

How to communicate the probe moves

Overview

- 2 key components for successful instruction and for learner success of being able to effectively coach your learners in image acquisition are
 - Use a common lexicon
 - dedicating separate time for a spatial reasoning practical
- What are the probe moves?
- How to teach probe manipulation skills
- Tips for improving spatial reasoning
- Tips for improving your teaching of spatial reasoning
- Practice describing the probe moves

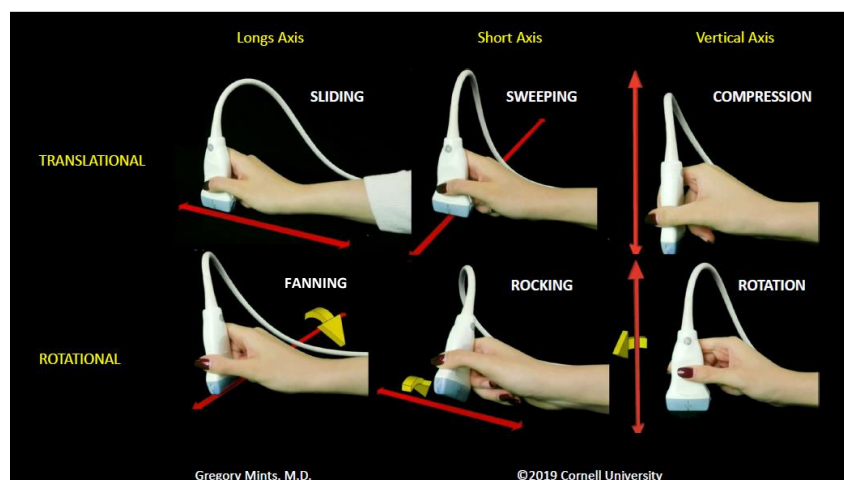
What is spatial reasoning?

- It's the ability to know where you are in space with respect to the probe and patient's anatomy in order to acquire diagnostic images

Common lexicon

- to teach more efficiently we need to get information from working memory into long term memory
- if learners are constantly trying to translate what we mean when we give probe moves instruction then this increases the cognitive load and decreases the efficiency of the teaching session
- we need to have one common word per movement and train our learners in this language so that everyone is on the same page
- D. Bahner et al, *Language of transducer manipulation, Codifying terms for effective teaching*, J Ultrasound Med 2016; 34:183-188

The probe moves



How to teach probe manipulation

- **Step 1 – Conceptualisation**
 - Lecture to describe the various aspects of probe and screen orientation, scanning planes, good sonographic technique and the specific probe moves
- **Step 2 – Silent demonstration**
 - Perform a silent demonstration of the probe moves
- **Step 3 – Narrated demonstration**
 - Repeat the demonstration and “think out loud” – describe the moves and their effect on the image
- **Step 4 – Student performs the probe moves with no screen**
 - Each student in turn performs the probe moves while scanning the bladder (or a simple structure that is square in the body) without looking at the screen
- **Step 5 – Student performs the probe moves with image**
 - Each student in turn performs each of the probe moves as per your instructions while scanning the bladder and watches the screen to observe the effect the moves has on the image
- **Step 6 – Repeat Step 4 & 5 while scanning the kidney**
 - In this rotation, the student needs to align the scanning plane with a structure that is not square in the body to learn how to maintain a long and short scanning plane on an oblique organ
- **Step 7 - *Optional extra* - Scan the bladder and adjust the image orientation**
 - While scanning the bladder perform the probe moves – slide and rock – in the correct orientation, then turn the probe 180° and repeat. Notice that the image moves in the opposite direction to what is expected
 - Repeat this exercise with the screen orientation marker in top right corner and notice the effect on the image
 - Finish by repeating the probe moves with the probe and screen orientation marker in the correct position

Why is teaching the probe moves separately so important?

- Learners need a framework for the probe moves that is committed to long term memory
- The repetitive nature of this practical allows for the transfer of this new knowledge from working memory to long term memory
- If they do not have a common framework / lexicon for the probe moves, then available cognitive space reduces as they try to translate your instructions. The strain on working memory often leads to confusion, frustration, failure and disengagement from the task.
- Teaching the probe moves separately with time dedicated to developing spatial reasoning skills ultimately speeds up the learning process
- When learners have the opportunity to “discover” action and consequence of the probe moves, this assists spatial cognition when applied to new topics.

- If you launch immediately into clinical applications or examinations without allowing the learner time to develop spatial reasoning skills, then you overload the learner and slow their progress. Spatial reasoning is a rate limiting step in the ability to scan effectively and efficiently.

Tips to improve spatial reasoning

- Practice
- Use spatial language
- Use gestures
- Visualize the anatomy or use the “mind’s eye”
- Constantly reinforce hand eye co-ordination by getting the learner to look at their hand position when they find the good view and to note where they are on the skin and the angle of the probe. Practice the probe moves while looking at the patient and visualizing the anatomy to get the feel for how much to move the probe
- When learners are lost, get them to stop looking at the screen. They can become target fixated.
- The Split Attention Effect occurs when students have to refer to two different sources of information simultaneously when learning something. Keep coaching to a minimum in the early phase of learning
- Play a matching game. Show the learner the exemplar image and ask them to reproduce it

To improve your ability to communicate the probe moves

- Stand on the opposite side of the bed
 - This forces you to describe the moves to the learner and makes it harder for you to put your hand on the probe
- Write it down
 - For each view, write a step-by-step guide to getting the view.
 - Use less than 7 steps. If there are more than 7 steps then you will need to teach 2 sub-parts to the skill
 - Identify the start position. What is the surface landmark?
 - Identify the sonographic landmark
 - Isolate each individual probe move it takes to get to the desired view and write it in sequence
 - Test your instructions on a complete novice. Do they work? Did you miss any steps?