



Review Article

Surgical Education within the Final Year of Studies - Back to the Roots

Antonia Bollensdorf^{1*}, Nicole Misera¹, Tobias Ludwig¹, Daniela Heinrich¹, Anja Pueschel¹, Rolf Oerter¹, Laura Hiepe², Markus Kipp², Justus Gross¹

¹Department for General, Visceral, Thoracic, Transplantation, Vascular Surgery, Rostock University Medical Center, Schillingallee, Rostock, Germany

²Department of Anatomy, University of Rostock, Institute of Anatomy, Gertrudenstraße, Rostock, Germany

***Corresponding author:** Antonia Bollensdorf, Department for General, Visceral, Vascular and Transplantation Surgery, Rostock University Medical Center, Schillingallee 35, 18057 Rostock, Germany

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Introduction

The German degree course in medicine takes six years and three months and is completed by a state exam, with which one obtains a license to practice as a physician (approbation). The last year of studying medicine in Germany consists of practical work in a clinic or a hospital in the fields of internal medicine, surgery, and one elective field. This phase is called the practical year. For medical students, the practical year means the conclusion of the primarily theoretical training and, at the latest, the beginning of a professional orientation. First and foremost, the practical year is characterized by practical work in the clinical professional routine. This training period is not only influenced by the students' thirst for knowledge, but also significantly by the teaching activities of the training institution. The potential for conflict builds up, when the mismatch between the students' aspiration and the provided possibilities for on-site training keep getting bigger.

In 2007, a survey of former students conducted by Thieme publisher showed that the teaching offered at university hospitals in Germany particularly was rated as inadequate (Figure 1) [1]. The main reason for the poor training was the prevailing framework conditions within the clinics. Among other things, lack of time, permanent understaffing of physicians, and efficient utilization

of surgical capacities often resulted in hardly any time remaining for student teaching during the practical year (Figure 2) [2,3]. Since several years, students felt inadequately prepared by their theoretical lessons for the requirements awaiting them, especially with regard to practical skills [4,5].

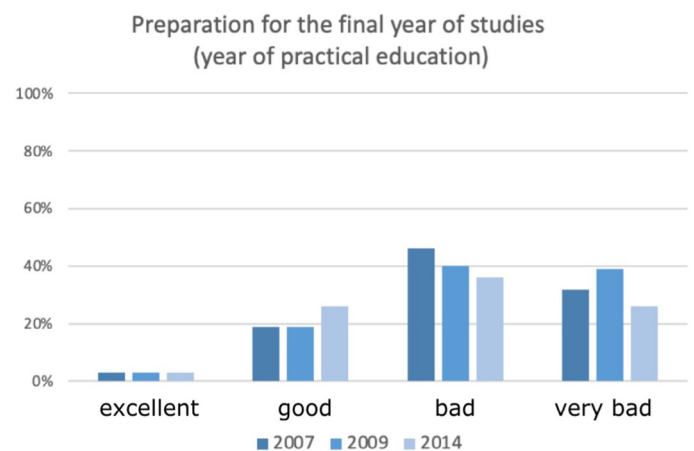


Figure 1: Evaluation of the preparation for the final year by theoretical studies.

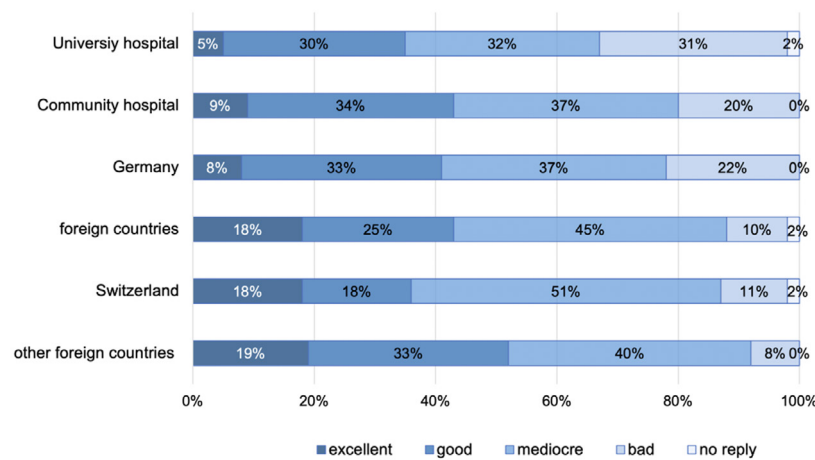


Figure 2: Assessment of the training offered in surgery during the final year.

According to another nationwide survey of graduates in Germany conducted by Thieme seven years later, 13% envisioned working in the surgical field in the future. After completing the practical year, only 8% of students were willing to work in this specialty. Again, the working atmosphere and the lack of integration into the - actually practically oriented - subject of surgery were cited as reasons (Figure 3) [6]. Therefore it is not surprising that numerous surveys, such as the Bavarian graduate survey MediBAP of 2015, have addressed the existing problems and the criticism of the students. Especially in the surgery training, the interest in becoming a surgeon decreases with increasing exposure to the actual daily work in surgery or even leads to a perspective reorientation to another subject. In contrast, other subjects could even achieve an increase in interested students through the practical year, for example, general medicine or pediatrics [6]. In summary, there was a discrepancy for the students between practical training, theoretical professional integration in the practical year and the expected requirement profile as an entrant to the profession.

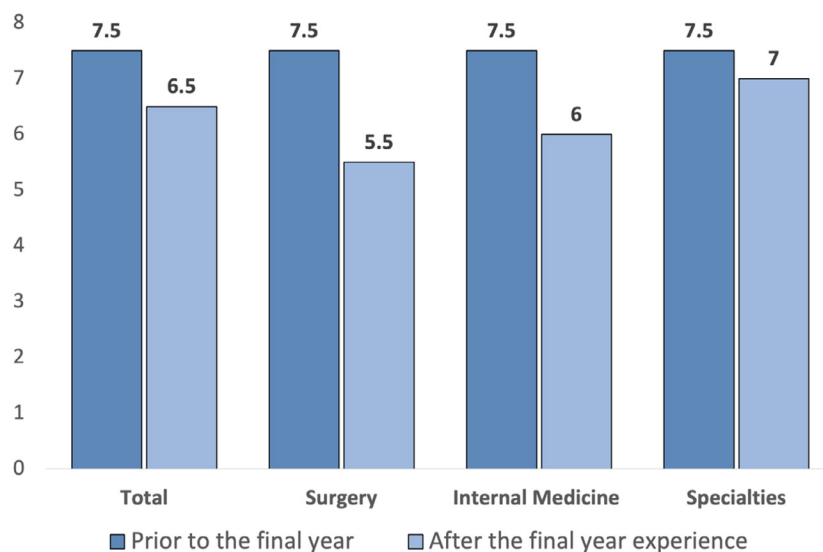


Figure 3: Motivation for becoming a doctor before and after the final year, (Elsenhans, 2014).

An investment in practical training and supervision of students seems long overdue, as there was already a significant shortage of physicians in surgery in 2008 [7]. To meet the demand for surgeons, 10-12% of graduates in each cohort would have had to enter a surgical career over the past decade. However, it is estimated that only 5% of graduates go on to surgical careers [8,9]. This trend has

been noticed, so that students in the practical year are now actively integrated into the daily surgical clinical routine. Skills labs, case discussions, continuing education, clinical supervision and ward presence generally characterize the daily routine of students today [10]. Nevertheless, the practical component in surgical training is often missed. The students are condemned to be a second-row assistant in the operating room throughout their final year [11] (Figure 4), and the placement of central venous catheters or chest drains is left to the young residents who are learning it themselves. Not least because of this fact, going abroad for practical experience during the final year, is very popular among those who want to gain preclinical hands-on surgical experience before entering surgical training [1,12]. Additional teaching opportunities that take place outside the time and economic pressures of daily clinical practice could rekindle enthusiasm for surgery and improve the culture of surgical education in Germany [3].

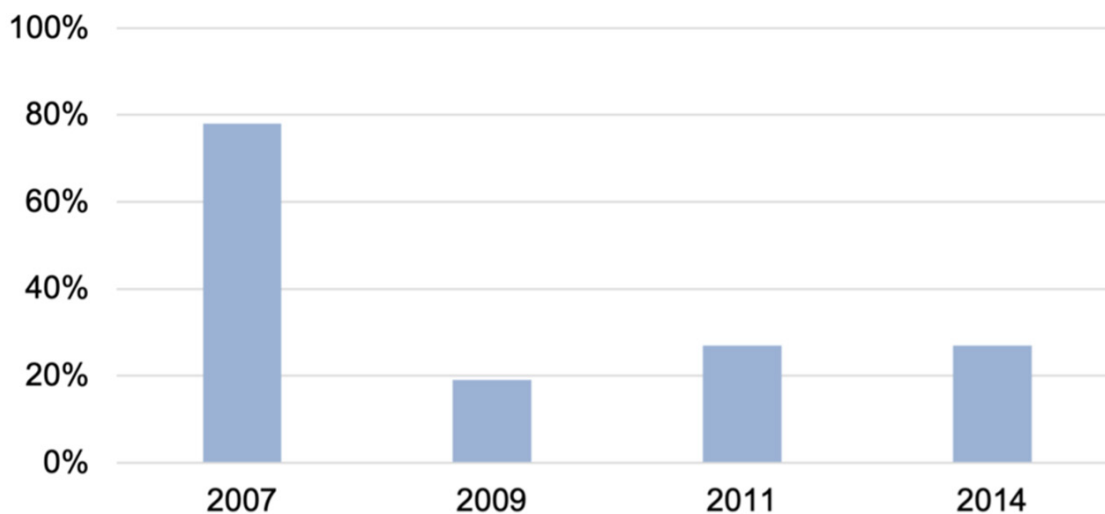


Figure 4: How often did the students see themselves used as cheap labor during the practical year in surgery? (Holding hooks, drawing blood).

To achieve a turnaround, a structured teaching program is needed that further promotes, in particular, the practical training of young medical staff in surgical subjects. A teaching concept outside the stressful daily hospital routine could provide the opportunity to learn basic surgical techniques and consolidate skills in a safe environment under a calm atmosphere without endangering patients. To meet these demands, the concept of surgical hands-on training on body donations is increasingly entering the consciousness of major surgical institutes [3,13].

Mortui Vivos Docent - The Dead Teach The Living

Numerous projects at German universities have been able to show that the integration of clinical seminars on body donations can be a part of this concept [3,13,14]. Because anatomical knowledge is the base of surgical training and is often considered deficient at the end of studies [15], the first surgical steps should be closely linked to anatomical knowledge. The performance of surgical procedures on body donations seems ideal -especially due to the quiet setting with adequate preparation possibilities - to impart surgical and anatomical knowledge in a sustainable way and to reawaken the enthusiasm for surgery in future generations.

In this context, the teaching of the basics of surgical techniques, but also the presentation of individual surgical preparation methods on body donations is perfectly suitable. Ethanol fixation ensures histologically accurate dissections at low cost [16]. Thiel and formalin fixation are alternative and common forms of preservation, which are more expensive and in some cases place high demands on the preparation technique [17]. This spectrum, in turn, offers the possibility to optimally apply all surgical procedures on corresponding fixation models. Surgical suturing, anastomosis of structures and surgical knotting techniques as well as instruction as an assistant in the operating room should be practiced at an early stage in order to provide students with initial confidence in the operating room. In this context, it seems useful to demonstrate procedures from different surgical disciplines on one body donation to ensure optimal logistical use of the body donation and to minimize costs.

In addition to training on whole body donations, it is also possible to practice surgical procedures on individual body parts. This is frequently used in the field of orthopedics, for example, for surgical courses on specific joints.

Methods

In order to improve the training of future physicians using the advantages of body donations, a new training concept was developed at the University Hospital of Rostock.

In the past two years, the Department of Surgery established an training event “Anatomy meets Surgery” in cooperation with the Institute of Anatomy (Director: Professor Dr. Dr. Markus Kipp, Head of clinical anatomy: Laura Hiepe, B.A.). Surgeons and students took the opportunity to deepen their anatomical knowledge and to practice surgical techniques on ethanol-fixed body donations. A current project from the Department of Vascular Surgery at the University Medical Center Rostock under the direction of Ass. Prof. Dr. Justus Gross focused on the access routes to the aorta in the thorax and abdomen. In the course of this cooperation, a whole operation room set up was established to reconstruct a realistic thoracoabdominal aortic operation. The benefit for all participants was shown in the evaluation by the course participants - 62% stated that the course completely expanded their special knowledge, for 77% the course completely fulfilled their expectations, for 23% it fulfilled them to a large extent.

The pilot project “Anatomy meets Surgery” and the enthusiasm that arose for this teaching model developed into the ICARos project, which is an interdisciplinary event for teaching surgical knowledge. The project was followed by a survey of the participants and an analysis of the data collected.

Workshop Structure ICARos - Surgical Training on Body Donations

As part of the project, an operating room was set up in the clinical anatomy department, which was used for interdisciplinary surgical training. Surgical interventions were practiced in a team consisting of final year students, surgical residents, surgeons and two surgical assistants. This not only created a realistic atmosphere equivalent to an operating room, but also allowed several individual training concepts to be combined at the same time - under the supervision of tutors in anatomy and surgery. In order to maximize the learning effect for final year students and residents, the surgical courses took place in a realistic surgical set-up consisting of operating table, surgical instruments, surgical lamp as well as sterile surgical gowns (Figure 5).

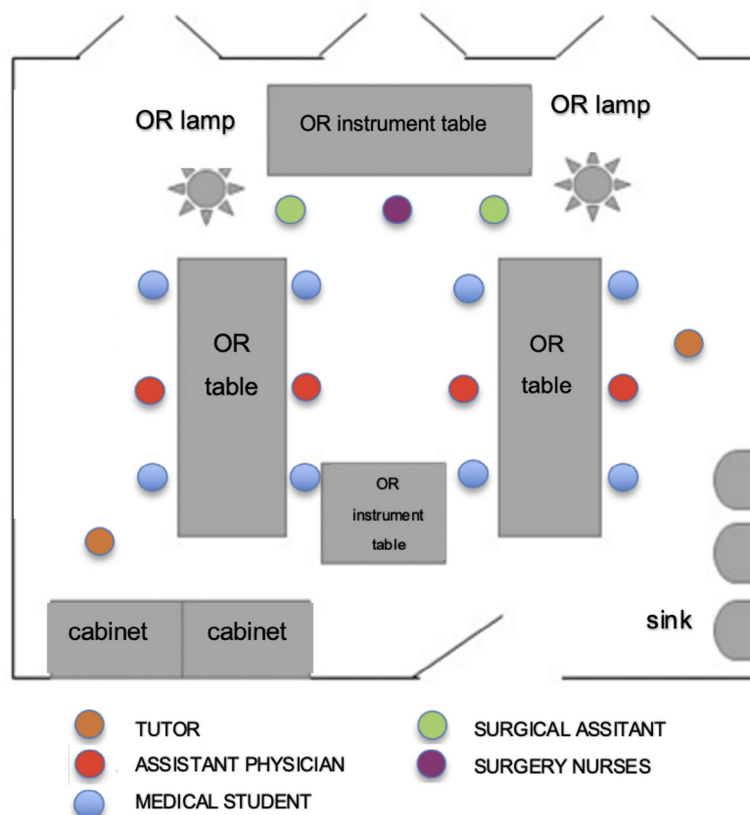


Figure 5: Operation room setup at the ICARos seminar.

The ICARos project was designed in six modules. The first module focused in particular on the basics of surgery, such as general behavioral instructions, communication and division of tasks in the OR. Access routes and classic suture techniques were then explained and practiced. In the field of visceral surgery, the classic approaches such as the median laparotomy and the alternating incision were practiced. In addition, the creation of an artificial intestinal outlet, preparation of hernias and the performance of a hemicolectomy were performed. Moreover, everyday procedures, such as the insertion of thoracic drainage as well as performing tracheostomy, were practiced, which are indispensable in emergency situations and may save lives. Within the other modules, operations from different specialties (e.g. neurosurgery, general surgery or orthopedic surgery) were performed. In particular, basic principles were taught which are indispensable for many surgical procedures in the specialty. In each case, particular emphasis was placed on access surgery.

Questionnaire

17 students, accomplishing their rotation in surgical fields during the final year of studies, completed a questionnaire after the course. We developed the questionnaire after reviewing relevant literature thoroughly. An initial meeting took place to identify

the goals of the questionnaire. Final questions were decided and validated within a small group of consultants and trainees. Likert scale (1: strongly disagree - 5: strongly agree) was used for the questionnaire.

Cadavers

Two Formalin-embalmed cadavers were used for this study. The cadavers were donated for scientific research and medical education through the body donation program of the University of Rostock.

Results

The evaluation of the survey showed that the course was generally considered to be very instructive and ideal for accompanying the final year of studies (Table 1). All 17 participants stated that practicing on body donations was more salutary for them than practicing on models. In addition, they would attend the course again. 86% of the respondents stated that the learning effect in the course was very great and that they would have liked this training earlier, to accompany their studies. The majority of participants found the course ideal, particularly for practicing suturing techniques, and were able to learn important new skills during the course (Table 1).

5 = clearly agree, 4 = agree, 3 = partly/partly, 2= disagree, 1= disagree at all.

	5	4	3	2	1
The conditions were suitable for sewing practice.	57 %	43 %	0 %	0 %	0 %
The learning effect in this course is very great.	86 %	14 %	0 %	0 %	0 %
I would like to see this course already accompanying the early stages of medical education.	86 %	14 %	0 %	0 %	0 %
I was able to learn important new skills during the course.	57 %	43 %	0 %	0 %	0 %

Table 1: Survey of participants in the ICARos project (n = 9).

In addition, the effect on work in the operating room was evaluated. All participants stated that they felt more confident in the operating room as a result of the course and were able to apply the knowledge they had learned. They felt well prepared to work in the OR, and participation in the course reduced anxiety about working in the OR for all respondents. In addition, the frequency of errors, for example during washing in, remaining sterile, and being a second assistant in general were subjectively reduced (Table 2).

5 = clearly agree, 4 = agree, 3 = partly/partly, 2= disagree, 1= disagree at all.

	5	4	3	2	1
I was able to apply the knowledge I learned in the course in the operating room	43 %	57 %	0 %	0 %	0 %
The course made me feel more confident in the OR.	71 %	29 %	0 %	0 %	0 %
The seminar prepared me well for my work in the operating room.	29 %	72 %	0 %	0 %	0 %
The course made me less afraid of the surgery.	71 %	29 %	0 %	0 %	0 %
Thanks to the course, I made fewer mistakes in the OR. (Washing in, staying sterile, suctioning, 2nd assistance).	29 %	58 %	0 %	0 %	0 %

Table 2: Improvement of OR experience through the course.

The majority of respondents reported feeling more comfortable during the course than in the OR. 72% of participants were able to ask more questions during the course than in the OR. In addition, 57% even felt they had learned more than when they were in the OR (Table 3).

5 = clearly agree, 4 = agree, 3 = partly/partly, 2= disagree, 1= disagree at all.

	5	4	3	2	1
I was able to ask more questions than in the operating room.	29 %	43 %	29 %	0 %	0 %
I felt more comfortable during the course than in the OR.	29 %	43 %	29 %	0 %	0 %
I learned more than I did in the operating room.	14 %	43 %	29 %	14 %	0 %

Table 3: Direct comparisons with the OR.

In particular, the independent work and the good supervision by lecturers met with enthusiasm among the participants. Furthermore, all respondents felt valued during the course and were able to close existing knowledge gaps. In particular, the practice of suturing techniques and the training in the placement of chest tubes were judged to be very instructive and practical.

Discussion

The results of the survey confirmed that not only it was possible to create a realistic surgical atmosphere outside the OR, but that the course was also an ideal supplement to teaching during the practical year. The early strengthening of team competencies, which are necessary for interprofessional operating, was addressed within the ICARos project in addition to the teaching of practical surgical skills. Using body donations to train surgical procedures proved to be an ideal way to achieve realistic conditions. Compared to other training models, the collaboration with residents and senior physicians as well as surgical assistants made possible is a great advantage, since not only motor skills but also communication and interaction in the operative setting are improved. Also, the possibility to reduce the fear of working in the operating room and thus create an atmosphere that promotes interest in surgical subjects can significantly contribute to strengthening the interest in surgical disciplines again.

Creating this atmosphere already during the final year of studies, one of the most important phases of orientation to a specialty department, is essential. A meaningful concept for student teaching in surgery should be established to counter the criticism of the culture of practical education in surgery [18]. The cooperation with anatomical institutes and the practical training on body donations allows a new teaching model in the field of clinical training. In this way, the shortage of young surgeons can be counteracted and the training model of the first years of training in surgery can be supplemented in a meaningful way.

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