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## Foreword

Welcome to the latest edition of the International Journal of Clinical Skills (IJOCS), Volume 7, Issue 4, July 2013.

When procedures are performed on patients many skills are required for safe and effective practice. 'Technical' competence on its own is insufficient. Professor Debra Nestel and Associate Professor David Campbell of Monash University, Australia, evaluate the impact of Simulation-based Training for Enhanced Procedural Skills (STEPS) – a program designed to prepare students for the safe practice of procedural skills. Discover how STEPS students perform in real clinical settings compared to those learning by traditional methods.

Simulation may be used as part of pre-qualification training for nursing students. Although students of healthcare professions typically enjoy and value simulation sessions, there is less evidence about just what it is that they value and how simulation learning outcomes compare with those of other learning modes. Researchers at City University London, United Kingdom, evaluate a simulated practice module and discuss incorporating such a module into the first year of the nursing curriculum. There is no doubt that this informative paper is of great significance to those planning nursing school curriculum and development.

Doctors at City Hospital Birmingham and New Cross Hospital Wolverhampton, United Kingdom, present an interesting review of arterial blood gas (ABG) sampling technique. It is a skill required of every newly qualified doctor, in numerous routine and emergency situations, but many new doctors feel that they have not been adequately trained to carry out this procedure confidently and reliably. This paper provides a step by step approach to help obtain an effective arterial blood gas sample and it proposes new equipment for training.

As always, your feedback is invaluable for the continued development of the International Journal of Clinical Skills – the only peer reviewed international journal devoted to clinical skills (e-mail: feedback@ijocs.org)

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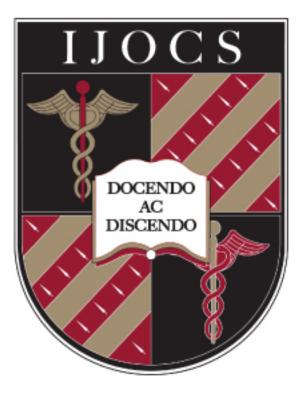
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# Arterial puncture for blood gas sampling – a new training method

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## Keywords

Arterial blood gas sampling Training methods

## **Abstract**

Arterial blood gas (ABG) sampling is a common clinical procedure performed in a variety of clinical situations by junior doctors. However, in undergraduate curriculum and clinical attachments, students do not routinely undertake formal assessment in ABG sampling techniques, nor do they routinely practice this skill on real patients. Many new doctors feel that they have not been trained adequately to carry out this procedure confidently and reliably [1]. In contrast to venous sampling, arterial sampling is a more invasive and painful procedure. Poor technique in ABG sampling often contributes to unpleasant patient experience and leads to stress among doctors, especially in emergency situations where ABGs are important in guiding management. It is therefore important that doctors are effective in carrying out this clinical skill and that training methods are established to educate doctors in the safe and competent techniques of ABG sampling.

In sampling an ABG, clinicians cannot visualise the target for ABG sampling due to the artery's deep location. Many people therefore find taking an ABG more difficult compared to venepuncture. An appreciation of the course and depth of the artery is required, via palpation of the arterial pulse. This article focuses on the technique that helps to correctly identify the needle entry point into the artery, which could help reduce the incidence of unsuccessful ABG attempts and consequent patient dissatisfaction. Good technique can help greatly reduce the level of anxiety in patients and in some cases also help avoid the need for local anaesthetic. In addition, there is evidence to show that the force and mechanical workload of needle insertion has been found to positively correlate with the frequency of pain [2].

The radial artery of the non-dominant hand is the preferred artery for obtaining an ABG sample. Perform Allen's test before the procedure to ensure there is an ulnar collateral circulation to the hand according to the following method: apply firm pressure over the ulnar and the radial arteries to occlude both of them. The patient is then asked to make a fist for about 30 seconds; after 30 seconds, the patient should relax and open the hand and if normal, it should appear blanched. Following that, the ulnar pressure is released and the colour should return

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within 2 seconds. This implies that the collateral ulnar arterial supply to the hand is sufficient and it is safe to undertake a radial artery puncture. Conversely, if the hand remains pale after 10 seconds, the radial artery must not be punctured.

Below are five steps to help obtain an effective arterial blood gas sample:

## STEP 1

Wash hands and wear gloves before the procedure. Use your index and middle finger to feel for the course of the radial artery – aiming to identify the strongest point of pulsation (Figure 1). Be aware of the surrounding bony structures and muscle layers. Identifying both the location and course of the artery is very important to maximise the accuracy of sampling ABG.

Figure 1: Palpating for the radial pulse and the course of the radial artery



## STEP 2

Use an alcohol wipe or cleanser to clean the area of the skin overlying the radial artery through which the needle will be inserted (Figure 2).

Figure 2: Clean the skin overlying the radial artery with an antiseptic agent



## STEP 3

Prepare the ABG syringe and needle, in readiness for needle insertion (Figure 3).

Figure 3: Attach needle to syringe and remove needle cap



## STEP 4

The patient's hand should be positioned in order to allow clear access to the intended puncture point. Rotate the position of your index and middle finger by 90 degrees so that the strongest point of arterial pulsation is located at the groove between the two fingers.

Slowly insert the needle at this 'strongest pulsation point' with the needle at 45 degrees to the artery and ensure that the bevel of the needle is facing the direction of blood flow (Figure 4).

Figure 4: Insertion of ABG syringe needle at the location identified by the channel between the two fingers



In some patients the needle may need to be inserted at an angle closer to 90 degrees, for example, in overweight patients or deep-seated radial arteries.

If bony structures or skin wounds do not allow the use of two fingers for locating the ABG needle insertion point, you could attempt to use a single finger to palpate the artery; in such a case, the needle should be slowly inserted at the strongest point of pulsation, marked by the midpoint of the fingertip (Figure 5).

Figure 5: Insertion of ABG syringe needle at location identified by the tip of the finger using a 'one-finger landmark technique'



## STEP 5

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Upon entry of the needle tip into the artery there should be a 'flashback' of blood into the hub of the ABG syringe. Subsequently the arterial pressure should normally allow blood to easily fill into the syringe by itself.

If there is no flashback of blood into the hub of the needle,

it usually implies that the needle tip is not inside the lumen of the radial artery. Try withdrawing the needle tip back slightly without it leaving the skin completely, and then re-advance it at a slightly different angle or direction, towards where you think the artery is located.

After drawing the required 1-2 mls of blood into the syringe, place a piece of gauze above the insertion point whilst withdrawing the needle. Pressure should be applied to the gauze for a few minutes in order to achieve homeostasis.

The now exposed ABG syringe needle should be inserted into the rubber cube provided with the syringe, to prevent needle-stick injury and ensure safety (Figure 6).

Figure 6: The needle is inserted into a rubber cube to ensure safety



The needle and rubber cube should be removed as a single unit and disposed in a sharps box. A sealing cap (provided with the syringe) should immediately be placed onto the ABG syringe (Figure 7). The sample should then be gently rolled for a few seconds between the finger tips to ensure adequate mixing.

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Figure 7: A sealing cap is used to cover the syringe



The ABG syringe sample should then be immediately analysed by a blood gas machine. Any significant delay in analysis of the sample could affect the ABG results.

# Proposing new equipment for training

In conjunction with the technique described, we also propose the idea to create a manikin made of transparent core material covered with a removal skin layer for training purposes. This model would allow students to practise observing the position, depth and course of the artery in a three-dimensional fashion. Students could also remove the skin layer of the arm following skin puncture with needle still in-situ, and appreciate the depth of the needle in relation to the artery. This approach would be valuable in allowing students to practise their ABG syringe needle insertion technique.

Finally, manufacturers could provide manikins with arteries of different sizes, positions, depths, courses and strengths of pulsation to achieve a more realistic simulation model. These variations would provide an excellent training tool and help students gain competency in ABG sampling, therefore possibly improving subsequent clinical care and reducing patient discomfort.

## Acknowledgments

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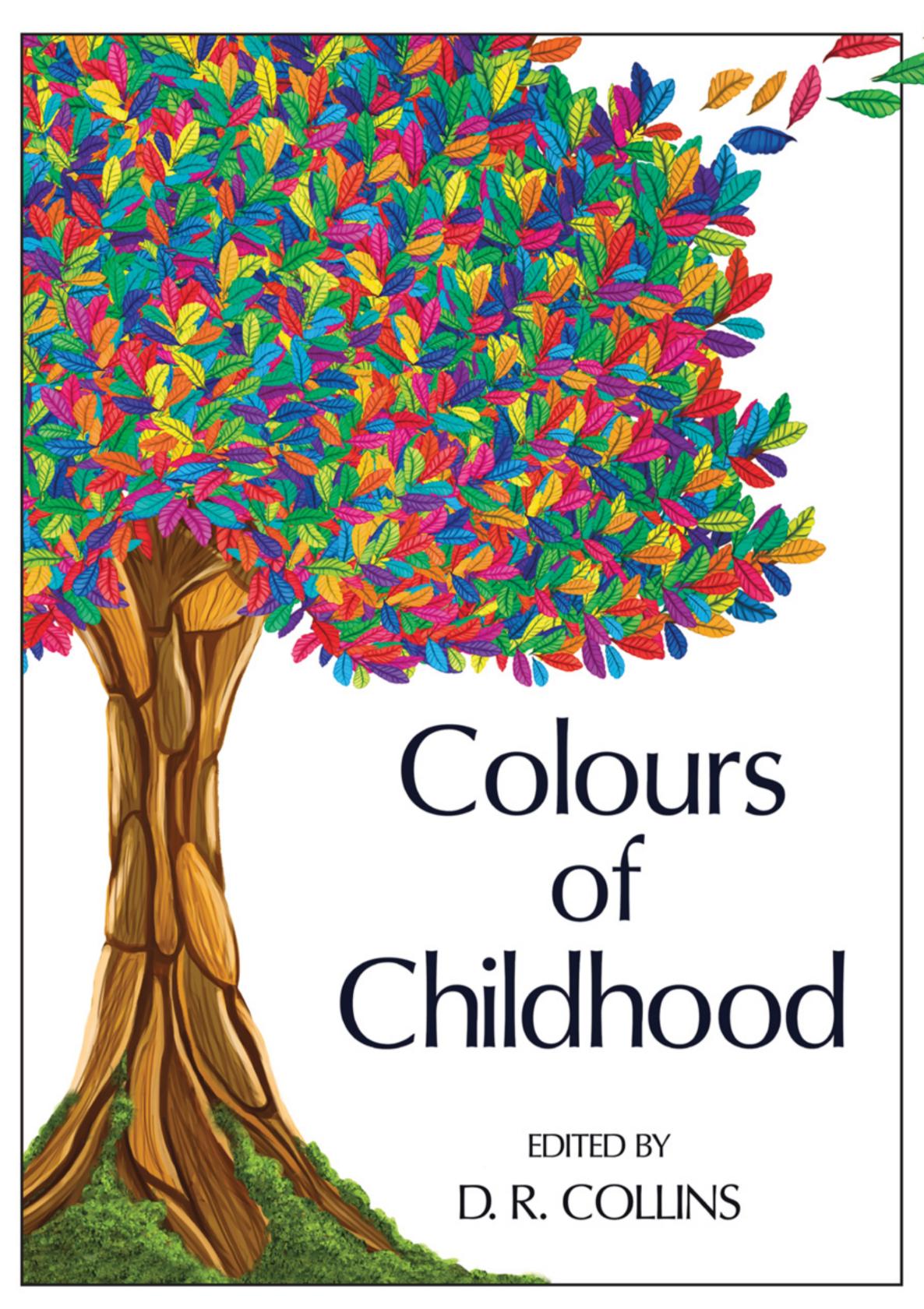
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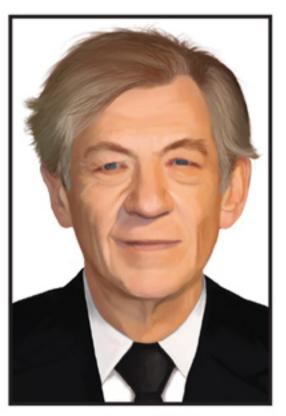


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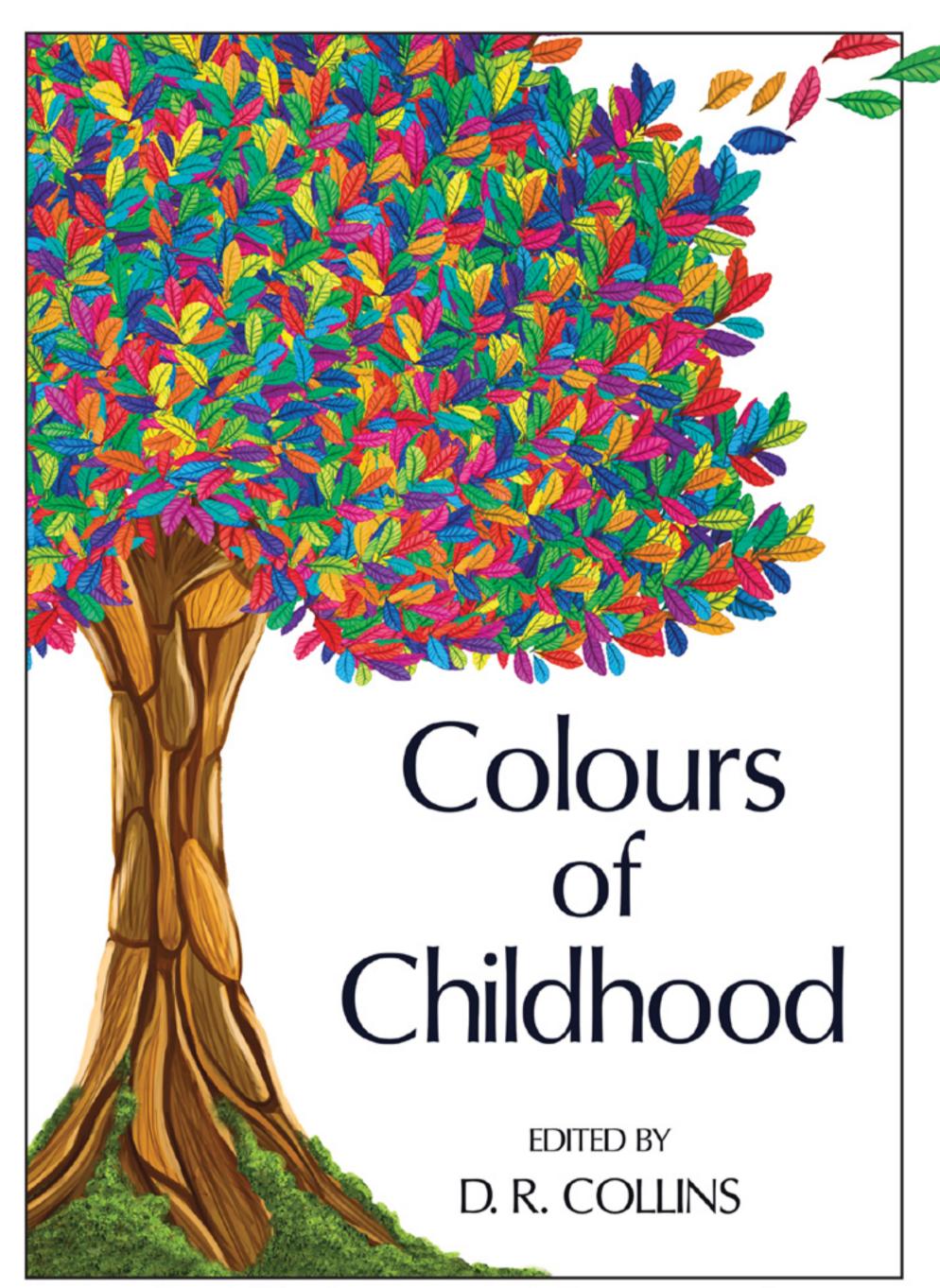
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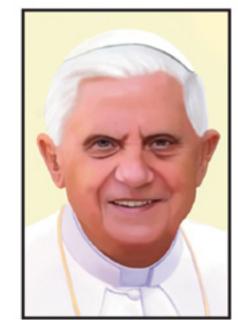
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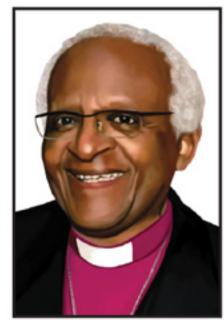
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