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Sono4Students – A student Sonography Project

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ABSTRACT

Clinical sonography is of high significance in the daily medical practice. This field is growing more and more important and larger in clinical daily routine and is used numerous in today's medicine. Clinical sonography is a useful tool, which burdens the patients less than other investigation technologies, by quickly confirming suspected diagnoses or excluding differential diagnoses. Therefore, sonography should be a part of early student education at universities. In spite of the immense importance of ultrasonic testing in clinical daily routine, only few universities make an effort to integrate a broad and organized ultrasound education in the curriculum.

At the University of Bonn students frequently asked for ultrasonic courses, but only a few medical subject areas offered detached ultrasonic courses, which cover only a fraction of the demand.

Because of the missing anchoring of this field in the curriculum of the medical faculty of Bonn, "Sono4Students" a student managed ultrasonic course was found in the beginning of 2010.

Today, Sono4Students is the biggest student initiative in Germany, in the scope of peer-teaching sonography. Since the beginning 189 courses with around 700 participants were held. The course offers a structured and standardized concept for participants, which focuses on topics relevant for the final exam and the clinical daily routine.

1. Introduction

By now, sonography has found its way into numerous subject areas. Moreover, it is an important tool in the medical education for students^[1-15]. In spite of the immense importance of ultrasonic testing in clinical daily routine, only few universities make an effort to integrate a broad and organized ultrasound education in the curriculum. Particularly, several analyses could show that students in small groups develop effective improvement of their

motor and interpretative skills, in the field of focused sonography^[3,6,8,11,12,15]. Especially sonography is a tool, which relies mostly on the abilities and knowledge or rather experience of the operator. That is why the most important factor is an early education in this field.

At the University of Bonn students frequently asked for ultrasonic courses, but only a few medical subject areas offered detached ultrasonic courses, which cover only a fraction of the demand. Because of the missing anchoring of this field in the curriculum of the medical faculty of

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Bonn, a student managed ultrasonic course “Sono4Students” was found in the beginning of the winter semester 2010/2011, which did develop further with each semester, in its contents and quality. This is how the project “Sono4Students“ was found by the students themselves.

2. Sono4Students

The ultrasonic courses by “Sono4students” are affiliated with the Bonn “Skills-Lab” and contain the bellow-mentioned courses, regarding the following topics:

- Emergency ultrasound: FAST-Plus
- Ultrasound of the thyroid and throat
- Ultrasound of the internal upper abdomen with anatomic cover separated into four different parts
 - Abdomen I: standard sections
 - Abdomen II: organ screening
 - Abdomen III: organ biometrics
 - Abdomen IV: Duplex sonography
- Ultrasound of the revulsive urinary paths (kidney and bladder)
- Ultrasound of the liver(cirrhosis)
- Ultrasound of acute appendicitis
- Ultrasound of the lungs with focus on pneumothorax diagnostics
- Ultrasound with deep vein thrombosis/embolism of the lung artery
- “Sono meets Prometheus”: applied anatomy for the pre-clinic
- Emergency ultrasound: FEEL-concept

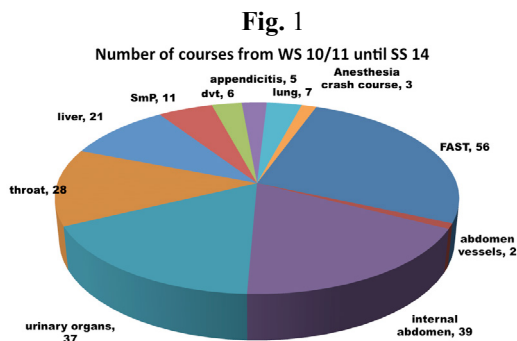


Fig. 1: Diagram of the Different Ultrasound Courses and the Number of Given Courses in 2010-2014

Moreover, occasionally full-time courses (about 8 hours) are offered on weekends, where participants work with multiple ultrasonic equipments, and in addition the teaching material of the Bonn “SkillsLab” can be used. For example, full-time emergency courses and sonographic crash courses with an internal focus are offered.

The courses orientate themselves on the concept of “peer-to-peer-learning”. They address beginners, as well as advanced students, and students in their practical year

with and without experience in the field of sonography. Every course has a theoretical and a practical part. The theoretical part consists of an interactive presentation, where participants are supposed to collaborate actively. At first, the main features of the physical fundamentals of sonography are explained, followed by a repetition of anatomy and, if necessary physiology of the organ systems relevant to the specific course. After that, a structured examination process will be performed on one of the course participants.

Afterwards, the practical part follows, in which students can practice sonographic examinations by hands-on training, under guidance and supervision of student tutors. A rotation principle is applied. At the beginning, each participant learns to adjust the right screen perspective, followed by the display of the standard section planes (rotation of participants each 5 minutes).

Afterwards the representation of the standard sections follows.

At the end, each student repeats one whole examination process. Whereat, experienced students help students with less experience. To finish, typical pathological findings are discussed, in the form of clinical presentations of cases. The learn process is supported by repetition and connection with existing knowledge. Participants receive hand-outs, which give them a red thread through the course. They also receive pocket cards, created by “Sono4Students”, which can be used to keep studying self-handedly in the clinical daily routine. Until now, there are cards regarding FAST-examination and abdomen sonography. Also, students have the opportunity to retain their knowledge at home with the help of case examples, which are given on the interactive learning platform at www.sono4students.uni-bonn.de

3. Methodology

The training of student tutors is based on a multi-level concept in combination with a contract of generations, which enables a substantiated training and advanced training.

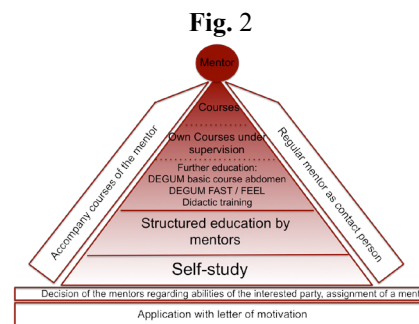


Fig. 2: Standardised Multi-level Concept as a Training Model for the Student Ultrasonic Tutor

At the beginning, the interested party applies for the position at “Sono4Students” and has to be considered suitable by the already trained mentors. After that, a mentor is assigned to the newcomer, who accompanies the training and is always available for questions. This is followed by a training program, see figure 2. The Newcomer prepares himself by previous self-study for the structured training by the experienced mentor. Moreover, newcomers, who are not working single-handed or are not 100% interested, are separated. Afterwards, they deal with one ultrasonic topic each, over several weeks, beginning with handling and instrument adjustment, to the individual course contents and examinations processes. At the same time the new tutors accompany their mentors in their courses and take over individual parts of the course with assistance by the mentor. Several times a year, participants have the opportunity to take part in DEGUM-certified courses and one didactics training. In this way, a gradual integration into the task as a tutor takes place. This facilitates the beginning as a tutor, but also offers the opportunity that assistance with regards to content and didactics can be given, by experienced team members at any time. Either ensures maintenance of a specific standard of tutor education, and with that also the quality of the courses. Regular tutor meetings function as a means to ensure quality. In the meetings potential problems are discussed, requests brought up, improvements and updates of the individual courses discussed, and further development and structuring of the courses, and of the accompanied offers (e.g. internet platform) planned and implemented.

Since the beginning of 2013, every tutor has the opportunity to actively participate in the DEGUM courses of the working group SonoABCD, to continuously develop themselves for the own Sono4Students courses. Since last summer, there is also the opportunity to take part in a DEGUM-certified abdomen basic course with Prof Stunk, from the University of Bonn. To ensure that every tutor has basic didactic knowledge, all of them need to participate in an didactic training “Dot.Med” of the medical faculty, on the issue of medical didactics. Moreover, there are tutors, who took actively part in the train-the-trainer training and therefore give valuable tips to the other tutors and mentors. The greatest charm of this form of teachings is the high own initiative of the students, offering a wide array of development opportunities and by doing so laying the ground for consistent motivation.

4. Results

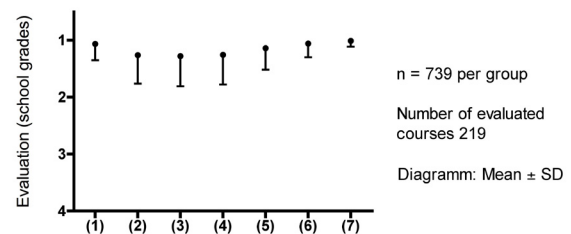
Since the beginning in winter semester of 2010 219 courses with around 800 participants were held, of whom 739 participated in the evaluation. The course participants evaluated the application procedure (1) the meeting of ex-

pectations (2) the increase of knowledge (3) the improvement of practical abilities (4) if the course was worth it (5) if they would recommended the course to other people (6) and the appearance of the tutors (7) using school grades from 1 to 6.

The results of the evaluation show the high satisfaction of the participants with the course concept. With a total grade of 1.15 of all courses and a very low standard deviation of 0.13 the “Sono4Students” courses belong to the most popular courses in the medical faculty.

Fig. 3

Evaluation of all courses from WS 10/11 - SS 14



1. The application for this course was without problems
 2. My expectations regarding goals and content of the course were fulfilled
 3. I increased my professional knowledge
 4. The course improved my practical abilities
 5. Measured by time and organizational expenditure the course was worth it
 6. I can recommended the course to other people
 7. The tutor was friendly and open minded
- 1= fully agreement 6= no agreement

Fig. 3: Overview of the Results of the Evaluation of the Courses in 2010-2014

5. Discussion and Conclusion

Ultrasonic examination is a simple and not invasive procedure, with a high diagnostic importance, which is assumed to be well-known in the clinical practice nowadays, but not taught sufficient at universities. Therefore, “Sono4Students” sets out to offer practical trainings of sonography as an integral part of education in Bonn.

Students, who have studied the basics of sonography autodidactically, are prepared well for the final exams, as well as for their future medical activity. To ensure the future existing of this course, it is based on the concept of “peer-to-peer-learning“ so that experienced tutors constantly educate new tutors.

The given evaluations and grades confirm this estimation. Because of the education from students for students an informal and intense exchange of knowledge is possible.

Moreover, a network with other student sonography projects from Germany and Austria was founded, which campaigns students interests regarding sonography. In this way, competence is concentrated, and a platform for

exchange of teaching experience develops.

This course concept from “Sono4Students” is innovative, future-orientated and can be transferred to curricula of all Skills Labs, which exist in the medical education and is optimally eligible for peer – to – peer teaching.

As with any other medical training, the use of ultrasound devices requires dedicated education and practical training. Educational programs need to be designed to facilitate the general medical practitioner learning at any level of experience, starting at the medical student level and continuing with more focus on specialty- related issues. Some models of US education have been developed. One offers graduated levels of exposure and imaging experience for medical students during third-year clerkships (Harvard Medical School, Boston, USA). The second model is more compact, organized as a dedicated 3-day program (Thomas Jefferson University Hospital, Philadelphia, USA). With the current wide variability in clinical clerkship requirements, it is conceivable that a student could complete a medical school curriculum without ever directly scanning a patient with ultrasound. Some authors predict that increasing numbers of clinicians and students will have such “echosopes” in their white coats, instead of, or in addition to, a “stethoscope”^[16].

Although integration of ultrasound training offers opportunities to provide instruction in the use of novel educational and clinical practice tools, efforts to integrate ultrasound technologies into undergraduate medical education are limited. To date, graduate medical education (GME) programs have served as pioneers in ultrasound training. In fact, the Accreditation Council for Graduate Medical Education has specific curriculum requirements for ultrasound education in specialties such as emergency medicine, internal medicine, radiology, and obstetrics–gynecology^[17-20]. A central issue in training students in ultrasonography lies in locating the time and funding for training programs. Early analyses demonstrated that in small cohorts, medical students were able to develop the psychomotor and interpretative skills required for effective focused ultrasonography. For example, a study at Wayne State University showed that first-year medical students were able to successfully utilize portable ultrasound to differentiate sonographic objects following six 90-min sessions covering abdominal, cardiovascular, genitourinary, and musculoskeletal applications^[21]. Additional efforts have demonstrated that focused ultrasonography may be useful as an educational aid in teaching anatomy to medical students^[22-25]. A study from the Mayo Clinic demonstrated that fourth-year medical students who used focused echocardiography to aid in the understanding of

cardiovascular anatomy had high satisfaction rates^[26]. Further, the use of focused ultrasonography among medical school students has been shown to potentially aid in the development of physical examination skill acquisition^[27]. In a study from the University of Chicago, fourth-year medical students used focused echocardiography in cardiac evaluation with subsequent improved detection of cardiac conditions and higher accuracy in cardiac auscultation skills^[28].

In 2006, the University of South Carolina, School of Medicine introduced an integrated ultrasound curriculum (iUSC) across all 4 years of medical school^[29]. The curriculum was based on a point-of-care “focused” ultrasound program that was developed for emergency medicine physicians and trainees^[30].

The faculty of Muenster (Germany) established an ultrasound curriculum allowing each student of the medical school to gain individually skills in imaging various human organs and its pathologies, creating an individual foundation for further medical practice, according to DEGUM sonographic guidelines for undergraduate medical students^[31].

Although there are already some innovative ultrasound curricula in medical schools around the world, there is a need for the development of national standards to facilitate widespread adoption of ultrasound education in medical school curricula since.

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