



Your Child's Growth:

A parent's guide to growth in childhood
and how to assess it

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INTRODUCTION

This guide has been developed to help you understand the importance of regularly monitoring your child's growth, and how to address any concerns you may have about it. Since 95% of children grow perfectly normally this booklet will hopefully reassure you that your child is one of them. But for the 5% who do not, regular monitoring will identify abnormal growth as early as possible, enabling treatment to be provided at an appropriate time.

Any child displaying poor or excessive growth should receive the best possible medical attention. If you think that your child is not receiving the best medical attention and



should be referred to a paediatric endocrinologist (growth specialist) for a second opinion, then follow your instincts and insist on it.

The Foundation can help you find that specialist. As a parent support group, it is unable to diagnose growth disorders or make appointments to see a growth specialist, but it can offer advice and information.

This booklet also contains background on the medical professionals' recommendations for growth monitoring, so that you can ensure that your Health Care Professional (health visitor, school nurse, GP or paediatrician) is doing the absolute best for your child.

Throughout this guide, for 'growth' read 'increase in height'. Growth is frequently poorly-defined in medical circles and (especially in infancy) is often used as a euphemism when "weight gain" or "weight loss/failure to thrive/faltering growth" would be more exact descriptions.

We hope that this information is helpful. We have been able to provide it free of charge only because of the generosity of others who have paid for its production. Please consider supporting us by becoming a Foundation member. Contact details can be found at the end of the booklet.

FACT & FANCY

There are plenty of 'old wives' tales about height and some of the wisdom is questionable!

- *'Don't worry if they are small, they will suddenly shoot up, just wait and see'*. Do not wait, that spurt might not ever happen. It is time wasted and may be growth lost. **If you are concerned, seek advice.**
- *'He's taking after his granny'*. It's the height of the child's parents that is most relevant, not the grandparents.
- *'You can help your child to grow by doing stretching exercises or eating special diets'*. This is not true, the most that they will do is to strengthen their muscles and keep them fit.

Growth is the most sensitive index of health in childhood. You only grow when you're a child. The major influence on your final height is genetic so you may be short or tall simply because your parents are. Assessment of children's growth is important, not only to establish that it is normal, but also that their stature is compatible with that of their parents. Since parents also come in all shapes and sizes, the range of normal growth is quite extensive. Remember that if one or both parents grew abnormally as



children, the same problem may now be an issue, but also treatable in their child. Be aware that abnormal growth may occur at any age during childhood!

A child's growth is normally rapid during the first two years of life, and slows down in childhood, (although there may be a slight acceleration 'the mid-childhood growth spurt' between 6 - 8 years) and speeds up again during puberty. It is during puberty that the significant growth spurt occurs, after which growth is more or less completed.

The age at which puberty begins is variable - and for some children it can be very difficult, when they seem to get left behind and appear to stop growing. Secondary school can be a frightening prospect when their friends "suddenly" become taller and more mature as a result of their pubertal growth spurt. For tall children, who may already tower over their peers, the prospect of further growth during puberty may also be equally alarming. The average age for the onset of puberty is between 10 - 10 ½ years. For boys, this is identified by testicular enlargement and pubic hair, and for girls, by the onset of breast development. In boys the growth spurt is a relatively late event in puberty, whereas in girls the growth spurt begins at the onset of physical changes at puberty. For girls in general, it is an average of 2 ½ years from onset of puberty until menarche, which occurs at an average of 12 ½ years. When there are no signs of puberty by the age of 13 years in a girl and 14 years in a boy, this should be discussed with a GP. When the epiphyses (growing ends of the long bones) have fused, no further growth is possible, although the age at which this happens also varies.

Current medical opinion suggests that there is no benefit, medically or psychologically, in allowing puberty to become significantly delayed before a referral to a specialist for assessment and possible medical intervention is discussed.

If physical signs of puberty become apparent before 9 years for a boy and 8 years for a girl, a referral to a specialist for assessment should also be discussed, as the child may be displaying Premature Sexual Maturation.

GROWTH CURVES

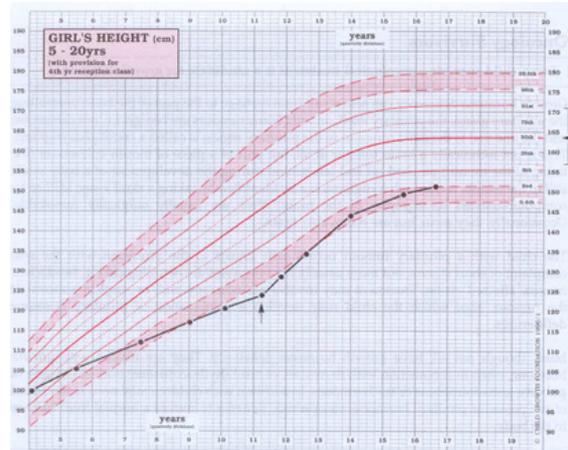
If you are concerned that your child is not growing enough or is growing too much, your priority should be to establish a growth curve. You might be anxious, not only because they appear to be the smallest or tallest in the class, but they never seem to grow out of clothes or shoes, or grow out of them too quickly! By measuring your child's length/height and plotting the measurements on a centile chart, it is possible to assess whether your child's growth curve is normal. By simply studying the charts you can predict how much your child should be growing year-by-year. If he/she grows less than 5cm in any given year then you should seek medical attention. Although, height velocity may potentially drop below this immediately pre-puberty.



A single measurement will usually not be sufficient. You will need two or more measurements to establish a growth curve.

When it is "normal" the curve runs parallel to one of the chart's printed centiles within a centile band. Any significant deviation (when the curve veers upwards or downwards through the centile bands) needs medical assessment.

Your child's growth curve should, of course, have been established through regular height monitoring by your health visitor or GP.



ADULT HEIGHT POTENTIAL

Mid-parental height, mid-parental centile and target centile range

The adult height which your child should expect to achieve genetically, if their growth is normal, it is called the mid-parental height [MPH], and is usually referred to in terms of one of the printed centiles on the chart - the mid parental centile [MPC]. The way to calculate boys/girls mid parental height/centile, are given below. There are many reasons why some children do not always follow their mid-parental centile exactly, but all should grow within specific centiles - their target centile range [TCR].

How to calculate a Child's MPH/MPC

1. Measure the height [in centimetres] of the parents
2. Add the two measurements together
3. Divide by 2.
4. To this figure add 7.5cm for a boy / subtract 7.5cm for a girl

The addition or subtraction of 7.5cm is to compensate for the average difference between the heights of Caucasian (white) men and women.

This is the child's Mid-Parental Height. Mark it with an inward pointing arrow to the right of the 18 year line on the back page of the chart. The Mid-Parental Centile is the printed centile nearest to the MPH. The Target Centile Range [TCR] is bordered by the two centiles, 7.5cm above or below the MPH. The child should be growing within these two centiles from the age of 2 years.



It is important to identify any growth problem at the earliest possible age. If appropriate, early treatment will then give the child maximum time to benefit from it and help to achieve their potential adult height.

ABC OF MEASURING AND PLOTTING

If your child is too young to be able to stand up straight, you should be measuring them supinely [lying on their back]. Because this is difficult to do accurately, and requires two people, you might prefer to take the measurements with your health visitor using a special measure-mat.

To measure your child standing up, special equipment is not as essential as long as you do it accurately. Again, two people should measure if possible; one ensuring that the child is standing correctly, the other recording the actual height.



Supine Measurement

Standing Height Measurement



Your child's shoes and socks should both be taken off (loose or baggy socks will also disguise the fact that a child may be raising their heels off the floor). Children who try to gain a centimetre or two in this way should be asked to wiggle their toes! To do both simultaneously is impossible.

Stand the child up straight against a vertical, straight surface (a wall or a door). The wall should not have a skirting board and should be free of pipes or radiators. Lower a suitable, flat object (e.g. large, hardback book) vertically on the child's head with one of its longer sides held at right angles against the wall. Check that both the child's buttocks and back of the shoulders are resting against the wall and the head is facing straight in front, in the 'Frankfurt Plane' position. (The professional term for an imaginary line running as close as possible between the lower sockets of the eyes and the ear holes). Pencil a mark at the point reached by the base of the flat object. The height measurement will be the distance between the mark and the floor.

Make a note of the measurement on your centile chart and plot the height on its grid.



Don't Over Measure

The Foundation recommends that you request your GP, health visitor or school nurse to measure your child as follows:

Birth/10 days | 16 weeks | 6-8 months | 18 months, 3, 5, 7 & 11 years

However, do not over-measure. A baby should not be measured supinely more often than 3 monthly, and standing height no more frequently than 6 monthly. This is because children often grow seasonally and in "fits and starts" and it may be confusing to measure/assess their growth more often. A baby's weight should be taken more frequently than its length during the first year, since uniquely, weight is the best indicator of well-being during this period.

If you would like to monitor your child's growth yourself, why not choose their birthday as being an easily remembered occasion on which to reach for the tape?

Measuring at birth is sometimes seen as controversial. However, it is an important measurement since it may help health professionals decide whether an infant crossing the centile bands downwards or upwards is failing to thrive, growing excessively or just displaying the phenomenon of "catch down" or "catch up" growth. Children often catch down or catch up their growth following birth as they begin the adjustment to their mid-parental centile. This process may take up to two years.

Plotting and Interpretation

On the growth charts, the grids are calibrated with age along the bottom and height up the sides. Find the co-ordinate on the grid where the measurement and the age meet and mark it with a firm dot.

One measurement will not show whether your child's growth is normal or abnormal. A second measurement taken 6 - 12 months later, and a third measurement taken after a further 6 - 12 months will often be needed for you to establish an accurate growth curve. For normal growth, the curve should run along, or be parallel to one of the chart's centile lines. If it deviates significantly upwards or downwards and you have checked that your plotting is correct, discuss the deviation with your GP, taking the chart with you.

General paediatricians and growth specialists are now agreed on all the criteria for referring children and the full agreement is reprinted on page 8 "Interpreting growth curves".



THE REFERRAL PATH TO A GROWTH SPECIALIST

If you still have concerns about your child's growth you should discuss this with your GP. Take this guide and your child's chart with you and any other measurements you have of your child's growth. If you think that your child is unusually short or tall for your family, then also discuss this with your GP. If he/she shares your concern, your child may be referred to a Paediatric Endocrinologist [a growth specialist]. To ensure the best medical attention available, all children with a growth disorder should be under the supervision of a Paediatric Endocrinologist.

BONE AGE

When you are born there are growing ends of the long bones called epiphyses. These allow the bones to grow. As you get older and increase in height the epiphyses grow and then ultimately fuse and no more skeletal growth is then possible. The various epiphyses are established by an x-ray of the left hand and wrist; and a bone age (an assessment of the child's biological, rather than chronological (actual) age) calculated. With this information a growth specialist can estimate how much growth is still available and this will also help them predict a potential adult height.

Generally tall children often have an advanced bone age and short children will have a delayed bone age. The majority of children attending a growth clinic are there because of growth delay: they are physically immature and shorter than their peer group.

GROWTH CENTILES

Centiles represent the growth of the population. The 50th is the average for the UK childhood population indicating the height, weight or head circumference of 50% of children at any given age: the 2nd and 98th centiles respectively, representing the 2% of children who are very tall or small.

Interpreting Growth Curves

The appeal of centile charts is that they allow health professionals to illustrate growth graphically, interpret any variation in its pattern and identify a growth disorder (or any other condition for which poor or excessive growth is an indicator), as early as possible. Growth specialists, paediatricians and GPs have agreed how many centile "bands" a child should be allowed to cross before being referred for expert medical assessment. Insist that your child be referred if any of the following applies:



- refer if the child's height falls above the 99.6th or below the 0.4th centile line or outside his/her Target Centile Range [TCR]
- for a child under five years old refer if their height curve crosses two height centile bands (for example from the 91st - 50th) in a period of 18- 24 months. If only one height centile band is crossed, the child should be measured again in 18-24 months and referred if a further height centile band has been crossed
- for a child over five years old refer if their growth curve crosses one height centile band (for example from the 50th - 25th) within one year. If it crosses only half height centile band, the child should be measured again in 6-12 months and referred if a further half height centile band has been crossed.

Growth Disorders

Some growth disorders are not necessarily rare. Even commonplace chronic (longstanding) conditions such as asthma or eczema can influence development, and many conditions not considered as being a "growth" condition can be identified by an abnormal growth pattern. These include conditions such as renal failure, congenital heart disease, coeliac disease and even child abuse.

Treatments for some medical conditions may also retard growth. For example, steroids given to control asthma may have an impact on growth. Radiotherapy used in the treatment of childhood cancer may also lead to complete pituitary gland failure and halt growth altogether. The estimated survival rate from childhood cancer disorders has increased significantly, and surviving children may need years of growth hormone treatment to help establish normal growth.

NORMAL GROWTH

General guidelines for height of younger children are in the region of:

- 0-12 months: 18 - 25 cm a year
- 1-2 years: around 13 cm a year
- 2-3 years: around 8.5 cm a year (most children will double their birth length by 3-4 years of age)
- 4 years to puberty at least 5 cm a year

See the Average Growth table (next page) for further details.

Pubertal changes will usually see a growth spurt of around 6.5cm to 11.5cm per year for girls, usually by 10 years. Boys experience both puberty and the growth spurt later, usually by 12 years and averaging 7.5cm to 12.7cm per year.



Once puberty finishes, the epiphyses (bone ends) will fuse and no further growth is possible.

AVERAGE GROWTH

Age	Boy	Girl
1 year	75.9cm	74cm
2 years	87.5cm	86cm
3 years	96cm	95cm
4 years	103cm	102.5cm
5 years	110cm	109cm
6 years	116cm	115cm
7 years	122cm	121cm
8 years	128cm	127.5cm
9 years	133cm	133cm
10 years	138cm	139cm
11 years	143cm	144cm
12 years	148cm	150cm
13 years	155cm	155cm
14 years	162cm	159.5cm
15 years	169cm	162cm
16 years	173cm	163.5cm
17 years	177cm	163.5cm
18 years	177cm	163.5cm



FAMILY SUPPORT

The Foundation currently provides advice, membership and information services, newsletters, and holds an annual convention/AGM, usually in October. Importantly, the Foundation provides information and support to parents with children diagnosed with a growth condition. It provides help and advice on how to achieve the best possible medical care for the child.

It publishes patient information booklets on specific disorders in association with the British Society for Paediatric Endocrinology, the academic body of the UK's growth specialists.

Although the Foundation's registered area of benefit is the United Kingdom, it also has overseas members.

If your child has a growth condition, membership of the Child Growth Foundation will be of great value to you. The Foundation is a national, independent charity representing the needs of children who fail to grow enough or grow too much. It was founded in 1977 and its aims include the following:

- to maintain a support network and offer advice for families of children with growth disorders
- to raise funds to support research into growth disorders
- to educate both the medical profession and the general public in the importance of measuring children regularly from birth
- to raise awareness of growth conditions

The Foundation is the UK's leading charity seeking to ensure that every child's growth is regularly assessed and every identifiable growth-related abnormality referred to an endocrine specialist for care or treatment.

Growth conditions include:

- Growth Hormone Deficiency (GHD) / Multiple Pituitary Hormone Deficiency (MPHD)
- Premature Sexual Maturation
- Silver-Russell Syndrome (SRS) Also known as Russell-Silver Syndrome (RSS)
- Intrauterine Growth Retardation (IUGR) and Small for Gestational Age (SGA)
- Bone Dysplasias
- Soto Syndrome
- Weaver Syndrome
- Tatton-Brown-Rahman Syndrome (DNMT3a Overgrowth Syndrome)



PAEDIATRIC ENDOCRINE CENTRES

City	Clinic/Hospital	Address
Belfast	Royal Belfast Hospital for Sick Children	180 Falls Road, Belfast BT12 6BE
Birmingham	Birmingham Women's & Children's NHS Foundation Trust	Steelhouse Lane, Birmingham B4 6NH
Bristol	Bristol Royal Hospital for Sick Children	Upper Maudlin Street, Bristol BS2 8BJ
Cambridge	Addenbrook's Hospital	Hills Road, Cambridge CB2 0QQ
Cardiff	The Children's Hospital for Children	Heath Park, Cardiff CF14 4XW
Edinburgh	Royal Hospital for Sick Children	9 Sciennes Road, Edinburgh EH9 1LF
Glasgow	Royal Hospital for Children	1345 Govan Road, Glasgow G51 4TF
Leeds	Leeds General Infirmary	Great George Street, Leeds LS1 3EX
Leicester	Leicester Royal Infirmary Children's Hospital	Infirmary Road, Leicester LE1 5WW
Liverpool	Alderhey Children's Hospital	East Prescott Road, Liverpool L14 5AB
London	Chelsea & Westminster Hospital	369 Fulham Road, London SW10 9NH
London	St Bartholomew's Hospital	West Smithfield, London EC1A 7BE
London	Kings College Hospital	Denmark Hill, London SE5 9RS
London	St George's University Hospitals NHS Foundation Trust	Blackshaw Road, Tooting, London, SW17 0QT
London	Great Ormond Street Hospital	Great Ormond Street, London WC1N 3JH
London	University College Hospital	235 Euston Road, Fitzrovia, London, NW1 2BU
Manchester	The Royal Manchester Children's Hospital	Oxford Road, Manchester M13 9WL
Newcastle	Royal Victoria Infirmary	Queen Victoria Road, Newcastle, NE1 4LP
Nottingham	The Queens Medical Centre	Derby Road, Nottingham NG7 2UH
Oxford	John Radcliffe Hospital	Headley Way, Headington, Oxford, OX3 9DU
Sheffield	The Sheffield Children's Hospital	Clarkson Street, Sheffield S10 2TQ
Southampton	Southampton Children's Hospital	Tremona Road, Southampton SO16 6YD



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FURTHER INFORMATION

If you have any questions regarding the information contained in this sheet, then please contact:

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DISCLAIMER

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FEEDBACK

Your feedback helps us to ensure we are delivering information to the highest standard. If you have any comments or suggestions, please contact us at: info@childgrowthfoundation.org

FUNDING

The Foundation funds research into many aspects of growth conditions such as the causes, effects, treatments and psychological impact. It also offers essential advice and experience to parents of children who have been diagnosed with growth problems. The annual convention provides a great forum for people to get together to discuss problems and solutions with others in a similar position. It also provides a chance to meet and learn from the doctors and professors dealing with child growth in the UK.

The CGF is entirely self-sufficient and is an independent charity. It relies on donations and membership subscriptions to keep going. If you have found this information leaflet helpful, please consider becoming a member and/or making a donation - www.childgrowthfoundation.org.