



GUIDELINE

Growth – birth to 18 years

Scope (Staff):	Community health
Scope (Area):	CACH, WACHS

Child Safe Organisation Statement of Commitment

CAHS commits to being a child safe organisation by applying the National Principles for Child Safe Organisations. This is a commitment to a strong culture supported by robust policies and procedures to reduce the likelihood of harm to children and young people.

This document should be read in conjunction with this [disclaimer](#)

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Aim

To provide information on growth assessment and expected growth patterns in children from birth to adolescence to support nurses with the provision of growth monitoring, anticipatory guidance and early identification of growth concerns.

Risk

Failure to assess growth and understand normal growth patterns may result in missed opportunities to provide anticipatory guidance and delays in identifying growth deviations. This may result in missed or late intervention in growth concerns and impact negatively on children developing to their potential.

Background

Growth is a very important indicator of overall health, development and wellbeing. Growth monitoring is important for:

- Providing opportunities for delivery of health promotion messages and anticipatory guidance
- Early identification and intervention in response to deviations in growth patterns
- Reviewing the impact of implemented strategies where a growth concern has been identified

Poor growth in-utero and early childhood is associated with short and long-term health effects including impaired immune response, developmental and psychosocial deficits and the development of lifestyle diseases including cardiovascular disease and metabolic syndrome.^{1, 2} Over-nutrition and obesity in childhood are also linked to adult overweight and obesity and poor health outcomes.^{3, 4} Both body size during the early years of life and a sudden, accelerated increase in infant growth trajectory are associated with a risk of later overweight and obesity in childhood and adulthood.⁵

Nurses are well placed to conduct growth assessments, including weight, length/height, head circumference and body mass index (BMI) at Universal and Universal Plus contacts, as required. Universal contacts also provide opportunities to provide anticipatory guidance to support the development of healthy lifestyles which promote healthy growth and development.

It is most meaningful when nurses undertake a holistic view of the child (and family) by working with parents/caregivers to achieve the following:

- Completion of age appropriate observations and assessments (including growth) using documented tools
- Reviewing previous health professional assessments (if available) and acting on clinical judgement
- Identification of protective and risk factors

This guideline provides the background information for monitoring and assessing growth. It should be read in conjunction with guidelines in the Clinical Nursing Policy Manual which support the identification of growth concerns as follows:

- [Growth – Downward trajectory](#)
- [Growth – Accelerated upward trajectory](#)

Normal growth patterns

Normal growth is a reflection of overall health and nutritional status.⁶ Most healthy children grow in a predictable fashion following a typical pattern in weight, length/height and head circumference which are accounted for in standardised growth charts.^{6,7} Growth velocity varies at different stages of childhood and normal growth in children is pulsatile, with periods of rapid growth (growth spurts) which are separated by periods of slower growth.^{6,7} The periods of most rapid growth are during infancy and adolescence.⁶⁻⁸

Minor fluctuations in growth in an otherwise healthy and alert infant or child may be of no immediate concern.⁹ However, unexpected increases, decreases or stasis in growth trajectories from a previously established rate of growth, may be an early indicator of underlying health or developmental issues.⁹

Key points

- Decisions about growth should be made using a holistic assessment in conjunction with growth data that has been plotted on the relevant growth charts.
- Holistic assessments will include considering gestational age and birth weight, previously established rates of growth, feeding or nutritional assessments, physical assessment, elimination, health status, developmental milestones and psychosocial factors.
- Growth assessment involves multiple measurements over time for weight, length or height, head circumference and BMI (over 2 years); followed by precise plotting on appropriate growth charts and correct interpretation of the percentiles to determine growth trajectories.
- Serial growth measurements will be undertaken and plotted on age and sex-at-birth appropriate growth charts, as part of a holistic assessment and prior to determining relevant care planning.
- Growth is considered healthy when the child's weight and length or height generally track along or between percentile lines.
- Growth deviations may be characterised by serial growth measurements indicating unexpected increases or decreases on the percentile lines, from a previously established rate of growth.
- Growth measurements and outcomes of the growth assessment should be recorded in electronic records. Discuss findings and growth patterns with parents.

- All nurses will refer to the Nursing and Midwifery Board AHPRA Decision-making framework in relation to scope of practice and delegation of care to ensure that decision-making is consistent, safe, person-centred and evidence-based.
- Nurses need to provide a culturally safe service delivery which demonstrates a welcoming environment that recognises the importance of cultural beliefs and practices of all clients.

Growth assessments in Community Health

Growth assessment opportunities	When to conduct growth assessment	Charts used
Universal contacts with length, weight, and head circumference	0-14 days 8 weeks 4 months 12 months	WHO 0-2 years and/or WHO 0- 6 months chart (if growth concerns) FENTON (for pre-term infants born <37 weeks gestation)
Universal Plus contacts with length/height, weight and head circumference	Birth to 2 years	WHO 0-2 year charts and/or WHO 0- 6 months chart (if growth concerns)
Universal and Universal Plus contacts with height, weight and BMI	2 years	WHO 2-5 years CDC BMI charts
School Entry Health Assessment (SEHA) with height, weight and BMI	School entry	CDC BMI chart
Targeted primary school assessment with height, weight and BMI	4 years plus	CDC BMI chart
No assessments recommended for secondary school age students		

Assessing child and adolescent growth

One-off measurements plotted on a growth chart describe a child's size and may be useful for screening children at nutritional risk, however they do not describe a pattern of growth.^{6, 10, 11} A child's pattern of growth is better described by a series of measurements over time, plotted on a growth chart.^{6, 10, 11}

Growth trajectory, the change in growth over time, is a more sensitive index of growth than a single measurement and the direction of serial measurements on the growth chart is more descriptive than the actual percentile.^{6, 10, 11}

Growth assessments involve looking at the overall trajectory of growth parameters, as appropriate for the child's age. CACH nurses use the following growth parameters to assess overall growth:

- Weight-for-age
- Length-for-age (under 2 years)
- Height-for-age (over 2 years)
- Head circumference-for-age
- BMI-for-age (over 2 years)

Tracking these growth parameters enables a determination of whether a child is following a growth curve or crossing percentiles upwards or downwards.^{6, 10, 11}

Percentiles are commonly used in the clinical or community setting because they indicate simply and clearly a child's position within the context of the reference population and dictate the expected percentage of a population being above or below a percentile.⁶ Most children will grow along their own growth curve; sometimes this is on one of the curves of the chart, but more often it is between two of the curves on the chart.¹²

For example, in the WHO growth charts, the:

- 3rd percentile indicates that 3 in approximately 100 children are below this line
- 50th percentile indicates that half the children at any age are above this line and half are below this line.
- 97th percentile indicates that 3 in approximately 100 children are above this line.

Parents and professionals should not feel under pressure to try and ensure that the child's height or weight should be on or near the 50th percentile at any age.¹² Very few infants grow along the same percentile line from birth, with up to half of these infants crossing at least one percentile (up or down), most often occurring in the first six (6) months and up to twelve (12) months of age.¹² In addition, children do not always follow the same percentile for length or height and weight, but they generally track along or between percentile lines.^{12, 13}

Questions often arise about children in the lower or higher percentile ranges (<3rd or >97th percentile). Small parents tend to have smaller children, and the small, healthy

child of short parents should not raise concern. Usually in this case, growth is steady in the lower centiles, but the large baby born to small parents may cross down centile lines before settling on their intended line.⁸

Growth charts are not diagnostic and therefore should be used in conjunction with a holistic assessment prior to making any care planning decisions.

Expected growth patterns and assessment by age

Preterm infants

A child born before 37 completed weeks of gestation is considered preterm.^{14, 15} Infants born preterm grow differently to term infants.^{14, 15} The optimal rate of weight gain or catch up growth for preterm infants is not known and expected growth patterns will depend on gestational age, birth weight, race/ethnicity, and other factors.^{14, 15} There are concerns that rapid weight gain early in life may increase later risk of the metabolic syndrome, hypertension and impaired neurodevelopment.¹⁶⁻¹⁸

Fenton charts have been developed for preterm infants with a birth gestational age of less than 37 weeks and can be used up to 50 weeks gestation age (10 weeks post-term age).¹⁹ Infants are then transitioned onto the WHO growth charts between 40 and 50 weeks gestation.

The Fenton growth chart for preterm infants accommodates the World Health Organization Growth Standard and reflects actual age instead of completed weeks, in order to improve preterm infant growth monitoring.¹⁹ These charts are a reference for growth, as ideal growth patterns of preterm infants remains undefined.¹⁹

Measurements should be plotted using the corrected (postnatal) age for prematurity until 2 years of age (or until the child 'catches' up, whichever is sooner.)¹⁴

Corrected age is determined by subtracting the number of weeks of prematurity (a term pregnancy is 40 weeks) from the actual or chronological age. For example, an infant at 12 weeks postnatal age, who was born at 30 weeks gestation, has a corrected age of two (2) weeks. This can be represented as: $12 - 10$ ($40 \text{ minus } 30 = 10$) = 2 weeks corrected age.¹⁴

Children (0-2 years)

The majority of healthy, full-term infants lose weight in the first days following birth, which is considered physiologically normal.^{6, 20} This is usually due to fluid balance adjustment and consumption of small amounts of colostrum.²⁰ Infants born via caesarean section have higher weight loss when compared to vaginal births.²⁰ Other variables associated with weight loss are gestational age, higher weight at birth, female sex, advanced maternal age (>40 years) and jaundice.²¹

Whilst there is insufficient evidence to indicate what is a normal physiological weight loss, statements from authoritative organisations suggest a loss of between 7 to 10 percent within the first few days to first week of life.^{6, 20, 22}

Infants who are breastfed usually begin to gain weight from around day 3 because secretory activation commences, and the infant begins to consume larger volumes of milk.²²

Approximately 85% of infants will regain birth weight by 2 weeks of age.²⁰ Infants who are losing weight after secretory activation has commenced, or those who have not regained their birth weight by 2 weeks of age warrant further review of lactation and breastfeeding efficiency, or infant formula consumption.⁹

Infants and young children have a relatively higher proportion of fat as a normal component of growth, which may reflect the wide variation in what is considered expected or perceived, normal weight gain. However the following general patterns may be observed in healthy term infants:⁶

- Newborns gain approximately 30g/day until 3 months of age
- Infants gain approximately 20g/day between 3 and 6 months
- Between 6 and 12 months, infants gain approximately 10g/day
- Infants double their birth weight between 3 and 6 months of age and triple their birthweight by one year
- Infants grow between 18 to 25 cm during the first year of life.⁶
- Children between 1 and 2 years grow between 10-13 cm per year.⁶
- Children reach one half of their adult height by 24-30 months
- The average head circumference at birth is 34 cm, 44 cm at 6 months and 47 cm at one year of age

In WA community health services, the *WHO growth charts (0-2 years)* for weight, length/height and head circumference are used as a standard for child growth. These charts show optimal growth rather than average growth and are based on breastfeeding as the norm.¹⁰ They are intended to be used for all children, regardless of ethnicity, socioeconomic background and type of feeding.²³

If there are concerns with growth status for a child under 6 months of age, it is recommended that nurses use the *WHO 0-6 month charts* to monitor and document serial weight, length and head circumference measurements. Fenton growth charts should be used for pre-term infants born <37 weeks gestation.

Children & Adolescents (2-18 years)

Growth patterns

The literature suggests that children typically:

- gain approximately 2 kg per year between two years and puberty.⁶
- grow in length and height on average approximately 5-6 cm per year.⁶

During middle childhood BMI falls as children become relatively leaner, and then increases as puberty approaches and body composition approaches that of adulthood.⁶ BMI-for-Age percentile charts reflect these normal, predicted changes of BMI throughout childhood.²⁴

Adolescence can be described as the period between childhood and maturity during which the process of growing up occurs. Many biological changes take place during the adolescent years.²⁵ Most obvious are the physical changes, for example, increases in height, acquisition of muscle mass, the distribution of body fat and the development of secondary sexual characteristics.²⁵ Although the order of many of the changes appears to be universal, their timing and the speed of change vary among individuals.²⁵ Both the characteristics of an individual (e.g. sex) and external factors (e.g. inadequate nutrition) influence these changes.⁶

One of the characteristics of puberty is the adolescent 'growth spurt'.²⁵ This is regulated by the complex, inter-related production of various hormones.^{6, 25} Males aged 12 to 17 may experience a growth spurt (peaking between 13 and 15 years) characterised by a gain in height of up to ten (10) cm in the year of peak growth velocity.²⁵ Females may experience a growth spurt between the ages of 9.5 and 14.5 years (peaking between 11 and 13.5 years) characterised by a gain in height of up to 9 cm in the year of peak growth velocity.²⁵

In instances where puberty is delayed, growth in height may slow until such time that a 'growth spurt' occurs until the child's genetically determined height is reached.²⁵ Noticeable growth is almost complete at 18 years in females and 20 years in males; longitudinal studies have indicated an average figure of 16.25 years (females) and 17.75 years (males) with a normal variation of ± 2 years.²⁵

Research suggests that obese children in pre-pubertal years may exhibit accelerated height velocity and bone maturation, however this growth then tends to slow in puberty to less than that of lean children.²⁶ Triggering of the endocrine system as a result of higher levels of adiposity are thought to be implicated in the early puberty trigger and accelerated growth, particularly among girls.²⁶

Growth assessment

The WHO and Chronic Disease Prevention and Health Promotion (CDC) recommend the use of BMI charts when measuring growth in children over the age of two.^{23, 27} The BMI characterises the relative proportion between the child's weight and height.²⁸ It is a valid predictor of adiposity and is considered the recommended clinical standard for defining underweight, overweight and obesity in children older than two (2) in non-specialist clinical settings.²⁸ For information on assessing BMI, refer to [Body mass index assessment](#).

WA community health services use both the WHO 2-5 years charts and the BMI charts from the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (CDC 2000) to assess growth for children who are two (2) years and older. They should be used as guidance for further assessment, referral or intervention, rather than a criterion for classifying children.¹⁰ Physical growth assessment is currently not provided by nurses in children older than primary school age. However, BMI remains a valid tool for screening in this age group.²⁹

BMI is a score calculated as the ratio of an individual's weight in kilograms to height in metres squared (kg/m^2) and measures the relative proportion of a child's weight and height.²⁸ While BMI does not distinguish between fat, muscle or fluid it can be used as

a proxy measurement of excess body weight for height.²⁴ In children, the BMI score is adjusted for age and gender (on BMI-for-Age and gender percentile growth charts), in order to account for growth and body fat changes that occur as part of normal development.³⁰ Interpretation of BMI in children and adolescents aged 2-18 years is based on growth percentile charts which use BMI-for-age reference values.²⁷ BMI charts are different to WHO growth charts in that a percentile score of >85% or < 5% can indicate a child/adolescent being at risk of negative health outcomes.²⁷ Specific guidance and explanation is given in [Growth – accelerated upward trajectory](#).

BMI is interpreted differently for children and adults, even though it is calculated using the same formula as adult BMI.³¹ Children and adolescent's BMI is age and gender-specific because the amount of body fat changes with age and the amount of body fat differs between girls and boys.²⁷ The CDC BMI-for-age growth charts take into account these differences and visually show BMI as a percentile ranking.²⁴

Factors influencing growth

A holistic view of the child (and family) requires an understanding of what influences growth. This includes considering genetics, birth weight nutrition, environmental and health and wellbeing factors (including adverse life-events) when undertaking growth assessments.² These factors may be modifiable (nutritional intake, feeding difficulties, activity levels, acute illness) or non-modifiable (genetic disorders, chronic health conditions) – see [Appendix 1 – Possible causes of abnormal growth](#).

Genetics

Parental size (particularly stature) has a direct influence on a child's growth potential and predicted adult height.⁶ When concerns with a child's growth have been identified, parental stature should be considered as part of the assessment.² For example, a short child with short parents may be a genetically small, healthy child (particularly in the absence of illness or poor nutritional intake).² However, where there are sustained nurse or parental concerns further assessments and care planning may be required.

Genetic disorders and chromosomal abnormalities such as Prader-Willi syndrome, Turner Syndrome, and Trisomy 21 (Down syndrome) have the potential to alter a child's growth. For example, children with Trisomy 21 typically have lower birth weights and different growth patterns than other children.⁶ Nurses will use clinical judgement when assessing growth for children with a disability that impacts growth.

Birth weight

Pregnancy-related factors, such as gestational diabetes or severe preeclampsia, influence the size of an infant at birth.⁶ These infants may not grow along the same percentile from birth, rather their growth curve may move to a lower or higher percentile.⁶ It is therefore paramount that a full assessment is taken considering the overall health and wellbeing of the child.⁹

Birth weight is a reliable indicator of not only the infant's health but also subsequent health risks in adulthood.³² A normal full term birthweight is considered to be between 2500 and 4000 grams.⁶ Low birth weight infants (less than 2500 grams) born at or near term are expected to track along a lower percentile on the weight for age growth

charts, compared to other infants.⁶ These infants may move to a higher percentile over time or may continue to follow their own line below the 3rd percentile.⁶ Most SGA infants catch up during the first few years of life, however are still at risk of persistent short stature and metabolic alterations later in life.³³ Infants who are large for gestational age (LGA) at birth have a higher risk of developing obesity and metabolic syndrome later in life.³⁴

Nutrition

Nutrition directly impacts growth patterns and growth trajectories.^{6, 9} Inadequate nutritional intake including energy, protein and micronutrients can slow growth potentially leading to growth faltering.⁹ Conversely, overfeeding associated with rapid weight gains may result in overweight or obesity.¹

Infant formulas with higher protein levels are associated with higher weight in the first two (2) years of life, but has no effect on length.³⁵ Further research linking protein level in infant formula and cow's milk with obesity and chronic disease in adulthood, has led to recommendations for infant formula composition to promote growth rates similar to that of breastfeeding infants. There is convincing evidence for infants who breastfeed having reduced risk of becoming obese in childhood, adolescence and early adulthood, compared to infants who are infant formula fed.³⁵

Nutritional requirements cannot be standardised for all infants, as factors such as age, gender, and health status all need to be considered.²² Feeding volumes fluctuate from feed to feed and from day to day.²²

Adequate nutrition is paramount for normal growth and development, especially in the early years of life when brain growth is rapid.²² Being undernourished in utero and during the first two years of life and then gaining weight rapidly in later childhood and adolescence has been associated with a high risk of chronic disease.¹

Children and adolescents should eat enough nutritious foods to grow and develop. The *Australian Dietary Guidelines* recommend eating a wide variety of nutritious foods from the five food groups every day and limit intake of foods containing saturated fat, added salt and added sugars.³⁶ In addition, the *Australian Dietary Guidelines* provide information on the number of serves and serving sizes for specific age groups. For more information on nutrition, protein levels of different milks and healthy eating, refer to the guidelines [Nutrition for children – 0 to 18 years](#).

Environment

Maternal health, age, parity, socio-economic status and substance usage during pregnancy such as smoking and second-hand smoke exposure can affect birth weight and growth.

Health and wellbeing

Frequent infections, developmental delays, feeding difficulties, long term medications, medical conditions, illness and food insecurity can all affect infant and young children's growth.

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Related internal policies, procedures and guidelines

The following documents can be accessed in the CH Clinical Nursing Manual:
[HealthPoint link](#) or [Internet link](#)

Body Mass Index assessment

Breastfeeding and lactation concerns - assessment

Factors impacting child health and development

Growth – Accelerated upward trajectory

Growth – downward trajectory

Head circumference assessment

Height assessment 2 years and over

Length assessment 0 – 2 years

Nutrition for children – Birth to 18 years

Physical assessment 0 - 4 years

Universal contact guidelines

Weight assessment 0 - 2 years

Weight assessment 2 and over

The following documents can be accessed in the WACHS Policy Manual

Enhanced child health schedule

Related internal resources (including related forms)

Breastfeeding Assessment Guide


Body Mass Index Boys (CHS430B)

Body Mass Index Girls (CHS430A)

How children develop (0-12 years)
Practice guide for Community Health Nurses
Tips to support healthy choices (2 – 5 years)
World Health Organization Growth Charts (CHS800A series)- (0-2 years and 2-5 years)
Nutrition Resource Catalogue

Related external resources (including related forms)
Australian Dietary Guidelines summary
Australia’s Physical Activity and Sedentary Behaviour Guidelines Pamphlets available- 0-5years; 5-12 years; and Families.
Infant Feeding Guidelines
Fenton growth chart
Raising Children Network
Royal Children’s Hospital - Child growth learning resource
World Health Organization Chart 0 - 6 months

This document can be made available in alternative formats on request.

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Healthy kids, healthy communities

Compassion
Excellence
Collaboration
Accountability
Equity
Respect

Neonatology | Community Health | Mental Health | Perth Children's Hospital

Appendix 1: Possible causes of abnormal child growth

Note: Causes listed in **bold text** are more common.³⁷

Percentile trajectory	Possible causes	Indicators
Weight - Increasing percentiles	Energy imbalance	Excessive food
	Endocrine disorders	Hypothyroidism, Excess cortisol (Cushing's), Pituitary disease
	Genetic disorders	Trisomy 21, Prader-Willi
Weight - Decreasing percentiles	Acute illness	Short term illness, vomiting, diarrhoea
	Chronic illness	Including but not limited to cardiac, respiratory gastrointestinal, renal disease
	Physical and/or developmental concerns	Neurological conditions, cerebral palsy
	Nutritional	Inadequate energy intake
Height - Increasing percentiles	Endocrine disorders	Excessive growth hormone, Hyperthyroidism
Height - Decreasing percentiles	Endocrine disorders	Growth hormone deficiency, Hypothyroidism
	Chronic illness	Chronic anaemia, chronic illness, Systemic failure (renal and cardiac)
	Genetics	Chromosomal disorders
	Nutritional	Long-term primary or secondary malnutrition, i.e., infection, iron deficiency anaemia
Head circumference - increasing percentiles	Hydrocephalus, chromosomal abnormality, developmental delay	
Head circumference - decreasing percentiles	Prenatal insult	Maternal substance abuse, maternal infection
	Birth complication	
	Chromosomal abnormality	