''Sono-Seepferdchen'': A Peer Teaching Tutorial for Abdominal Sonography

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Background:

Sonography is a basic competence for all physicians. Recently, performing an emergency ultrasound (FAST) has been included in the national competence-based catalogue of learning objectives (NKLM) which itself is a recommendation for all medical faculties. Nevertheless, there is no such class in the majority of German medical schools. Teaching sonography mostly takes place in electives that only allow only a restricted number of participants. Students at Hannover Medical School recognize the gap between students' need and the availability of suitable classes.

They acquire sonographic skills during clerkships, often without adequate senior guidance. This might result in incomplete skill acquisition and resulting students' frustration about suboptimal transducer positions, limited recognition of shown structures and mostly a lack of structured remediation.
A survey including eleven German Skills Labs revealed that nine of them offer a peer teaching tutorial for sonography but only six offered free practice at their ultrasound machines. Only two of these Skills Labs asked for participation in the tutorial prior to allowing free ultrasound practice.

Summary of work:

We established a peer teaching tutorial qualifying participants in knobology and enabling them for free practice in abdominal ultrasound. It is based on a flipped classroom concept that has been conceived in cooperation with a consultant gastroenterologist who is also a DEGUM 2 instructor (German Association for Ultrasound in Medicine) and consists of the following three elements:

- The students are asked to study a booklet on theoretical background in their own time.
- It is required that the participants study an hour-long instructional video showing a best practice of an abdominal ultrasound prior to attending the hands-on part of the tutorial.
- During the hands-on part of the tutorial the trained student tutors assist the students in performing the abdominal ultrasound. The hands-on time is dedicated entirely to practical training without the need of lengthy introductions.

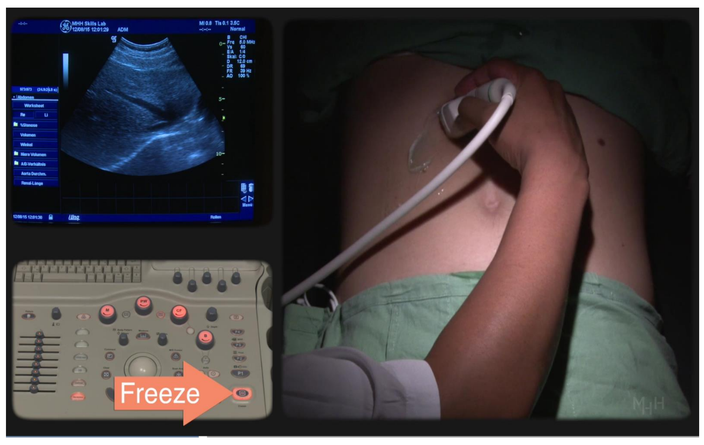
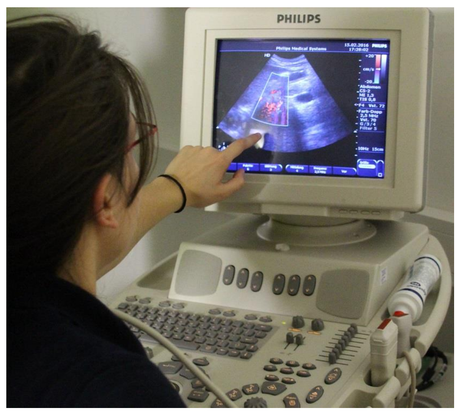


Fig. 1: screenshot of instructional video
The split monitor allows the viewer an authentic perspective : The patient's abdomen is shown to the right, the ultrasound image on the top left and the panel on the bottom left (including indicating the buttons that are being used during the examination).
The video should also be used as a guideline during free practice.



Participants acquire theoretical knowledge during individual preparation.
Therefore, the class concept allows for sufficient hands-on training time during which trained student tutors facilitate participants' learning through demonstration, explanation and instant remediation of problems.
One tutor supervises three participants.

Summary of Results:

Participants' subjective ultrasound competence

We organized our evaluation documents using six-item Likert scales and concentrated on the topics preparation, self-perception of sonographic skills before and after the tutorial and general satisfaction related to the tutorial. We have provided the tutorial three times so far, with a total of 17 participants.

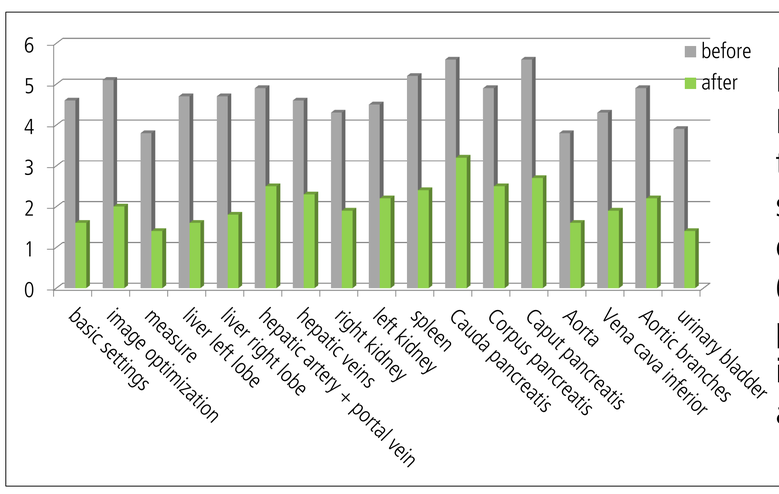


Fig. 2:
Preliminary data suggest that most of the participants improved their subjective sonographic skills after the class (subjective skill on a Likert scale: 6= very little, 1=very good), particularly in basic settings and image generation of the liver, spleen and caput pancreatis.

Participants' subjective skills improved most regarding the setting of the ultrasound machine and image generation of the liver (Fig. 2).
All participants altered their sonographic technique (mean value of 1,7 on a Likert scale, 1= major changes, 6= no change; data not shown).

Student tutors as ultrasound facilitators

The participants rated the tutors' explanations as very well comprehensible (1,3 on a six-point Likert scale with 1 being very good). Participants' feedback also revealed that the tutors answered all questions satisfactorily (1,5 on a six-point Likert scale with 1 being very good).

Acceptance of the tutorial

Every tutorial was signed out within one hour. As far as we can see the number of students taking part in free ultrasound training increased because more than 60 percent of the former participants of the "Sono-Seepferdchen" have so far signed up for it.
Participants of the first tutorial were not aware of the need to study the class material before participation.

Discussion:

The evaluation revealed a challenge for further tutorials: Since this is the first and only peer teaching tutorial based on flipping the classroom, students are not yet familiar with the flipped classroom concept and its inherent need of an intensive preparation. It became evident that only well-prepared participants took optimal advantage of the hands-on time. This requires a change of attitude in the participants and also an increased communication of the student tutors on the importance of thorough preparation. Assuming an adequate preparation, flipping the classroom allows students to focus on their practical skills during class instead of wasting precious time on the theoretical background.
Time will show whether the increased booking of ultrasound free practice is sustainable.

One point we would like to explore as well is the following: Until now we just asked our participants about their subjective feeling referring to their ultrasound competence. For the future we are planning to gain more objective data introducing a formative practical examination at the end of the tutorial by the DEGUM-2 instructor.
As an outlook we hope to provide our absolvents with improved ultrasound skills.
The use of student tutors proved to be very efficient: On the one hand, the participants improved their subjective skills. On the other hand, The tutors were able to improve their own ultrasound skills through the initial training and repeatedly teaching others.
Further advantages are the tutors' high motivation as well as the cost-efficiency of trained student tutors in contrast to physicians who could hardly make the extra time.

Take Home Message:

In conclusion, to our mind the flipped classroom concept is very useful for teaching the basics of abdominal sonography.
Even though we offered „just" a peer teaching tutorial the subjective skills of the participants improved both in image optimization and in finding/measuring the abdominal organs, suggesting remediation of prior mistakes. In our opinion the concept is directly adaptable for other skills labs.

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