

*The NIHR Southampton Biomedical Research Centre (BRC) has a tight quality assurance system for the writing, reviewing and updating of Standard Operating Procedures. As such, version-controlled and QA authorised Standard Operating Procedures are internal to the BRC.*

*The Standard Operating Procedure from which information in this document has been extracted, is a version controlled document, managed within a Quality Management System. However, extracts that document the technical aspects can be made more widely available. Standard Operating Procedures are more than a set of detailed instructions; they also provide a necessary record of their origination, amendment and usage within the setting in which they are used. They are an important component of any Quality Assurance Framework, but in themselves are insufficient and need to be used and interpreted with care.*

*Alongside the extracts from our Standard Operating Procedures, we have also made available here an example Standard Operating Procedure and a word version of a Standard Operating Procedure template. Using the example and the Standard Operating Procedure template, institutions can generate their own Standard Operating Procedures and customise them, in line with their own institutions.*

*Simply offering a list of instructions to follow does not assure that the user is able to generate a value that is either accurate or precise so here in the BRC we require that Standard Operating Procedures are accompanied by face-to-face training. This is provided by someone with a qualification in the area or by someone with extensive experience in making the measurements. Training is followed by a short competency assessment and performance is monitored and maintained using annual refresher sessions. If you require any extra information, clarification or are interested in attending a training session, please contact Dr Kesta Durkin ([k.i.durkin@soton.ac.uk](mailto:k.i.durkin@soton.ac.uk)).*

*This document has been prepared from Version 2 of the BRC Standard Operating Procedure for making circumference measurements of children. It was last reviewed in April 2015 and the next review date is set for April 2017. The version number only changes if any amendments are made when the document is reviewed.*

## NIHR Southampton Biomedical Research Centre

### Procedure for Measuring CIRCUMFERENCES OF CHILDREN

#### BACKGROUND

This procedure is to be used for circumference measurements of children between the ages of 12 months and 12 years.

#### PURPOSE

To ensure correct and uniform measurement of child circumferences.

#### SCOPE

This procedure applies to any study that requires making circumference measurements of children, within the BRC.

#### RESPONSIBILITIES

It is the responsibility of the measurer to ensure they are competent, and to follow this procedure when making circumference measurements of children. It is the responsibility of the Principal Investigator to ensure that staff members who are working on specific studies have adequate experience/training to do so.

#### PROCEDURE

Any anthropometric tape should be flexible and non-extensible. Metal tapes are preferable to plastic-coated fabric tapes, which can stretch with use over time therefore introducing error into the measuring process. They should ideally be narrow and have a blank space at the beginning of the tape so that you can hold it in position when measuring without covering up the origin/zero mark with your thumbs. We use Lufkin Executive Thinline tapes ((W606PM) figure 1a and b) which are metal retractable tapes and are only 5mm wide. When cleaning them after use with a Clinell wipe, you must dry the length of the tape with a hand tissue before allowing the tape to retract into the casing, otherwise the tape develop rust.



**Figure 1a.** Lufkin metal Tape measure



**Figure 1b.** Metal tape showing blank space before the zero mark

Where possible, make measurements on the non-dominant side. It is advantageous to have an assistant, who can help from the other side by checking the tape is always level and remains in the correct position.

### **Child Head Circumference**

1. Wash your hands and explain the procedure to the child and parent.
2. Make sure that you can measure the head without including large amounts of hair (ponytails/plaits/hair clips etc will need to be taken out).
3. If the participant is below 5, measure them when they are seated. Children above 5 should be measured standing.
4. Stand to the side of the child.
5. Make sure their arms are relaxed by their sides and their head is in the Frankfort Plane (an imaginary line joining the upper margin of the external auditory meatus and the lower border of the orbit of the eye).
6. Position the tape so that the zero mark is on the side of the head.
7. Pass the tape around the head, placing it on the most anterior protuberance of the forehead and the most posterior protuberance of the back of the head (remember your aim is to measure the maximum head circumference).
8. Once located, pull the tape measure tight to compress the hair.
9. Measure to the nearest 0.1cm (1mm)
10. Make three measurements of head circumference.

11. Record the mean (average) measurement by adding the values together and dividing by three.

### **Child Chest Circumference**

1. Wash your hands and explain the procedure to the child and parent.
2. Whilst the child is standing, feel for the xiphisternum where the ribs meet the sternum and mark with a short horizontal line.
3. Pass the tape around so that the mark is at the upper border of the tape.
4. Make sure the tape is level. It should rest on the skin but not indenting it/not pulled too tight.
5. Take the reading at the end of expiration.
6. Measure to the nearest 0.1cm (1mm).
7. Make three measurements of chest circumference.
8. Record the individual measurement and the mean (average) by adding the values together and dividing by three.

### **Child Waist Circumference**

1. Wash your hands and explain the procedure to the child and parent.
2. Always mark both sides; it helps keeping the tape level. Palpate for the lower rib margin (costal margin) and mark with a short horizontal line.
3. Palpate for the iliac crest and mark with a short horizontal line.
4. Using the tape measure, measure the mid distance between the two horizontal lines and mark this with another short horizontal line in the middle.
5. Ask the child to cross their arms across their chest so that you have access to the waist. Instruct them to stand relaxed and look straight ahead. Try and make sure that they don't deliberately hold themselves in or out.
6. Pass the tape around the waist, making sure it is level and that it is positioned at the mid-distance mark on both sides.
7. Make sure the tape is not pulled too tight. It should rest on the skin but not indent it.
8. Make the measurement at the end of expiration.
9. Measure to the nearest 0.1cm (1mm).
10. Make three measurements of waist circumference
11. Record all three measurements and the mean (average) by adding the values together and dividing by three.

### Child Mid Upper Arm Circumference

1. Wash your hands and explain the procedure to the child and parent.
2. Instruct the child to stand with their back to the measurer and their arms hanging by their sides.
3. Palpate for the acromion and mark with a biro.
4. With the child's arm flexed at 90°, palpate for the olecranon (tip of the elbow) and mark with a biro.
5. Using a tape measure, measure the distance between the mark at the acromion and the mark at the olecranon. Whilst still holding the tape in place, make a short horizontal line at the mid-point. This line marks the middle of the upper-arm (i.e. if the tape measure shows that the measured distance between the acromion and olecranon is 32.6cm then the mid-point mark should be drawn at 16.3cm).
6. This marks the level at which the circumference will be measured.
7. Ask the child to relax and to keep their arm hanging by their side. This is important as a very different reading may be obtained if the arm is not fully relaxed.
8. Align the tape around the upper arm such that the mid-point mark is situated between the two parts of the tape (figure 1)

Mid-point mark.

Arrange the tape so that the mid-point mark (blue line) sits between the two parts of the tape when positioned round the arm

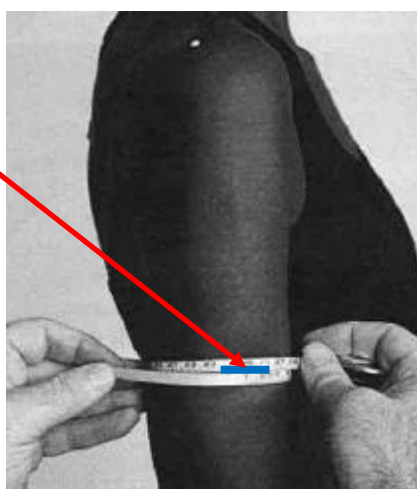


Figure 1. Mid-upper arm circumference tape placement.

9. Ensure the tape is horizontal. Make sure the tape is not pulled too tight. It should rest on the skin but not indent it.
10. Make three measurements of mid upper arm circumference.
12. Record all three measurements and the mean (average) by adding the values together and dividing by three.

### **Child Hip Circumference**

1. Wash your hands and explain the procedure to the child and parent.
2. Make the measurement at the widest part of the hips (usually between the greater trochanter (top of the thigh bone) and the lower buttock level). Make the measurement over pants/knickers or thin shorts with the legs together.
3. Ensure the tape is horizontal all round.
4. Measure to the nearest 0.1cm (1mm).
5. Make three measurements of hip circumference.
6. Record all three measurements and the mean (average) by adding the values together and dividing by three.