

# Teaching surgery – a review

## Nauczanie chirurgii – przegląd piśmiennictwa

Andrzej Żyluk✉

Pomorski Uniwersytet Medyczny w Szczecinie, Klinika Chirurgii Ogólnej i Chirurgii Ręki, ul. Unii Lubelskiej 1, 71-252 Szczecin

Pomeranian Medical University in Szczecin, Department of General and Hand Surgery

✉ azyluk@hotmail.com

### ABSTRACT

**Introduction:** Teaching medicine is a specific task consisting of transferring current medical knowledge and rules of medical practice to students. Teaching surgery traditionally includes acquiring manual skills. This article touches several issues concerning surgical education (curriculum) in the course of medical studies. Attention was paid to the specificity of operative room experience, risk of intimidation, anxiety provocation, and potential benefits. The factors which motivate surgeons to engage in teaching students were discussed.

**Conclusions:** It was noticed that the range and methods of transferring medical knowledge during medical studies (the curriculum) frequently does not comply with the requirements of future medical practice. The usefulness of frequent everyday testing of acquired knowledge was emphasised. Unreasonable hopes relevant to the introduction of novel techniques of teaching medicine in training centres with skills learning on dummies and simulators were questioned. The importance of ward-round and simple manual skills teaching was emphasised.

**Keywords:** teaching surgery; surgical curriculum; surgical clerkship.

### ABSTRAKT

**Wstęp:** Nauczanie medycyny klinicznej jest specyficznym zadaniem, na które składa się przekazywanie studentom aktualnej wiedzy medycznej i zasad praktyki lekarskiej. Nauczanie chirurgii obejmuje nabywanie umiejętności manualnych. W pracy poruszono kilka zagadnień dotyczących kształcenia chirurgicznego w trakcie studiów medycznych. Zwrócono uwagę na specyfikę zajęć prowadzonych na bloku operacyjnym, związanych z tym obaw i potencjalnych korzyści. Poruszono problem motywacji lekarzy do uczenia studentów chirurgii.

**Wnioski:** Zauważono, że zakres i sposób przekazywania wiedzy chirurgicznej w trakcie studiów w wielu aspektach nie spełnia wymagań przydatności w przyszłej praktyce lekarskiej. Wskazano na celowość częstego, nawet codziennego sprawdzania nabywanej w trakcie zajęć wiedzy. Poddano w wątpliwość wygórowane nadzieje związane z nowymi technikami nauczania chirurgii na symulatorach i trenażerach, a uwypuklono wartość badania chorych i ćwiczenia prostych umiejętności manualnych.

**Słowa kluczowe:** nauczanie chirurgii; program nauczania chirurgii; staż chirurgiczny.

## INTRODUCTION

Teaching medicine is a specific task consisting of transferring current medical knowledge and rules of medical practice to students. Teaching surgery traditionally includes acquiring manual skills, i.e. suturing, stitch removal, limb immobilisation, catheterisation and assisting operations. An adequate proportion between theoretical knowledge and practical skills acquired during the surgical curriculum is frequently a matter of discussion and so called “skill-oriented teaching” is considered important and desirable in the education of students. However, this term, although popular and frequently used, has been differently – and not necessarily correctly – understood, particularly by non-surgeons. In the authors’ university, surgery is taught for a total of 3 years, beginning in the 4th up to the 6th year. The curriculum comprises lectures, seminars (classroom teaching) and classes (ward-round teaching), of which the latter take up most of the time. For instance, the 5th year surgical programme comprises 12 h of seminars and 120 h

of ward-round teaching and this – by assumption – meets the criteria of “skill/competency-oriented teaching”. However, the ward-round time is not necessarily used for learning clinical skills or, even if so, not those that are useful in the graduates’ (doctors’) future practice. The author’s more than 30-years of work as an academic teacher and regular general surgeon has allowed him to evaluate the effects of such teaching in comparison to the level of surgical skills and knowledge of young doctors referring their patients to the emergency surgical ward. This led to the reflection that our (my and my colleagues) imagination about surgical knowledge and skills being useful in a doctors’ daily practice frequently fails to meet the facts of the case. There are also differing demands for this knowledge between graduates who have entered surgical or non-surgical specialities (residencies). The objective of this article was to determine the actual level of teaching surgery in the medical school, considering 3 aspects: the topics of teaching, the methods of teaching, and the methods of assessment of the effectiveness of teaching.

## TEACHING IN THE OPERATIVE THEATRE

This is one of the fundamental parts of the surgical curriculum. Attending operative theatre is practiced in the 4th to the 6th year of studies. The real value of theatre experience for general medical education is not clearly determined. At the beginning, most students enjoy observation and assisting in operations, as it introduces them in a new, unknown and a bit mysterious world. In individual students' imagination, this world varies from positive thinking and enthusiasm to anxiety and fear. It may concern inadequate behaviour in the operating room: keeping no distance from a sterile table with instruments, unintentional touching of sterile table-cloths or entering the "anesthesiologists" part of the room. These "mistakes" usually arise from a natural willingness to observe something in the operative field, behind the operating surgeon's back, which frequently requires much ado. It seems to be obvious that students should be instructed and informed about theatre-specific behavioural rules. The results of one study show that 70% of students negatively estimated the level and accuracy of the instructions imparted prior to entering the operative theatre [1]. An informal interview with 5th year students revealed that in most cases the instructions were missed by tutors.

Apart from short-lasting enthusiasm at the beginning of attending operative theatre, this method of teaching surgery is lowly rated by the students [2, 3]. Poor estimation of the "shadowing" experience – knowledge of surgical techniques acquired in the operating room – may be surprising for many surgeons. These findings confirmed our personal feeling that spending many hours in the operating room, watching surgical procedures from behind the operating surgeon's back ("shadowing") is useless for the vast majority of students and provides no benefit for future medical practice; this particularly concerns those entering non-operative specialties. This teaching method is, unfortunately, fairly common, due to the necessity of assisting elective operations by young trainees who, simultaneously, are engaged in teaching students. In the authors' institution, the students are obviously involved in operative procedures in the theatre, as well as for gaining experience in theatre-specific behaviour rules. However, we select operations to observe, depending on the specific clinical problem that was discussed (i.e., inguinal hernia, varicose veins) and provide the opportunity to examine the pathology after resection, i.e. gall bladder with stones or large bowel with a tumour. This method of learning in the operating room can give a real impression about the disease and its surgical treatment.

Another issue is the real value of theatre experience for general medical education of future doctors. Surgery is taught during the final 3 years of medical studies and the decision about future specialty is usually made in the last (6th) year. The author's own observations and results of simple statistics show that the vast majority of students will not elect surgery or other surgical (interventional) disciplines for their future professional life. For this group who would elect i.e. anesthesiology, internal medicine, pediatrics or radiology, the skills and knowledge acquired in the operative theatre will be not

useful and will be gradually forgotten. It does not necessarily mean that teaching them was a waste of time and resources, but, if theatre classes constitute a major part of the surgical curriculum, teaching other important knowledge (ward rounds, manual skills, clinical reasoning) may be minimized or missed. On the other hand, for those who would decide to be surgeons, this undergraduate theatre experience has no particular value, as postgraduate specialization programs extort from residents quickly acquiring this knowledge during the first weeks of hospital work. For academic teachers it seems to be extremely important to incline students to choose a surgical discipline as a future speciality. Positive "theatre experience" frequently is a crucial argument for the decision to be a surgeon. The results of 2 studies showed a statistically significant relationship between frequent practicing of manual skills (suturing wounds, tying knots, removing stitches) and students choosing a surgical discipline as a future speciality [1, 2].

The teachers and tutors imagination about the methods of acquiring surgical knowledge and skills that are most effective for students frequently fails to meet the facts of the case. Most of us believe that showing the students an operation as a final part of the diagnostic and therapeutic process has the greatest value for their "theatre experience". The results of some studies show that most students prefer learning simple manual skills and active participation at the operation, i.e. making incisions, suturing wounds, tying surgical knots, rather than reasoning the case as a whole [1]. Obviously, it is not always possible due to formal and medico-legal restrictions. The results of investigations conducted in the author's institution confirm such a "skill-oriented" expectation by students about the surgical curriculum [3]. However, as it has been already mentioned, the real value of this experience for future professional practice is limited. The results of an inquiry performed among doctors, several years after graduation and in the course of various specialties, show that "operative theatre experience" acquired during surgical curriculum was not useful in their actual daily practice [4].

Is assisting operations a positive or negative experience for the participants? The results of some studies show differences regarding the role they play: most surgeons (60%) enjoyed students assisting the operation and declared that it positively influenced the atmosphere in the operative room. Most of them also believed that students actively participated in the procedure. However, almost half of the students (48%) declared that the surgeons had not been satisfied with their assistance and had the impression of being rather an obstacle than support, because of a lack of practical acquaintance and bothering staff with "stupid" questions; most of them considered their participation completely passive. More than half (55%) of the students felt unpleasant fear during assisting, about doing something wrong (a blunder) and about carping criticism from the surgeon [1]. It seems that treating the operative theatre as a "temple", in which each person being a nonmember of the team feels like an intruder, this belongs to the outgoing stereotype. Most surgeons remember from the early years of their practice some unpleasant situations

of being rebuked by a senior surgeon or even by an operative nurse. For the future surgeon, who has to be adamant and stiff-necked, such an experience is even desired, but for students it is not necessary. This question has been raised in some studies, with authors suggesting that the atmosphere prevailing in the operative theatre should be friendlier for “aliens” [2, 5]. Obviously, it does not mean departing from discipline and rules which must be abided to in the theatre, for obvious reasons.

## MOTIVATION TO LEARNING STUDENTS

Teaching is an essential duty of physicians and surgeons, but many have noted that there is little time for teaching in the busy modern workplace. Physicians are burdened with patient-care, research and administration and teaching activities are often uncompensated and conducted on a voluntary basis. Given that teaching is so vital to the maintenance of the medical profession, it is surprising that few authors have examined the factors which motivate physicians and surgeons to engage in this activity. The author's own observations show that didactic duties and financial bonus subsequent to academic employment are key factors driving young surgeons to teach students. Being challenged academically by the presence of learners was also found to be a motivating factor for the young doctors. Having learners forces them to stay up to date of current literature and techniques. Results of one study show, however, that factors that prompt doctors to teach are more complex.

A questionnaire filled by 15 surgeons from University Department of General Surgery in Edmonton (Canada), showed the following 5 factors:

1. A sense of responsibility to teach future physicians.
2. An intrinsic enjoyment of teaching.
3. The need to maintain and expand one's own knowledge base.
4. Watching students develop into competent practicing physicians and playing a role in their success.
5. Fostering positive lifelong professional relationships with learners.

This study demonstrates that there are multiple factors which motivate surgeons who teach well. The 1st factor was focused largely on the profession and society at large: feeling a responsibility to teach. Two additional factors focused primarily on the surgeon themselves: intrinsic enjoyment and expanding one's own knowledge. The last 2 factors are focused on others: helping others develop and fostering lifelong relationships. It seems obvious that treating students' teaching as kind of “mission” is more effective than doing it as in duty bound. Results of some studies show that it improves acquiring transferred knowledge and helps in development positive attitude of students to learn [6, 7]. Positive motivation itself is not enough condition to be a good teacher and to score didactic successes. Possessing current knowledge and a competence in its transferring are at least the same important prerequisites for good teaching. A number of factors were also identified which were associated with surgeons being less motivated to teach. These include having too many duties to perform

together with teaching, poor organization of classes, i.e. too many students attending the ward at the same time, having disinterested learners or being tired after a heavy night duty.

Another important motivating factor is chief's attitude to teaching students. If the professor is interested in quality of didactic program carried on in his clinic, he supervises how the assistants and residents accomplish it (perfectly if conducts the classes him). The expertise and knowledge he imparts on students contributes to a feeling of competence and prestige. Positive example on the chief's side strongly motivates the inferiors for carrying on classes perfectly. On the other hand, if a chief considers didactic duties troublesome ballast, this attitude easy spreads to the whole team and teaching is carried on without adequate enthusiasm and engagement.

Next factor influencing negatively the quality of teaching is lack of adequate scoring didactic achievements in the university rank list. The algorithm is recognized validation instrument for ranking scientific achievements of particular clinics and departments. High scoring of the algorithm directly translates to amount of money transferred to institutions from universities' budget. It is not a case for teaching students; there is not extra “financial bonus” for doing this duty perfectly. For past 10 years, Pomeranian Medical University has been using questionnaires to assess quality of teaching in particular units. Questionnaires are filled by students who completed an academic year and they rank the clinics and departments from best to worst based on their subjective opinion about quality of teaching. Apart from its simplicity and formal imperfection, the results of this ranking system do not translate in any grade to the department's budget, prestige or other valuable bonus. Although personal satisfaction and enthusiasm are key factors driving physicians to teach but any additional bonus (financial, prestigious or other) would be obviously desired. It is also symptomatic that individual didactic achievements are not considered in academic career of the clinician. There is no additional points for this good teaching, like it is for research work and publications. Being a good clinical teacher is not an argument for prolongation of particular adjunct's employment in the university, if he fails to obtain a habilitation.

## ASSESSMENT OF THE EFFECTIVENESS OF TEACHING

Traditionally, the final exam is recognized method of assessment of the knowledge acquired by the students during their 3-year surgical curriculum. In most medical schools the students are obliged to pass a test after each year of learning, to obtain a credit. This system, however, does not provide optimal conditions to fix the knowledge acquired via surgical curriculum. Learning directed towards passing the exam or obtaining a credit is burdened by instability and, in consequence, most of information and knowledge assimilated in this way will be easy and quickly forgotten. More effective way of assimilating knowledge is systematic learning and frequent evaluation of its efficacy. Results of 2 studies emphasise



the importance of this approach – systematic assessment of the knowledge provided during classes (immediate feedback) appeared to have strongly positive effect on its recalling in students memory [8, 9]. In details, it relied on carrying a queries session at the final 10–30 min of classes. The students were asked about the patients they had examined, the activities they had performed or operations they had assisted, and their responses were scored by a tutor. Such a permanent evaluation of acquired knowledge aroused a positive emotional mechanism, prompting students to greater engagement and concentration on carried tasks, which resulted in strengthening of the acquired knowledge. There is an evidence that students highly esteem opportunities for evaluation of their learning provided by teachers and that it translates to their positive opinion about tutors and institutions. Contrary to imaginations of most teachers, most students enjoy to be asked and evaluated “up to date”, as it gives them feeling of active participation in process of acquiring knowledge. It is very effective and practical method of teaching, having priceless didactic favours. Frequent (at any occasion) asking questions gives a teacher an opportunity to check the students’ understanding currently discussed topic, general medical knowledge and ability to binding information from different medical disciplines. These findings may be valuable information for teachers how, with mild efforts, to improve significantly effectiveness of teaching.

## THE CONTENT OF TRANSFERRED KNOWLEDGE

The content of transferred knowledge during university curriculum is not precisely determined, particularly for clinical subjects. Program of teaching (a syllabus) is rather of a list of wishes which are executed at most in part, mainly because most of the academic teachers had never seen it on their own eyes. The author’s more than 30 years observations and experience in clinical teaching show that the knowledge taught during surgical curriculum is not formally arranged (accidental) and is not adequately supervised (controlled), neither by individual professors responsible for a part of teaching, nor by university authorities responsible for execution of the whole curriculum. In the past, when the students used to pass the final exam orally, the author asked sometimes if a candidate have seen (collected a history and/or examined physically) any patient with acute appendicitis, gall stone disease or inguinal hernia. The answer “no, I have not” was not uncommon, and this fixed my conviction that our system of teaching is defective. It is true that the patient admitted for appendectomy or following this operation is not always available at the surgical ward when a given group have classes, but during 3-year surgical curriculum such a favourable opportunity had to come true. It concerns also other frequent surgical diseases, and, even more, malignancies. A question, what is favourable for students: observation of perfectly performed gastrectomy for gastric cancer (lasts 2–3 h) or taking history and examining physically this patient prior to surgery (takes 15–20 min) seems

to be rhetorical. Interviewing patients with malignancies is the best way to acquire so called “oncologic watchfulness”, a specific sensitivity to presence of discrete and apparently “innocent” symptoms and signs observed in early stages of neoplasms. Lack of this experience is, unfortunately, not uncommon among graduates from medical universities. In the past, there was an obligatory list of manual tasks to perform by the student to obtain a credit. This list included relatively complicated (for students) procedures such as suction drainage of the pleural cavity, introduction of nasogastric tube, puncture the pleural cavity, wound suturing, catheterizing and others. This list was an obvious fiction and, fortunately, it was given up. It seems, however, reasonable, introducing a list of surgical diseases obligatory to familiarize with by the students along their 3-year surgical curriculum. It would include i.e. earlier mentioned acute appendicitis, varicose veins or colonic cancer. Such a list, at least in assumption, would discipline the tutors to carrying on classes in a “ward rounds” and outpatient clinic setting and search opportunities to show the students adequate patients (suffering from the diseases on the list).

From clinical teacher’s point of view, the more important is to acquaint students with basic rules of diagnosing, clinical reasoning and treatment of common diseases, with which they will be faced frequently, than showing detailed knowledge from narrow (although interesting) discipline. Highly specialised medicine may attract students and arise them to continue this direction of education, but eventually, for vast majority will be not useful and will be forgotten. It is also worth emphasising that acquiring knowledge is more effective when learner is an active participant, not passive observer of the diagnostic and/or therapeutic process. The student who takes history and examine a patient suffering from heart infarct benefits more than his colleague who observes coronarography or stenting coronary arteries. Similarly, an interview with a patient suspected for colonic cancer benefits more than looking at colonoscopy or assisting a hemicolectomy in the theatre. Unfortunately, only few clinicians understand this problem and it is a frequent cause of losing time appointed for teaching or its ineffective (but sometimes splashy) use. This occurs frequently because doctors carrying on classes are simultaneously engaged in their clinical duties involving narrow clinical disciplines and have no time for trivial ward rounds. Unfortunately, there is a trend to consider this way of teaching (ward rounds, outpatient clinic) boring and out of fashion, even if scientific evidence deny this opinion [4, 10].

The term „content of transferred knowledge” includes also its amount. Contrary to the common sense and scientific evidence, a tendency is observed to increase amount of information provided to the students and overloading it with details. It is an incorrect approach and the results of this way of teaching are frequently counterproductive. Results of some studies suggest that a traditional educative system provides little flexibility despite a desire for flexibility by students with and without an interest in a surgical field and that faculty are typically unaware of students’ individual learning goals.

## SIMULATION TEACHING SURGERY

It is common trend among organizers of an academic curriculum, who are enthusiastic about moving students' education from clinical departments to training centres with skills learning on dummies and surgical simulators. This tendency is observed in some countries and is slowly being introduced in medical universities in Poland [11, 12, 13]. Training on surgical simulators and dummies, some of them sophisticated and technically advanced, allows procedures such as tracheal intubation, gastroscopy, and laparoscopy to be practised in lab conditions. This has proved to be beneficial in specialised postgraduate training, but its usefulness for general medical practice seems doubtful. Results of some studies demonstrate that the tendency to re-organization of undergraduate medical education should be carefully weighted. Funding complex laboratories equipped with medical simulators and dummies is expensive and, apparently, meets the expectations of a modern, fashionable teaching model. However, the benefit of this teaching for future doctors' practice requires follow-up assessment and weighting, to avoid the harmful effect of reducing ward-round teaching in hospital departments.

Other controversial question is advisability of establishing centres for medical stimulation which frequently is associated with substantial investments spent for building facilities, fitting rooms, purchasing equipment (stimulators) and employment a staff. In many universities a separate departments are created for simulation teaching. It is worth mentioning that fast progress in this field of learning, frequently allows online training (by the Internet) after signing in to the appropriate portal. Already now, most of training courses in many domains, not only associated with health care, but i.e. with personal data protection, ethics and reliability in doing research or learning of particular procedures (i.e. hands hygiene in the hospital) is carried on online. Likewise, many new computerised programs are launched presenting virtual operative rooms. The residents can perform virtually simple surgical procedures (endoscopic or laparoscopic) sitting at home and using laptop, mouse and simple manipulator [14]. Extending this offer in any scale of complication is only a matter of time, what indicates dynamically developing market of computerised games. Is creating the game titled "laparoscopic appendectomy", with appropriate video game console, equipped with virtual surgical instruments any problem for contemporary game creators? Obviously it is not. If so, which will be a future of expensive simulating centres and it's the same expensive equipment? Ignoring this problem at discussions about future educative programs seems to be a naivety and short-sightedness.

Problems and challenges associated with efficacy of undergraduate surgical education touched in this article seem to be important. Efficacy of teaching means transferring this particular knowledge and learning these particular skills which appear to be useful in doctors' future medical practice, regardless the specialty they choose. Avoiding teaching everything what the tutor knows but carefully selected part of knowledge which students will recall and will use in their future practice. Reflections and thoughts presented in this article are based on the author's own observations, experience, results of investigations and review the literature. In most, they do not meet the criteria of scientific evidence, but rather raise several important questions about how undergraduate surgical education should be organized and suggest ways in which it may be improved.

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