

Taking the myth out of capillary sampling

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Hospital do Coração (HCor) in São Paulo, Brazil is a hospital for cardiac patients, many of whom are children and newborns.

Cardiac patients are closely monitored with respect to acid base and blood gases, and even the newborns have several arterial and venous blood samples drawn daily.

Dr Alberto Duarte from the central laboratory of HCor decides to challenge the myth of capillary sampling and introduce a new tradition in his lab: Capillary blood gas sampling of newborns.

Capillary sampling is not a tradition in Brazil, so he asks his blood gas supplier for assistance with training and implementation of the new procedure.

This is the background for inviting Lisbeth Theil to Brazil to conduct training in capillary sampling. Lisbeth is the POC coordinator at Hvidovre Hospital in Denmark. She brings with her to HCor years of experience with capillary sampling and training in the procedure.

acutecaretesting.org has interviewed Lisbeth after the training to learn how it feels to travel across the world to help implement a procedure across tradition, language and culture.

Facts box and background information

Private hospital

230 beds, of which 70 % are for cardiac patients

HCor has no labor ward; all children are transferred from other hospitals and are primarily cardiac patients

20 beds for children (newborns and older children)

Central laboratory is ISO 9000 certified

300 blood gas samples are drawn per day

All samples are drawn by nurses and physicians

The lab has previously been in charge of blood sampling, but today only nurses and physicians are allowed to sample blood. Dr Duarte decided to collect a phlebotomy team of nurses in his lab and educate them in lab routines and requirements

acutecaretesting.org: What were the success criteria for HCor and for your training, and did you reach them?

As I understand it, the clinical staff at HCor has urged for smaller sample volumes for more than 2 years. There has been a previous attempt to implement capillary sampling procedures, but it never succeeded.

This time, a full week of training was planned so the phlebotomist team could work alongside with someone competent in the procedure as well as in training.

It was a success criterion for HCor and myself to have trained the team to be competent in the procedure and to be able to train their colleagues.

Another success criterion was to demonstrate correlation between the usual arterial blood gas results and the new capillary blood gas results. Simultaneous results were obtained and compared, to the satisfaction of the clinical staff.

As a consequence, today all routine blood gas samples (morning and afternoon rounds) are capillary samples. The acute samples are of both arterial and capillary blood, depending on the situation.

I also know of three other hospitals in São Paulo that subsequently have sent phlebotomy staff to HCor for training, with the effect that my initial training has spread capillary sampling to a large patient population.

That is an impressive progress because implementation of a new procedure takes more than instructions; it takes motivation, practice and reflection. I believe we achieved this partly because we managed to create a good and safe learning environment.

acutecaretesting.org: What do you mean by a safe learning environment?

I mean an environment where all parties strive to learn, rather than to perform perfectly the first time or to be shy. That is essential for me as the instructor in order

to correct errors. Capillary sampling is not an easy procedure; it takes practice.

acutecaretesting.org: Did you do anything in particular to create this environment?

I aim to prevent barriers by being open-minded. I pay a lot of attention to the people and the surroundings so that the training program and I myself fit in as naturally as possible.

I immediately felt a connection with the staff – I travel across the world and I find myself in an environment that resembles my own lab very much. In a certified lab with the same equipment, high quality and hygiene standards as Hvidovre Hospital.

The phlebotomists take the same pride in their job as I do, and any initial reluctance they may have had about this whole training event disappeared when the baby doll dropped out of my hand during a demonstration. It lost a leg. It was not very professional but it made everybody laugh, and that created a good atmosphere.

acutecaretesting.org: Did you train the phlebotomy team only?

My initial talks were directed towards the phlebotomy team as well as the clinical staff. It is very important that the nurses and doctors from the pediatric departments get involved, as the procedure also implies a change in practice for them.

For example, it is relevant for the clinical staff to know the advantages and cautions of capillary blood gas results.

The actual practice of capillary sampling was directed towards the phlebotomist team from the lab.

acutecaretesting.org: Can you describe the blood-sampling situation that existed before to your visit?



All samples were of arterial or venous blood, as the hospital did not sample capillary blood. For blood gas measurement alone, 300 samples were analyzed per day.

It is not uncommon to draw 2-3 arterial blood samples per day on some of the patients. Add venous samples to this and the drawn blood volume per day becomes substantial. As a result of the sampled volumes, some of these babies had hemoglobin concentrations as low as 6-7 mmol/L.

This was part of the motivation for the staff, to minimize the sample volumes by replacing many of the arterial samples with capillary samples.

On top of that, neonatal arterial sampling is difficult and poses a risk for the patient. There is also a risk that the results are biased by mixture of arterial and venous blood.

acutecaretesting.org: What was the training program like?

Initially I gave talks to the staff from the lab and the pediatric departments. I introduced them to the advantages and cautions of capillary sampling for blood gas results. An important advantage is being able to minimize the sampled blood volume. An important caution is the interpretation of the results.

Other relevant topics were how to avoid preanalytical errors and how to plan the sampling, e.g. what

equipment to bring and what to ask about the individual patient (does the patient lack thrombocytes, have anemia, frequent blood sampling, etc.).

Then the practical training started. We focused on the babies who were younger than 6 months, and used their heels as sampling sites.

I first described the procedure and then we practiced the procedure in three steps:

1. Practicing the capillary effect when filling a capillary tube.
 - 1.1. Place 5 drops of blood on a piece of plastic. The drops keep their shape when they are on plastic.
 - 1.2. Prepare the capillary tube by sliding a mixing wire inside and mounting a loose end cap on the far end of the tube
 - 1.3. Fill the tube with the blood drops by touching the drops with the end of the tube. Practice the feel for drops being collected into the tube (called the "capillary effect"). Practice the angle to hold the tube at. Avoid air bubbles and expel them if they enter the tube.
 - 1.4. Close the tube with both end caps. Mix the sample with heparin by inverting the tube repeatedly. The mixing wire will slide from end to end.
2. Preparing the sampling site on a colleague's finger.
 - 2.1. Heat the site with a warm towel.
 - 2.2. Puncture with a lancet.
 - 2.3. Sample blood as practiced in step 1.
3. Performing the procedure on neonatal patients.



acutecaretesting.org: Do you think that one week of training will make neonatal capillary sampling a routine procedure at HCor?

I believe that the staff groups involved were convinced of the advantages of the procedure seen from the patient's perspective. It was even quite obvious that the babies cried less than during arterial puncture.

The challenges onward are true implementation of a standard procedure as well as solving the practicalities of purchasing lancets and the other gear needed for good sampling. I have prepared a standard procedure for HCor, complying with CLSI guidelines, which is now being translated to Portuguese.

acutecaretesting.org: In your opinion, what are the three most important elements when training in neonatal capillary blood gas sampling?

1. Creating a learning environment where everybody feels safe.
2. Ensuring a motivated group by involving them and explaining not only WHAT and HOW but also WHY the procedure is like it is.
3. Having all utilities for the procedure available and organized.

acutecaretesting.org: Did you also learn something from the training that you can use in your work at Hvidovre Hospital?

Yes, I have been confirmed that capillary sampling procedures CAN be taught, even to people who have never heard of the procedure before.

In my work at Hvidovre, I can use this knowledge to plan the efficient training, even when the circumstances are different from the HCor training. As an example, I am about to implement capillary sampling for bilirubin testing in the lab.

That means introducing a new procedure for lab and clinical staff. Even though capillary sampling is not new to my colleagues, the training must be planned to reflect the new element of transportation of the sample.

Interviewee

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