and modified, proven and established (but also establishing [after inauguration]) as well as planned (or being planned [shortly before inauguration]) main lectures, seminars, courses

and other teaching events („Teaching manual“ in preparation – currently, prefinal version).

“Practical year“ (PY) – Surgical Third of the 6th year (of the study of human medicine) and PY-logbook

For PY-students (students of the study of human medicine in their 6th year), a mandatory PY-logbook is released for the 4-month surgical third of the 6th year. It serves as a structure description and guidance for self-organized learning during the so-called “Practical year“. The logbook derived from the basis document of the Central Conference of Medical Schools (“Medizinischer Fakultätentag“ - MFT) of 2012, supplemented with details and adapted to the specifics of various medical disciplines and Magdeburg’s Medical School, it comprises the section “Basic abilities“, which consists of essential skills required for surgery such as:

- Pain therapy,
- Consent talk,
- Wound treatment,
- Disinfection and sterility in the operating room (as well as)
- Principles of patient’s positioning and methods in the operating room.

The single points were classified according to the criteria:

- A (Demonstration),
- B (Performed under supervision) and
- C (transferred into routine).

The added section consists of the skills on the surgically relevant and, in particular, frequent disorders such as:

- Acute abdomen,
- Peripheral arterial occlusion disease (or)
- Sepsis (etc.).

For these aspects, the same assessment criteria (A–C) are used. The last section “Surgical interventions“ classifies the students’ knowledge with regard to specific operations, e.g.,

- Laparotomy,
- Endoprosthesis of the hip (or)
- Thrombembolectomy (and others)

in a similar manner as for the other sections. The logbook is signed by the surgical attending responsible for teaching or the head of the department at the end of the 4 months in surgery. In addition to the logbook on the “Practical year“ (PY), a manual on the “Practical year“ (PY) is being prepared, which is to summarize important information and advices for students and, thus, facilitate first steps during the “Practical year“ (PY) (publication in preparation) ([LINK 8 – prefinal version of the PY-logbook](#); [LINK 9 – information flyer on the “Practical year“ in surgery](#); [LINK 10 – Welcome to the “Practical year“ in surgery](#)).

Surgical internship (during semester interruption - clinical part of the study of human medicine [in German, “Famulatur“])

This type of surgical internship is getting more and more accep-

tance and appreciation; it is offered to students, in particular, to those of the own Medical School with an appropriate application form including curriculum, health certificate and certificate of an existing/ongoing matriculation in Germany.

PY-Seminar

(LINK 11 – PY-seminar plan, anonymized)

Every two weeks, a PY seminar takes place, which is performed by the head of the departments or attendings responsible for surgical teaching of each surgical discipline. The seminar is scheduled for 120 min and presents diagnostic and therapeutic options of various surgical disciplines such as General, Abdominal and Vascular Surgery, Heart and Thoracic Surgery, Traumatology and Plastic and Esthetic Surgery as well as Pediatric Surgery for students in an interactive manner. Attendance to this seminar is mandatory for PY-students.

ERASMUS exchange program (experiences of exchange students - [Ref.: URL aus UMMDD])

Magdeburg's Medical School is an active partner of the Europe-wide ERASMUS exchange program, which accepts mutually certificates of the accomplished teaching courses. It has been well proved to hire a student in charge from Magdeburg who himself stayed in another country as previously as an exchange student a certain period of time to:

- welcome exchange students from other countries at Magdeburg's School of Medicine,
- assist them during the initial time period of their stay, e.g., in administration affairs such as accommodation, working clothes, appointment at the company doctor's office (and)
- to integrate the guest students as soon as possible.

Teaching working group in surgery

For a few semesters, the so-called "Teaching working group in surgery" has been successfully established. This group comes together once a month (more frequently, if necessary). The members are teaching representatives of single surgical departments, sometimes the group appointment is also attended by department heads, the persons in charge with regard to teaching affairs. This group has been proven to talk and decide on specific current teaching problems, which can be recommended.

Teaching bureau in surgery

Similarly to the teaching working group, a teaching bureau in surgery has been established for several months, which serves as a contact point for student problems, which has been well proven, in addition to very favorable personal contacts, direct communication and email-based correspondence in time.

Teaching assessment by students

Students are steadily asked to assess teaching events in surgery aiming for continuous feedback and subsequent improvement of teaching but also with the students' involvement, in particular, to get a representative judgement on the value of teaching, in particular, from students. For this, each teaching event is rated from 1 to 6. The assessment questionnaire comprises various categories such as a subjective overall assessment of teaching events. Then,

the questionnaire asks how teaching events prepare for:

- written exams in surgery,
- state exam (and)
- daily practice as a physician.

Hereafter, there are boxes for free text including positive and negative criticisms. As the last part, the assessing student is asked what medical discipline he/she focusses on and whether teaching events have influenced this decision (manuscript under review). This document has the copyright of the "Main office for student affairs".

Surgical activities in teaching events of other (medical) disciplines

Surgical representatives are also active in teaching events of other medical disciplines, e.g., in the interdisciplinary complex seminar:

- "Fit for Famulatur" (surgical/medical internship) (and)
- "Fit for PY (practical year)",

taking place once a week, which has been inaugurated and which is held by a cardiologist (from the Dept. of Cardiology, Pneumology und Angiology – University Hospital at Magdeburg).

DISCUSSION

There is a broad agreement on the fact that the traditional "frontal lesson" of an oral lecture and theoretical education of a seminar are not enough for sufficient training to become a capable physician [5,6]. This is, in particular, true for surgery, in which – in addition to theoretical knowledge – practical abilities need to be mastered in order to be well-prepared for the state exam and forearmed for professional entrance [7]. §2 of the medical license regulations determine the frame for various teaching events, which need to be held by a university. In practice, this means "Seminars comprising minimally 98 hours as integrated events, in which suitable disciplines need to be integrated, and moreover further seminars with clinical relation comprising minimally 56 hours." In addition "minimally 20 % of the practical trainings after the 1st part of the state exam [...] need to be presented as coherent practical training events." 476 hours of "bed-side-training" need to include patient demonstration and patient examination [8].

Within this frame, an optimal and motivating education and practical training have to be demanded, which prepare sufficiently for the medical profession [9]. This appears necessary, in particular, due to the fact that surgical training does not seem to be very attractive to today's medical students. Only 8.9 % of the students still want to begin a residency in general surgery according to a survey from the German district Baden-Württemberg. Attraction to surgery or surgical disciplines might be positively influenced by an appealing practical training in one of the surgical disciplines as well as by a positive role model [10]. With the presented teaching concept, it is attempted to match the demanding requirements in the best way possible and to design theoretical education and practical training as reasonable parts of surgical teaching in an attractive manner and, in particular, one that is practice-oriented. Hereby, a balanced ratio between oral lectures, seminars, practical training as well as autonomous and self-reliant learning needs to

be achieved [11,12]. A similar teaching concept has been inaugurated and published by the Ludwig-Maximilian's-University Medical School in Munich (Germany) [13]. It remains to be expected that such teaching concepts will be developed and established region-widely at many Medical Schools with University Hospitals in order to implement various conceptual and institution-specific ideas. Additional approaches such as that by the Theodor-Billroth Academy*, in which engaged medical students are enabled by sufficient preparation to begin a surgical residency in an appropriate manner [14], deserve particularly high recognition.

Teaching is associated with time investment and, therefore, surgical colleagues who have a teaching assignment need to be basically excused from the demands of patients' care at that time. This demand appears trivial but the arrangement can be very difficult from time to time. A substantial prediction is early coordination between the "Central office for student affairs" and the single department(s) even if there are similar or repeating time frames during the semester from year to year. Thus, teaching needs to be taken into account in planning clinical service or vacation since patients' care plus teaching can only be put into effect successfully during the period of peak activity if the whole team is available. In addition, it is important for internal planning of a department that the appointments are fixed for the colleagues with teaching assignments a long time in advance. Department internal workplans, in particular, related to upcoming obligations, are recommendable (e.g., as in the own Department of Traumatology, in which teaching has a fixed and equal place among the workplan obligations for colleagues such as emergency room, outpatient clinic, normal ward, ICU/IMC, operating room etc.). Thus, it is guaranteed that the responsible colleagues can fully dedicate themselves to their teaching activities during a specific time period (in particular, to avoid the prompt unexpected request for someone to: "Take over") (personal communication, S. Piatek). Furthermore, it is also urgent to improve education and practical training of academic teachers, surgical colleagues with teaching assignments. The "Faculty Development Program in Teaching Skills" which has been successfully established at the Johns Hopkins University in Baltimore/MD (U.S.A.) needs to be increasingly discussed [15]. It would also be imaginable that medical students can be involved in teaching activities. According to a study by Haist et al., basic clinical examination techniques can already be taught by medical students in their advanced part of the study of medicine as effectively as by Faculty Members [16]. For instance, exam results could be improved by the employment of student tutors [17,18]. The lower difference in age and social status can contribute to a better informal atmosphere, which may facilitate the learning process [19]. Student tutors benefit from the preparation of teaching appointments with a more intense understanding of the teaching contents and development of greater self-confidence in their role as teachers [20,21]. In addition, student tutors are completely accepted by students, for which an appropriate training and adequate supervision of the tutors are an absolute prediction [22,23]. Single projects to educate student tutors have existed in Europe [24,25] as well as in the U.S.A. [26,27] for a long time but with no standardization so far, meaning that there are still great development needs [28].

SkillsLab

According to already published data, the inauguration of SkillsLab-based courses has been particularly appreciated by the stu-

dents [6,29]. Steps to standardize teaching methods especially for such SkillsLab-based courses, e.g., by means of the so-called "Four-Step-Approach" by Peyton have been already undertaken [30]. In addition, a survey among graduates of the study of human medicine at the own institution showed, that the majority of medical students prefers problem-oriented learning (POL – as mentioned above) versus frontal lecture [31]. In particular, "Soft skills" such as:

- "Interdisciplinary thinking",
- "Psychosocial competence",
- "Capacity for teamwork", and
- "Ability for problem solution"

were assessed with a conclusion that they can be learned more effectively via POL. The study also showed that self-assessment of the acquired abilities during POL is inadequate. This means that these courses may not become a self-selling item but they need to be accomplished by a real exam [32]. However, at the Otto-von-Guericke University Medical School with University Hospital of Magdeburg, feedback to the SkillsLab-based courses is completely positive, and a scientific evaluation of the students' assessments is planned.

Documentation of teaching quality

The acquisition of teaching quality is still underestimated. On one hand, there are very hopeful approaches to document the students' assessments of teaching, e.g., via ways of questionnaires even at the Otto-von-Guericke University Medical School with a University Hospital at Magdeburg, but conclusions whether the assessments are positive or negative are still missing. In relation to this fact, various measures have been demanded so far, e.g., assessment instruments such as the assessment score are demanded and might be introduced, which can be considered similar to the impact factor of registered scientific journals [33]. A high score could lead to personalized financial donations for research. Or, a teaching concept might become part of the specific German (scientific) doctoral degree called "Habilitation". The German Society of Surgery ("Deutsche Gesellschaft für Chirurgie") could compile guidelines which could be named "Good Teaching Practice" in addition to the very active working group "Surgical teaching" of the society, which might acquire an increasing country-wide presence by pioneering recommendations and periodic teaching conferences. Furthermore, more teaching prizes could be awarded.

Practical year

According to a survey of the publishing company "Thieme", medical students think they are not well-prepared to the surgical third of the practical year (4 months of the 6th year of the study of human medicine) [34] (see also above) as 29 % of participating medical students declared. The trend to complete an internship in foreign countries appears slightly decelerated – despite this, 20 % of the medical students have gone to foreign countries for the surgical part of the practical year in 2011 while in 2009, every fourth medical student did this.

The concern that medical students are "misused" as cheap employees is still existing despite an inaugurated payment for medical students, which is one of the most important advances of the last years. Fortunately, there is also a trend existent apart from this concern. The surgical third of the practical year is no longer the

worst part: 27 % of medical students stated that they sometimes feel like a cheap employee while during the obligatory third of internal medicine, 36 % had this conviction.

Furthermore, attention needs to be focused on the fact that surgery is becoming more attractive to beginners to prevent a shortage of recruits [35-38]. Such shortage of recruits has become distinctly apparent – therefore, 1,200 young professionals would have to start a surgical residency yearly to match the estimated need of 4,000 young surgeons until 2020. However, only 400 to 600 do so and an unknown number of them changes into another medical discipline after they start a surgical residency [39].

In the License of practice medicine regulations (“Ärztliche Approbationsordnung” [“ÄAO“]), the teaching contents for the surgical part of the practical year are very vague; e.g., the students should, according to §3, section 4, of the License of practice medicine regulations (ÄAO) during the practical year “... intensify and extend the knowledge, abilities and skills acquired during the previous study of human medicine. They should learn to apply them to single clinical cases. For this purpose, they should perform similar to physicians according to their educational level with guidance and supervision by the teaching physician(s)” [40].

As a reasonable instrument to improve medical education and practical training during the practical year, logbooks have been introduced at several Medical Schools. Such logbooks content a reasonable list of abilities and skills which need to be acquired and which can be checked and confirmed. The logbook should serve as orientation for exams and should provide the option to document deficits in teaching in certain parts but also to compensate them by clear visualization. According to a study of the University at Greifswald (Germany), 39 % of the medical students believe that a logbook has improved the practical training of medical students in surgery [41]. A possible cause for this is that despite the logbook, teaching of medical students cannot be claimed and the teaching quality strongly depends on the personality of the tutor. Even this problem has been discussed in an article by Busemann et al. [41]. Medical students in their 6th year (practical year) demand more:

- Personal feedback from a mentor,
- Bed-side teaching (and)
- Supervision in practical work.

Even here, there is need for improvement, e.g., by ways of analysis of the logbook in between by a teaching representative who needs to possess appropriate competence for adequate measures to improve tutoring for further courses of the practical year. At the Medical School with University Hospital at Cologne (Germany), 82 % of the medical students assessed logbooks during the practical year as very positive, whereby no disorders were included. Instead, clinic processes and clinical work at the ward were strongly emphasized [42].

Since novel teaching concepts as described above (in contrast to „frontal lessons“ such as oral lecture), the distinct need for more personal capacity, release of the surgical colleague from a teaching assignment from other obligations has to be demanded [43]. Even in relation to this, there is need for further improvement at almost all German Medical Schools with University Hospitals. Such a “multimodal“ teaching concept should be – similar to a curricular structure – continued with no interruption to the connected

surgical residency [44,45].

Internet-based educational aid such as “webop.de“ will become of greater importance already in the near future [46].

In addition, costs need to be taken into account. Study results show that the costs of longer operating times and higher complication rates decrease with greater experience of the resident. A possibly good and practice-oriented theoretical education and practical training is therefore in the great interest of the whole society and economy [47].

OUTLOOK

Teaching concepts should be steadily open for the integration of novel ideas and for the optimization of ongoing projects. Only in this context, the presented concept can be classified.

The structurally optimized SkillsLab at the presenting institution, as well as the improved concepts not only in surgery allow an appealing use of the SkillsLab options, which have been already initiated.

“OSCE“ is an up-to-date topic, which, in particular, can be used for an objective assessment of the practical training results of medical students. In relation to this, teaching contents in oral lectures, seminars or courses are not only designed to be practice-oriented but they have to be correlated with OSCE-related topics.

The logistic options of the Magdeburg’s SkillsLab allow to store and provide pig paws for the curricular and facultative knot-and-suture courses as it is planned to be put into effect.

In perspective, the use of animal organs is imaginable for courses with the “Pelvi-trainer“ if the appropriate organisatory predictions have been managed and contracts have been made in accordance to animal protection agreements.

The pelvi-trainer can be used far beyond the students’ examination course as a model for individual exercises as well as organized courses as part of other laparoscopy-using disciplines such as:

- Urology,
- Gynecology,
- Pediatric surgery (or)
- Reproductive medicine [48].

By initiating surgical practices during semester interruptions (“Famulatur“), reserves are seen, e.g., in inquiry, documentation and evaluation of teaching contents – a document is in preparation.

With the presented teaching concept, it is aimed to:

- focus Magdeburg’s medical students on the own Medical School with University Hospital and its Teaching Hospitals in the region and to convince them of a reasonable teaching concept (and)
- inally achieve attention also in other German districts to appropriately exploit the potential of an active student exchange, e.g., as part of surgical practices during the study of human medicine by getting to know other teaching concepts.

CONCLUSION

Medical students' theoretical education and practical training in surgery should be performed with practice-oriented and motivating teaching events. Therefore, the components:

- Oral lectures,
- Seminars (and)
- Practical exercises

are adjusted to each other and integrated into an interdisci-

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