# Guideline



# Management of Positional Plagiocephaly by Allied Health Professionals

**Summary** A clinical Guideline to support best practice for assessment referral and management of infants with positional plagiocephaly.

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Author branch Agency for Clinical Innovation

Branch contact (02) 9464 4711

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# MANAGEMENT OF POSITIONAL PLAGIOCEPHALY BY ALLIED HEALTH PROFFESIONALS

# **GUIDELINE SUMMARY**

The Guideline was developed to provide best practice guidance for management of infants with positional plagiocephaly.

The objectives of the Guideline are to:

- assist clinicians working in primary and secondary health service areas with early detection and assessment and of infants with positional plagiocephaly
- provide clinicians with best practice guidance for management of infants diagnosed with positional plagiocephaly
- provide clinicians with best practice guidance for referral of infants with positional plagiocephaly to tertiary services (e.g. Craniofacial–Helmet clinic).

# **KEY PRINCIPLES**

The Guideline should be used in conjunction with the *Physiotherapy management of plagiocephaly* eLearning module available through the NSW Health Education and Training Institute (HETI) online learning portal, My Health Learning.

Key principles for the Guideline are outlined further in Section 1.3. The Guideline is one component of clinical decision making and provides a guide for best practice for clinicians working with infants with suspected or diagnosed positional plagiocephaly.

# USE OF THE GUIDELINE

Chief Executives must:

• ensure that the Guideline is adopted and that local policies based on the Guideline are in place in all hospitals and facilities likely to be required to care for children with positional plagiocephaly.

Directors of Clinical Governance are required to:

- inform relevant clinical staff treating paediatric patients of this guideline
- ensure that all staff treating infants are educated and supported in the use of the locally developed protocols for referral and management of positional plagiocephaly.

# **REVISION HISTORY**

Version	Approved by	Amendment notes
June-2020 (GL2020_013)	Deputy Secretary, Health System Strategy and Planning	New Guideline



# **ATTACHMENTS**

1. Management of positional plagiocephaly by allied health professionals



# CONTENTS

1	BAC	CKGRO	UND	1
	1.1	About	this document	1
	1.2	Object	ives	1
	1.3	Key pr	inciples of practice	1
	1.4	Inform	ation for users	2
		1.4.1	Inclusions	2
		1.4.2	Exclusions	2
	1.5	Key de	finitions	3
	1.6	Preval	ence	3
	1.7	Growth	n and development	3
	1.8	Manag	jement	4
2	ASS	SESSMI	ENT	5
	2.1	Risk fa	actors	5
	2.2	History	/	5
		2.2.1	Patient history	5
		2.2.2	Motor development	6
		2.2.3	Caregiver concerns	6
	2.3	Physic	al examination	6
		2.3.1	Observational assessment of head shape and range of motion	7
		2.3.2	Palpation of the anterior fontanelle and cranial sutures	8
		2.3.3	Head circumference measurement	8
		Crania	I diameter measurement - Plagiocephaly	9
		2.3.4	Calculations	. 10
		2.3.6	Motor development	12
		2.3.7	Systems review	. 12
	2.4	Differe	ntial diagnosis	. 13
		2.4.1	Congenital Muscular Torticollis (CMT)	. 13
		2.4.2	Positional torticollis	. 13
		2.4.3	Unilateral coronal synostosis	. 13
		2.4.4	Unilateral Lambdoid synostosis	. 14
3	INTI	ERVEN	TION	. 15
	3.1	Mild rig	ght-sided positional plagiocephaly	. 15
		3.1.1	Treatment options	. 15
		3.1.2	Timing of clinical decision making	. 16
		3.1.3	Referral for neurosurgical review and assessment for helmet	. 16
	3.2	Moder	ate right-sided positional plagiocephaly	. 16
		3.2.1	Treatment options	. 16
		3.2.2	Timing of clinical decision making	. 17
		3.2.3	Reterral for neurosurgical review and assessment for helmet	. 17



	3.3	Severe	e right-sided positional plagiocephaly	17
		3.3.1	Treatment options	17
		3.3.2	Timing of clinical decision making	
		3.3.3	Referral for neurosurgical review and assessment for helmet	
	3.4	Mild le	ft-sided positional plagiocephaly	
		3.4.1	Treatment options	
		3.4.2	Timing of clinical decision making	
	o -	3.4.3	Referral for neurosurgical review and assessment for heimet	
	3.5	Moder		
		3.5.1	I reatment options	
		3.5.Z	Peterral for neurosurgical and helmot review	20
	36	Sovor		20
	3.0	361	Treatment entions	20
		3.6.2	Timing of clinical decision making	
		3.6.3	Referral for neurosurgical and helmet review	
	3.7	Helme	t prescription	
	3.8	Parent	t/carer education	
	3.9	Resou	Irces	
4	SYD	NEY C	HILDREN'S HOSPITAL, RANDWICK, CRANIOFACIAL-HELMET	CLINIC 23
	4.1	Referr	al to Craniofacial-Helmet Clinic	
5	REF	EREN	CES	
6	APP		LIST	
-	App	endix 1	List of acronyms	
	App	endix 2	: Referral pathway	
	App	endix 3	: Sample plagiocephaly assessment form <sup>35</sup>	
	App	endix 4	: Sample brachvcephalv assessment form <sup>36</sup>	
	App	endix 5	: Argenta Scale <sup>23</sup>	
	App	endix 6	: Cranial technologies severity scale for plagiocephaly <sup>25</sup>	
	App	endix 7	: Cranial technologies severity scale for brachycephaly <sup>25</sup>	
	App	endix 8	: Anthropometric landmarks <sup>37</sup>	
	App	endix 9	: Patient handout - Right-sided positional plagiocephaly <sup>39</sup>	40
	App	endix 1	0: Patient handout - Left-sided positional plagiocephaly <sup>40</sup>	



# 1 BACKGROUND

# **1.1 About this document**

*Management of positional plagiocephaly by allied health professionals* was developed to provide evidence based recommendations to physiotherapists to assist with clinical decision-making, assessment, intervention and ongoing management of infants with positional plagiocephaly.

This Guideline was initiated in response to the following identified issues:

- increased referral to physiotherapy services for assessment and treatment of infants with positional plagiocephaly<sup>1</sup>
- increased requests for advice and support regarding the diagnosis and treatment of infants with positional plagiocephaly, from therapists working in non-tertiary facilities.

Initially, educational material in the form of an eLearning package was developed to support clinicians working with infants with positional plagiocephaly. Following the development of the eLearning module it became apparent that a guideline would further support best practice management of the condition. A best practice model for differential diagnosis and treatment of positional plagiocephaly was developed by a time limited working party.

# 1.2 Objectives

This Guideline has been developed to ensure that infants with positional plagiocephaly receive optimal management of the condition according to current available evidence.

The objectives of the Guideline are to:

- provide recommendations for the early detection of positional plagiocephaly and assessment of head shape in infants at risk
- provide a conservative management approach that will assist in the reduction of the incidence of positional head deformities in infants and encourage normal infant motor development.

# **1.3 Key principles of practice**

This Guideline should be used in conjunction with the *Physiotherapy management of plagiocephaly* eLearning module available through the NSW Health Education and Training Institute (HETI) online learning portal, My Health Learning.<sup>2</sup>

Key principles:

- physiotherapists ensure best practice guidelines are adhered to when working with infants with positional plagiocephaly
- multidisciplinary healthcare teams work closely with parents and carers to support and empower families



• when working with children with positional plagiocephaly, a person/family-centred approach to therapy plays an integral role in intervention.<sup>3</sup>

Use of this Guideline is one component of good clinical decision-making, which also takes into account family preferences and values, clinicians' experience, and the available evidence and resources.

# **1.4 Information for users**

A range of health professionals have a role in the identification, referral, assessment and management of infants with positional plagiocephaly as detailed below.

- child and family health nurses
- general practitioners
- occupational therapists
- orthotists
- paediatricians
- physiotherapists.

This Guideline is primarily for the use of physiotherapists working with infants. The role of a physiotherapist is to improve the health and well-being of individuals, including infants and children, and reduce or prevent the onset of secondary conditions by optimising mobility and strength.<sup>4</sup>

It may also be used as a reference by other health professionals to identify evidence based recommendations regarding the management of positional plagiocephaly by allied health professionals. The referral pathway (see <u>Appendix 2</u>) is a guide to support the decision making of health professionals.

# 1.4.1 Inclusions

This Guideline applies to infants presenting with any, or a combination of, the following features:

- head turning preference to one side
- posterior flattening on one side of the head
- symmetrical occipital flattening
- ear displacement
- asymmetrical protuberance of the forehead.

#### 1.4.2 Exclusions

This Guideline does not apply to infants with:

- dysmorphic features or syndromes
- craniosynostosis

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- congenital muscular torticollis
- medical conditions where varying infant position may increase or cause health risks.

# 1.5 Key definitions

Altered head shape such as localised cranial flattening and possible facial deformities can be observed in healthy newborns and older infants. This may be as a result of prenatal and/or postnatal external moulding forces to the malleable and growing infant head.<sup>5, 6</sup>

Infant head deformities are referred to as:

- non-synostotic plagiocephaly which involves posterior flattening on one side of the head
- brachycephaly which involves symmetrical occipital flattening
- scaphocephaly which involves flattening on the side(s) of the head, and compensatory expansion which occurs in the anterior and posterior cranium. These infants tend to develop a long, slender head.<sup>7</sup>

The fontanelles are open and cranial sutures appear normal in both non-synostotic plagiocephaly and brachycephaly.<sup>8</sup>

**Note** that for the purpose of this document, both non-synostotic plagiocephaly and brachycephaly are referred to as positional plagiocephaly. Scaphocephaly does not fall within the scope of this Guideline and as such will not be specifically addressed.

#### 1.6 Prevalence

Referral rates for positional plagiocephaly increased after 1992 when the *Back to Sleep* campaign was initiated.<sup>8</sup> This campaign aimed to reduce the incidence of Sudden Infant Death Syndrome (SIDS), now considered a subset of Sudden Unexpected Death in Infancy (SUDI), by recommending that infants be placed on their back to sleep from birth.

Prevalence in healthy infants and children range from 22.1% at seven weeks to 3.3% at two years.<sup>8</sup> Prevalence reported in the literature varies according to the measures used to quantify the extent of skill asymmetry or posterior flattening. Positional plagiocephaly appears to manifest in the first few months of life and be age dependent.<sup>8, 9</sup>

# 1.7 Growth and development

Positional plagiocephaly refers to skull deformation which affects the cosmetic appearance of the infant's head. This can be of great concern to parents, who frequently seek advice from health professionals about the potential impact of the deformation on their infant's growth and development.

Evidence suggests that positional plagiocephaly alone is not a predictor of developmental delay.<sup>10</sup> It has been reported that some infants with positional plagiocephaly exhibit marked developmental delays in early infancy which are largely gross motor in nature. When assessed over time, these delays are reported to improve to expected levels in



infants followed up to 17 months.<sup>11</sup> In infants (average age 22 weeks) developmental delays are also associated with sleep position, muscle tone, activity level, male gender and neck dysfunction, but not positional plagiocephaly.<sup>12-14</sup>

Early intervention improves infant health and developmental outcomes. Infants with positional plagiocephaly show an elevated risk of developmental delay.<sup>15</sup> A thorough developmental assessment is recommended where positional plagiocephaly has been identified. Use of a standardised assessment tool is recommended.

See <u>Appendix 2</u> for a recommended referral pathway to assist medical, nursing and allied health professionals to navigate the referral process.

Prompt referral to early intervention services, such as physiotherapy, may alleviate developmental delays and identify infants with longer term developmental needs.<sup>10, 15</sup> Reassuring a parent that their child's head shape is not causing a developmental delay is important.

# 1.8 Management

Physiotherapists play an important role in the prevention, diagnosis and management of infants with positional plagiocephaly. There is strong evidence to support early conservative management of positional plagiocephaly, including infant handling, counter positioning, stimulation of motor development and parental education.<sup>16</sup>

Helmet therapy is not recommended as standard treatment for mild and moderate cases of positional plagiocephaly.<sup>17</sup> Research suggests that infants with severe positional plagiocephaly, who have not responded to conservative management, may benefit from helmet therapy.<sup>9, 17-21</sup> This should be considered on a case by case basis following consultation with the parent or carer.



# 2 ASSESSMENT

Diagnosis of positional plagiocephaly is a process determined by history taking, physical examination and observational assessment.

# 2.1 Risk factors

Risk factors for positional plagiocephaly may be identified through:

- physiotherapy screening for presence of infant motor delays
- assessment of caregiver's skills in infant handling and positioning.

Observation and assessment of an infant's skull and facial features can assist in determining whether conservative physiotherapy management or neurosurgical review is required.

Cases of synostotic head deformities such as craniosynostosis are very rare and present much less commonly than positional plagiocephaly, or non-synostotic deformities. Infants with synostotic head deformities require referral to a neurosurgeon\* for further investigation and appropriate medical management. Skull x-rays and computed tomography (CT) scans are only indicated in cases where the infant's head shape is not the typical parallelogram or posteriorly flattened shape seen in positional plagiocephaly.

Physiotherapy screening and assessment should provide opportunities for the identification of appropriate intervention and prevention programs for non-synostotic head deformities.

There are three steps to assessment:

- 1. obtaining relevant history
- 2. physical examination
- 3. differential diagnosis.

# 2.2 History

The first step in the assessment is to gather the relevant patient history from the parent or caregiver (see <u>Appendix 3</u> and <u>Appendix 4</u>). Information obtained should include, but not be limited to:

# 2.2.1 Patient history

- prenatal history
- gestational age
- current age
- delivery type

\*In regional or rural areas where access to a Neurosurgeon is problematic, refer to a Paediatrician to avoid delays



- birth weight
- general health
- feeding
- vision and hearing
- screen for other congenital conditions e.g. muscular torticollis, congenital talipes equinovarus (CTEV), developmental dysplasia of the hip (DDH)
- previous interventions
- social/family history.

#### 2.2.2 Motor development

- history of rotational head preference
- motor milestones
- preferred sleep position
- daily positioning routine, including time spent in supine, prone, side lying, infant car seats/carriers, prams and other infant furniture
- daily mobility and immobility time.

#### 2.2.3 Caregiver concerns

- assess level of caregiver anxiety regarding perception of severity of head shape deformity
- identify advice or information provided to caregiver by others to date
- address concerns including infant positioning and handling skills.

A history of rotational head preference during awake and asleep time is a key indicator of positional plagiocephaly.<sup>22</sup>

# 2.3 Physical examination

Physical examination may include:

- observational assessment of head shape and head positioning
- palpation of the anterior fontanelle and cranial sutures
- measurement of head circumference
- measurement of cranial diameters
- review of motor development
- review of other body systems.



#### 2.3.1 Observational assessment of head shape and range of motion

Very young infants or infants with poor head control may need to be placed in the supine position to make these observations.

- Position the infant in supported sitting on the caregiver's lap facing outwards.
- Observe in front for any head tilt and/or rotational head preference and/or facial asymmetry.
- Observe the infant's active cervical range of motion or ability to turn their head to the left and right. If restricted observe passive range in supine.
- Look at the infant's head shape from above:
  - o identify the side and extent of posterior flattening
  - o place your fingers gently in the external ear canals
  - identify the extent, if any, of anterior positioning of the ear, and note which ear
  - o observe for frontal protuberance or bossing of the forehead on the same side of any forward displacement of the ear.

A diagnosis of positional plagiocephaly is made if the posterior flattened side corresponds with anterior or forward positioning of the ipsilateral ear and frontal protuberance or bossing of the forehead as shown in Figure 1.

#### Figure 1: Positional Plagiocephaly





Observational assessment tools such as the Argenta Visual Scale<sup>23</sup> and the Cranial Technologies Severity Scale<sup>24</sup> for plagiocephaly are useful in determining the initial degree of head shape severity, monitoring progress over time and implementing management programs (see <u>Appendix 5</u>, <u>6</u> and <u>7</u>).

### 2.3.2 Palpation of the anterior fontanelle and cranial sutures

- Position the infant in supported sitting on the caregiver's lap facing outwards.
- Gently palpate over the anterior fontanelle for patency. Note size and shape. Normally a diamond shape.
- Palpate over the coronal, sagittal and lambdoid sutures for any abnormal bony ridging.
- The average size of the anterior fontanelle is 2.1 centimetres, and the median time of closure is approximately 14 months.<sup>25</sup> Abnormalities in the size and shape of the anterior fontanelle and/or premature closure of the cranial sutures may indicate craniosynostosis (refer to Sections <u>2.3.3</u> and <u>2.3.4</u>) and cases should be referred to a paediatric neurosurgeon for further investigations.

#### 2.3.3 Head circumference measurement

- Position the infant in supported sitting on the caregiver's lap facing outwards. The carer may assist to steady the head using hand support along the sides of the lower jaw and the base of the head.
- Use a flexible, non-stretchable measuring tape that can be cleaned with an alcohol based wipe after use on each patient or a disposable paper tape.<sup>26</sup>

Place the tape measure around the infant's head so the lower edge is placed just above the eye brows and includes positioning over the opistocranium (see <u>Appendix 8</u>) at the back of the head. Do not pull the tape too tight. Make sure the tape has no folds and is in contact with the skin all the way around the head.

Measurements are recorded to the nearest 0.1 of a centimetre. Measures can be
plotted and compared to age norms on *Head circumference-for-age percentiles*(birth to 2 years) infant growth charts from the World Health Organisation Child
Growth Standards. Growth charts can also be found in an infant's *My First Health Record (Baby Blue Book)*<sup>27</sup> or the medical record.

Infants with abnormally small or large size heads or detected changes in growth percentile should be referred to a doctor (general practitioner or paediatrician) for further investigation as infants with positional plagiocephaly have normal rates of head growth.



#### Cranial diameter measurement - Plagiocephaly







- Position the infant in supported sitting on caregiver's lap facing outwards. The carer may assist to steady the head using hand support along the sides of the lower jaw and the base of the head.
- Approach the infant posteriorly and superiorly, trying not to be seen if the infant is distractible.
- Position the calipers on the inner rim of the lambdoid suture of the contra-lateral side to the fronto-temporal point.
- Place the posterior point and secure before placing the anterior point to reduce the chance of the infant being uncomfortable or seeing the calipers.
- Read the measurement.
- Remove calipers superiorly from the head.
- The left measurement is recorded when using the left fronto-temporal point. The right measurement is recorded using the right fronto-temporal point.
- Record measures for the right and left diagonals.

# 2.3.4 Cranial diameter measurement - Brachycephaly







\*See <u>Appendix 8</u> for descriptions of Anthropometric landmarks

# 2.3.5 Calculations

The severity of head shape deformity is calculated differently for the typical parallelogram shaped head and the predominantly posteriorly flattened head. Assess the cranial diameters by taking the head width, length and diagonal measurements as appropriate and use the tables below to assess severity as mild, moderate or severe: parallelogram shaped head (<u>Table 1</u>) or posteriorly flattened head (<u>Table 2</u>).

The Cranial Index (CI) is required to determine the severity of brachycephaly. The CI is the ratio of head width to head length and is used to quantify the degree of posterior flattening.

Cranial Index (CI) = head width ÷ head length x 100%
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#### Table 1: Severity of parallelogram shaped head

Severity of Plagiocephaly	Absolute difference in cranial diagonal lengths
Mild	<10mm
Moderate	10-20mm
Severe	>20mm



Severity of Brachycephaly	Cranial Index (CI) % [9]
Normal	80-82
Mild	82-90
Moderate	90-100
Severe	>100

#### Table 2: Severity of posteriorly flattened head

#### 2.3.6 Motor development

To reduce the risk of SUDI, infants should be placed on their backs to sleep.<sup>28</sup> Caregivers of infants with positional plagiocephaly often report also positioning their infants in the supine position during wake time. Carers identify that the infants are spending a prolonged amount of time lying on their backs in prams, car seats or baby bouncers, with avoidance of the prone position for play. Lack of experience in the prone position may impact on the development of some early infant motor skills, including the development of balance reactions in prone.

Observe the infant's motor skills, including head control in prone and supported sitting, and when rolling. A standardised tool should be used if further assessment is indicated. Examples include the Movement Assessment of Infants (MAI)<sup>29</sup>, Alberta Infant Motor Assessment (AIMS)<sup>30</sup>, Hammersmith Infant Neurological Assessment (HINE)<sup>31</sup> or the Neurological, Sensory, Motor, Developmental Assessment (NSMDA).<sup>32</sup>

#### 2.3.7 Systems review

When assessing infants with positional plagiocephaly the physiotherapist may identify clinical signs of other issues of concern that warrant further investigation and possible specialist referral. The following systems review is a recommended guide to assist in identifying other areas of concern:

#### Visual function screen

- midline visual focus
- ocular alignment (especially symmetrical downward gaze).

#### Lower limb musculoskeletal screen

- hip range of motion asymmetry
- hip clunk
- leg length discrepancy
- abnormal foot posture.



#### **Neurological screen**

- predominant asymmetrical tonic neck reflex
- abnormal muscle tone.

# 2.4 Differential diagnosis

Positional plagiocephaly should be differentiated from four other conditions which may also result in head shape deformity:

- 1. congenital muscular torticollis
- 2. positional torticollis
- 3. unilateral coronal synostosis
- 4. unilateral lambdoid synostosis.

# 2.4.1 Congenital Muscular Torticollis (CMT)

CMT presents as shortening or tightening of the sternocleidomastoid muscle (SCM) resulting in head tilt to the affected side and rotation to the opposite side. Weakness of the opposite neck muscles can prevent the infant being able to fully rotate their head and occipital flattening can result on the opposite side to the tight neck muscle.

A tight left SCM results in a tendency to look to the right an infant with a tight left SCM is likely to develop right sided occipital flattening. A tight right SCM results in a tendency of the infant to look to the left resulting in possible left sided occipital flattening. Facial symmetry is worsened by the pull of the SCM on the side of the face, creating flattening of the ipsilateral forehead, cheek and face.

Congenital muscular torticollis requires early physiotherapy intervention to restore cervical range of motion, correct the head tilt and prevent positional plagiocephaly.

# 2.4.2 Positional torticollis

Infants with positional torticollis present with a head turning preference and/or a head tilt. To differentiate between CMT and positional torticollis, check active and passive cervical range of motion (see 2.3.1). If SCM range is limited, CMT is the diagnosis.

Positional torticollis requires early physiotherapy intervention to restore cervical range of motion, correct the head tilt and prevent positional plagiocephaly.

# 2.4.3 Unilateral coronal synostosis

Premature fusion of the coronal suture causes forehead asymmetry can occur in combination with positional plagiocephaly. Coronal synostosis should be considered when there is significant forehead asymmetry with occipital flattening.

An infant with unilateral coronal synostosis may present with the ipsilateral orbit higher and wider than the other orbit and the nose deviating away from the side of the forehead flattening. When viewed from above, protrusion of the eyeball ipsilateral to the forehead flattening may be present when compared to the other side.



Suspected cases of unilateral coronal synostosis should be referred to a paediatric neurosurgeon or craniofacial surgeon. Diagnosis is determined by clinical examination and skull imaging.

#### 2.4.4 Unilateral Lambdoid synostosis

Premature fusion of one of the lambdoid sutures may also cause occipital flattening. Lambdoid synostosis is very rare, occurring in 1 in 150,000 newborn children.

In cases of unilateral Lambdoid synostosis the ear is displaced posteriorly and the frontal protuberance is contralateral to the flattened side.

P→ Suspected cases of unilateral lambdoid synostosis should be referred to a paediatric neurosurgeon or craniofacial surgeon. Diagnosis will be determined by clinical examination and skull imaging.

Note the differences between unilateral lambdoid synostosis and positional plagiocephaly in Figures 2 and 3 below. The most obvious difference to notice is the direction of displacement of the ear.

Figure 3: Positional Plagiocephaly

#### Figure 2: Unilateral Lambdoid synostosis



A diagnosis of positional plagiocephaly is made when the flattened side of the head corresponds with anterior positioning of the ipsilateral ear and frontal protuberance.



# 3 INTERVENTION

The purpose of physiotherapy intervention is to:

- restore and maintain normal cervical range of motion
- prevent or limit the severity of the misshapen head
- closely monitor the associated risk of developmental delay
- promote the attainment of normal gross motor milestones.

Treatment options, timing of clinical decision making and referral are determined by severity (refer to <u>Table 1</u>) and the affected side consistent with the following classifications:

- mild right-sided positional plagiocephaly
- moderate right-sided positional plagiocephaly
- severe right-sided positional plagiocephaly
- mild left-sided positional plagiocephaly
- moderate left-sided positional plagiocephaly
- severe left-sided positional plagiocephaly.

# 3.1 Mild right-sided positional plagiocephaly

#### 3.1.1 Treatment options

- Counter positioning, which is active repositioning of the head towards the left side during sleep and play, and organising the environment so the infant turns to the left side. Considering the position of the cot or change table; placing toys to encourage rotation to the left hand side; and carrying positions that encourage left neck rotation are examples of counter positioning.
- Position head to left side for sleeping. Ensure that parents/carers understand the baby should be placed on their back to sleep unless supervised. In accordance with safe sleeping guidelines, positioning pillows are not recommended due to increased risk of SUDI.<sup>28</sup>
- Minimise supine time when awake e.g. position in supportive baby chair inclined to at least 45 degrees, side-lying on left side.
- Encourage active tummy time i.e. active neck extension in prone including fixing and following to left hand side.<sup>33</sup>
- Utilise activities which will develop head control e.g. picking up and putting down the infant on their side.

See <u>Appendix 9</u> for sample patient handouts illustrating examples of positioning and stretches.



### 3.1.2 Timing of clinical decision making

Monthly appointments should occur until the following clinical indicators are met:

- able to visually follow equally to the left and right sides in supine, sitting and prone positions
- midline head control in supine, sitting and prone positions
- head lateral righting reactions are equal to the left and right sides in vertical suspension
- demonstrates age appropriate prone motor skills
- objective cranial diameter measurements are improving
- passive and active cervical rotation is equal to both sides
- for infants less than four months of age, provide physiotherapy intervention and monitor. If improving objectively no need for further medical referral.

#### 3.1.3 Referral for neurosurgical review and assessment for helmet

Neurosurgical and helmet review are not required.

# 3.2 Moderate right-sided positional plagiocephaly

#### 3.2.1 Treatment options

- Stretches to improve left cervical rotation range of motion if limited.
- Counter positioning, which is active repositioning of the head towards the left side during sleep and play, and organising the environment so the infant turns to the left side. Considering the position of the cot or change table; placing toys to encourage rotation to the left hand side; and carrying positions that encourage left neck rotation are examples of counter positioning.
- Position head to left side for sleeping. Ensure that parents/carers understand the baby should be placed on their back to sleep unless supervised. In accordance with safe sleeping guidelines, positioning pillows are not recommended due to increased risk of SUDI.<sup>28</sup>
- Minimise time spent in supine when infant is awake e.g. position in supportive baby chair inclined to at least 45 degrees, left side-lying for play.
- Encourage active tummy time i.e. active neck extension in prone including fixing and following to left hand side.<sup>33</sup>
- Utilise activities which will develop head control e.g. anterior carry hold (alternate between both left and right arm position).

See <u>Appendix 9</u> for sample patient handouts illustrating examples of positioning and stretches.



### 3.2.2 Timing of clinical decision making

Monthly appointments until the following clinical indicators are met:

- able to visually follow equally to the left and right sides in supine, sitting and prone positions
- midline head control in supine, sitting and prone positions
- head lateral righting reactions are equal to the left and right sides in vertical suspension
- demonstrates age appropriate prone motor skills
- passive and active cervical rotation is equal to both sides
- objective cranial diameter measurements are improving
- for infants less than four months of age provide physiotherapy intervention and monitor. If improving objectively no need for further medical referral.

#### 3.2.3 Referral for neurosurgical review and assessment for helmet

Neuro surgical and helmet review are not required.

# 3.3 Severe right-sided positional plagiocephaly

#### 3.3.1 Treatment options

- Stretches to improve left cervical rotation range of motion if limited.
- Counter positioning, which is active repositioning of the head towards the left side during sleep and play, and organising the environment so the infant turns to the left side. Considering the position of the cot or change table; placing toys to encourage rotation to the left hand side; and carrying positions that encourage left neck rotation are examples of counter positioning.
- Position head to left side for sleeping. Ensure that parents/carers understand the baby should be placed on their back to sleep unless supervised. In accordance with safe sleeping guidelines, positioning pillows are not recommended due to increased risk of SUDI.<sup>28</sup>
- Minimise time spent in supine when infant is awake. Encourage activities that promote independent sitting skills.
- Encourage active tummy time i.e. active neck extension in prone including fixing and following to left hand side.<sup>33</sup>
- Utilise activities which will develop head control e.g. anterior carry hold (alternate between both left and right arm position).
- Promote age appropriate motor development by encouraging activities such as facilitated rolling, sitting balance, and prone skills.

See <u>Appendix 9</u> for sample patient handouts illustrating examples of positioning and stretches.



### 3.3.2 Timing of clinical decision making

Monthly appointments should occur until the following clinical indicators are met:

- able to visually follow equally to the left and right sides in supine, sitting and prone positions
- midline head control in supine, sitting and prone positions
- head lateral righting reactions are equal to the left and right sides in vertical suspension
- age appropriate prone motor skills
- passive and active cervical rotation is equal to both sides
- objective cranial diameter measurements are improving
- provide physiotherapy intervention and monitoring up to six months of age
- referral to paediatrician to review if developmental delay is present.

#### 3.3.3 Referral for neurosurgical review and assessment for helmet

Referral for paediatric neurosurgical review and assessment for helmet therapy should be considered based on the severity of objective measures (see <u>Section 4</u>).

# 3.4 Mild left-sided positional plagiocephaly

#### 3.4.1 Treatment options

- Counter positioning, which is active repositioning of the head towards the right side during sleep and play, and organising the environment so the infant turns to the right side. Considering the position of the cot or change table; placing toys to encourage rotation to the right hand side; and carrying positions that encourage right neck rotation are examples of counter positioning.
- Position head to right side for sleeping. Ensure that parents/carers understand the baby should be placed on their back to sleep unless supervised. In accordance with safe sleeping guidelines, positioning pillows are not recommended due to increased risk of SUDI.<sup>28</sup>
- Minimise supine time when awake e.g. position in supportive baby chair inclined to at least 45 degrees, side-lying on right side.
- Encourage active tummy time i.e. active neck extension in prone including fixing and following to right hand side.<sup>33</sup>
- Utilise activities which will develop head control e.g. picking up and putting down the infant on their side.

See <u>Appendix 10</u> for sample patient handouts illustrating examples of positioning and stretches.



### 3.4.2 Timing of clinical decision making

Monthly appointments should occur until the following clinical indicators are met:

- able to visually follow equally to the left and right sides in supine, sitting and prone positions
- midline head control in supine, sitting and prone positions
- head lateral righting reactions are equal to the left and right sides in vertical suspension
- demonstrates age appropriate prone motor skills
- objective cranial diameter measurements are improving
- passive and active cervical rotation is equal to both sides
- for infants less than four months of age, provide physiotherapy intervention and monitor. If improving objectively no need for further medical referral.

#### 3.4.3 Referral for neurosurgical review and assessment for helmet

Neurosurgical and helmet review are not required.

# 3.5 Moderate left-sided positional plagiocephaly

#### 3.5.1 Treatment options

- Stretches to improve right cervical rotation range of motion if limited.
- Counter positioning, which is active repositioning of the head towards the right side during sleep and play, and organising the environment so the infant turns to the right side. Considering the position of the cot or change table; placing toys to encourage rotation to the right hand side; and carrying positions that encourage right neck rotation are examples of counter positioning.
- Position head to right side for sleeping. Ensure that parents/carers understand the baby should be placed on their back to sleep unless supervised. In accordance with safe sleeping guidelines, positioning pillows are not recommended due to increased risk of SUDI.<sup>28</sup>
- Minimise time spent in supine when infant is awake e.g. position in supportive baby chair inclined to at least 45 degrees, right side-lying for play.
- Encourage active tummy time i.e. active neck extension in prone including fixing and following to right hand side.<sup>33</sup>
- Utilise activities which will develop head control e.g. anterior carry hold (alternate between both left and right arm position).

See <u>Appendix 10</u> for sample patient handouts illustrating examples of positioning and stretches.



# 3.5.2 Timing of clinical decision making

Monthly appointments should occur until the following clinical indicators are met:

- able to visually follow equally to the left and right sides in supine, sitting and prone positions
- midline head control in supine, sitting and prone positions
- head lateral righting reactions are equal to the left and right sides in vertical suspension
- demonstrates age appropriate prone motor skills
- passive and active cervical rotation is equal to both sides
- objective cranial diameter measurements are improving
- for infants less than four months of age provide physiotherapy intervention and monitor. If improving objectively no need for further medical referral.

# 3.5.3 Referral for neurosurgical and helmet review

Neurosurgical and helmet review are not required.

# 3.6 Severe left-sided positional plagiocephaly

#### 3.6.1 Treatment options

- Stretches to improve right cervical rotation range of motion if limited.
- Counter positioning, which is active repositioning of the head towards the right side during sleep and play, and organising the environment so the infant turns to the right side. Considering the position of the cot or change table; placing toys to encourage rotation to the right hand side; and carrying positions that encourage right neck rotation are examples of counter positioning.
- Position head to right side for sleeping. Ensure that parents/carers understand the baby should be placed on their back to sleep unless supervised. In accordance with safe sleeping guidelines, positioning pillows are not recommended due to increased risk of SUDI.<sup>28</sup>
- Minimise time spent in supine when infant is awake. Encourage activities which promote independent sitting skills.
- Encourage active tummy time i.e. active neck extension in prone including fixing and following to right hand side.<sup>33</sup>
- Utilise activities which will develop head control e.g. anterior carry hold (alternate between both left and right arm position).
- Promote age appropriate motor development by encouraging activities such as facilitated rolling, sitting balance, and prone skills.

See <u>Appendix 10</u> for sample patient handouts illustrating examples of positioning and stretches.



### 3.6.2 Timing of clinical decision making

Monthly appointments should occur until the following clinical indicators are met:

- able to visually follow equally to the left and right sides in supine, sitting and prone positions
- midline head control in supine, sitting and prone positions
- head lateral righting reactions are equal to the left and right sides in vertical suspension
- age appropriate prone motor skills
- passive and active cervical rotation is equal to both sides
- objective cranial diameter measurements are improving
- provide physiotherapy intervention and monitoring up to six months of age
- referral to paediatrician to review if developmental delay is present.

#### 3.6.3 Referral for neurosurgical and helmet review

Yes. Consider referral for paediatric neurosurgical review and assessment for helmet therapy based on the severity of objective measures (see details in <u>Section 4</u>)

# 3.7 Helmet prescription

A prescription for a helmet will be determined following assessment by a neurosurgeon and orthotist who specialises in the fabrication of paediatric helmets.

Physiotherapy intervention is still important after a helmet is fitted to monitor the infant's cervical range of motion and attainment of age appropriate motor skills.

A custom fitted helmet is made by an experienced orthotist and assists the skull molding process by removing the pressure over the flat spot and thus allowing the skull to grow into the space provided. The helmet is lightweight and made with a firm thermoplastic outer shell and foam inner lining.

Helmets are most effective if initiated early between six and eight months of age. After a settling in period, they are required to be worn 23 hours per day and the average duration is usually two to six months, depending on the age of the infant and the severity of the positional plagiocephaly.

The orthotist regularly monitors and adjusts the helmet to ensure proper head growth and optimal correction of the head shape deformity.

Evidence suggests that helmets are most effective in the correction of severe cases of positional plagiocephaly.<sup>17</sup>



# 3.8 Parent/carer education

Information and education about positioning and handling babies is available to all parents/carers in NSW.<sup>27, 34</sup> This is a primary healthcare strategy to enhance infant development and prevent head shape deformities. Education includes recommendations for activities, such as starting tummy time from birth. It is best to implement these measures from birth because most head flattening occurs in the first six weeks of life. However, once developed, positional plagiocephaly can be managed by parents and carers with simple repositioning and infant handling techniques aimed at minimising pressure on the head when the infant is awake.

Key points to remember when educating parents/carers:

- back to sleep, tummy or side for play (with supervision)
- alternate the baby's head position between left and right facing when putting the baby to sleep on their back
- the first six weeks is the most important time for preventing head shape deformity
- positional plagiocephaly is usually easily treated
- positional plagiocephaly does not cause brain damage
- parents/carers should contact a paediatric physiotherapist, child and family health nurse, general practitioner or paediatrician if they are concerned about their baby's head shape.

#### 3.9 Resources

#### **Raising Children**

Safe sleeping: 11 tips http://raisingchildren.net.au/articles/safe\_sleeping.html

#### Sydney Children's Hospitals Network

Positional Plagiocephaly https://www.schn.health.nsw.gov.au/fact-sheets/positional-plagiocephaly

#### The Royal Children's Hospital, Melbourne

Baby's head shape. Face time and tummy time equals head control. <u>https://www.rch.org.au/physio/links/</u>



# 4 SYDNEY CHILDREN'S HOSPITAL, RANDWICK, CRANIOFACIAL-HELMET CLINIC

The Craniofacial-Helmet Clinic is the only multidisciplinary clinic in NSW where infants with severe positional plagiocephaly are assessed and diagnosed. Subsequent management is decided by a team of specialist clinicians. The team consists of a neurosurgeon, clinical nurse consultant, orthotist, physiotherapist and social worker (as required). A multi-disciplinary, patient centred approach is taken when prescribing helmets for patients with severe positional plagiocephaly.

For enquires and referral advice contact the Sydney Children's Hospital, Randwick, Neurosurgical Clinical Nurse Consultant or Secretary of Neurosurgery on (02) 9382 1544.

Children attending the clinic should bring their *Personal Health Record (Blue Book)*<sup>27</sup> along with any imaging, for example x-rays or relevant scans.

# 4.1 Referral to Craniofacial-Helmet Clinic

A written referral from a local doctor or paediatrician should be faxed to the Craniofacial-Helmet Clinic on (02) 9382 1845. The referral should include:

- patient's name, date of birth and contact details of parents/carers
- a clinical description including relevant medical history, severity of plagiocephaly and developmental status.



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# 6 APPENDIX LIST

- 1. List of acronyms
- 2. Referral pathway
- 3. Sample plagiocephaly assessment form
- 4. Sample brachycephaly assessment form
- 5. Argenta Scale
- 6. Cranial technologies severity scale for plagiocephaly
- 7. Cranial technologies severity scale for brachycephaly
- 8. Anthropometric landmarks
- 9. Patient handout: Right-sided positional plagiocephaly
- 10. Patient handout: Left-sided positional plagiocephaly



# Appendix 1: List of acronyms

AIMS: Alberta Infant Motor Assessment CMT: Congenital Muscular Torticollis CT: Cranial Index CT: Computed Tomography CTEV: Congenital Talipes Equinovarus DDH: Developmental Dysplasia of the Hip HETI: Health Education and Training Institute MAI: Movement Assessment of Infants NSMDA: Neurological, Sensory, Motor, Developmental Assessment SCM: Sternocleidomastoid Muscle SIDS: Sudden Infant Death Syndrome SUDI: Sudden Unexpected Death in Infancy SCHN: Sydney Children's Hospitals Network



### Appendix 2: Referral pathway

This referral pathway for positional plagiocephaly is designed to guide evidence based decision making of health professionals in the referral of infants with abnormal head shape and size.





# Appendix 3: Sample plagiocephaly assessment form<sup>35</sup>

Date of Ax:	Physiotherapist:
Guardian's Name:	Contact No:
Gestational Age:	Age at 1° Ax:
Current Diagnosis/Hx:	
Referred by:	
Other health Professionals Involved in care:	
Relevant PHx:	
Subjective	
Examination:	
Objective Examination:	Scoring: I – Posterior assymetry II – Ear malposition III – Frontal assymetry IV – Earing
	A roctal assymetry V - Temporal bossing or posterior vertical cranial growth
	Image taken from Argenta (2004) Clinical classification of positional plagiocephaly. The Journal of Craniofacial Surgery 15(3): 368-372.
	Date
	Score



Objective	CALIPER MEASUREMENTS (in cm)					
Examination:	Date					
	АР					
	Lateral					
	Right (front) Diagonal					
	Left (front) Diagonal					
	ACTIVE CERVICAL ROM (in °)					
	Left Rotation					
	<b>Right Rotation</b>					
	Left Lat Flexion					
	Right Lat Flexion					
		PASSI	VE CERVIC	AL ROM (in	°)	
	Left Rotation					
	<b>Right Rotation</b>					
	Left Lat Flexion					
	Right Lat Flexion					
	Other Findings:					
Treatment:						
Plan:						
Next Appt:						



# Appendix 4: Sample brachycephaly assessment form<sup>36</sup>

1	
Date of Ax:	Physiotherapist:
Guardian's Name:	Contact No:
Gestational Age:	Age at 1° Ax:
Current	
Diagnosis/Hx:	
Referred by:	
Other health	
Professionals	
Involved in care:	
Relevant PHx:	
Subjective	
Examination:	
Objective	
Examination:	I – Central posterior deformity
	II – Widening of posterior skull
	III - Vertical head, head growth or
	temporal bossing
	Image taken from Argenta (2004)
	Clinical classification of positional
	plagiocephaly. The Journal of Craniofacial Surgery 15(2):
	368-372.
	$( \leftarrow \rightarrow)$
	Type III (Seperior view) (Latival view)
	Date
	Score



Objective	CALIPER MEASUREMENTS (in cm)					
Examination:	Date					
	АР					
	Lateral					
	Right (front) Diagonal					
	Left (front) Diagonal					
		ACTIV	E CERVICA	L ROM (in	°)	
	Left Rotation					
	<b>Right Rotation</b>					
	Left Lat Flexion					
	Right Lat Flexion					
		PASSI	VE CERVIC	AL ROM (in	°)	
	Left Rotation					
	<b>Right Rotation</b>					
	Left Lat Flexion					
	Right Lat Flexion					
	Other Findings:					
Treatment:						
Plan:						
Next Appt:						

GL2020\_013

Page 33 of 53



# Appendix 5: Argenta Scale<sup>23</sup>

Occipital Plagiocephaly





# Appendix 6: Cranial technologies severity scale for plagiocephaly<sup>25</sup>



Issue date: June-2020

Page 35 of 53



# Appendix 7: Cranial technologies severity scale for brachycephaly<sup>25</sup>

Severity Assessment for BRACHYCEPHALY	Sax M F
	Notes
TOTAL SCORE	
ID Cranial Technologies Inc. 2002 Rev 01	



# Appendix 8: Anthropometric landmarks<sup>37</sup>

### LANDMARK DESCRIPTION FOR CALIPER MEASUREMENTS

#### Measurement of Head Length (AP):

- Position calipers from the glabella to the opistocranium
- This measuring line must be parallel to the *Frankfurt line*.





# Measurement of Head Width (lateral):

- Position calipers from *eurion* to *eurion* in the strictly horizontal line.
- Eurion is located 1cm above the *otobasion superius* point.





# Measurement of Oblique Distance (Diagonal):

- Position calipers on the *inner rim of the Lambdoid suture* of the contra-lateral side to the *fronto-temporal* point.
- Measurements must be taken in a strictly horizontal manner.<sup>38</sup>





# Appendix 9: Patient handout - Right-sided positional plagiocephaly<sup>39</sup>

# Physiotherapy

# Exercises for your baby with a preference for turning their head to the right



# **INFORMATION BOOKLET**

If you have any questions or problems please contact the Physiotherapy Department.

GL2020\_013

Issue date: June-2020

Page 40 of 53



# Introduction

Your baby has developed a preference for turning their head to the right.

This can cause a flattening on the back of the head on the right side. It can also mean that your baby will have more difficulty turning their head to the left. Babies need to be able to turn their head in both directions equally.

This handout will assist you and your baby to overcome this issue by providing easy to follow exercises and guidance.

If you are having difficulty with these exercises, please speak to your physiotherapist.

Aims of physiotherapy are to:

- Encourage turning of your baby's head to the left
- Show you how to position your baby to discourage head flattening
- Stretch your baby's neck muscles if there is any tightness.



Examples of flattening on the back of the head.

Images provided courtesy of Cranial Technologies.



# Positioning and handling

# How should I position my baby for sleep?

Place your baby on their back so that all activity is on the left side.

Place toys and mobiles on their left side and ensure you approach the cot from the left side.

You may consider placing the right hand side of the cot against the wall so this is not interesting for the baby to look at.



To reduce the risk of sudden unexpected death in infancy, babies should sleep on their back and have their head and face uncovered. For further information go to <a href="https://rednose.org.au/">https://rednose.org.au/</a>.

# How should I pick-up and carry my baby?

It can help if your baby is carried and cuddled so that they are encouraged to turn their head to the left.





# How should I position my baby to play?

To decrease flattening of your baby's head, it is important to place your baby in a variety of positions. This means you are not always putting pressure on the same part of their head.

Some examples are supported sitting, side-lying and tummy time. You should place your baby on both sides to play.

Positions toys to encourage your baby to turn to the left.











# Why does my baby need tummy time?

This is a good position for your baby to practise lifting their head, developing strength in their back and neck muscles, and taking weight through their arms.

In this position, use toys to encourage your baby to turn their head to the left.

When your baby is little, a rolled towel or small pillow may be placed under their chest to help them maintain this position.











# **Rotation stretches**

Your physiotherapist will advise if these stretches are necessary.

# Stretch A

- Place your baby on their back.
- Encourage your baby to turn their head to the left by following your face or a toy. Keep one hand on their right shoulder (to stop your baby rolling over) and your other hand on the side of their face, gently turn their head to the left until a resistance is felt.
- Hold this position for at least thirty seconds.
- Repeat five times.
- Do this exercise \_\_\_\_ times per day.





# Rotation stretches

Your physiotherapist will advise if these stretches are necessary.

# Stretch B

- Hold your baby flat against your chest.
- Encourage your baby to turn their head to the left by following a toy or by looking in a mirror. Then, gently push the right side of your baby's head flat against your chest. This is to assist to turn their head to the left as far as comfortably possible.
- Hold this position for at least thirty seconds.
- Repeat five times.
- Do this exercise \_\_\_\_ times per day.



The source of the information in this handout is from the Physiotherapy Department at the Sydney Children's Hospital, Randwick.

Illustrations by Janice Latham, Images 4U.

Issue date: June-2020

Page 46 of 53



Appendix 10: Patient handout - Left-sided positional plagiocephaly<sup>40</sup>

# Physiotherapy

# Exercises for your baby with a preference for turning their head to the left



# **INFORMATION BOOKLET**

If you have any questions or problems please contact the Physiotherapy Department.

GL2020\_013

Issue date: June-2020

Page 47 of 53



# Introduction

# Your baby has developed a preference for turning their head to the left.

This can cause a flattening on the back of the head on the left side. It can also mean that your baby will have more difficulty turning their head to the right. Babies need to be able to turn their head in both directions equally.

This handout will assist you and your baby to overcome this issue by providing easy to follow exercises and guidance.

If you are having difficulty with these exercises, please speak to your physiotherapist.

Aims of physiotherapy are to:

- Encourage turning of your baby's head to the right
- Show you how to position your baby to discourage head flattening
- Stretch your baby's neck muscles if there is any tightness.



Examples of flattening on the back of the head. Images provided courtesy of Cranial Technologies.



# Positioning and handling

# How should I position my baby for sleep?

Place your baby on their back so that all activity is on the right side.

Place toys and mobiles on their right side and ensure you approach the cot from the right side.

You may consider placing the left hand side of the cot against the wall so this is not interesting for the baby to look at.



To reduce the risk of sudden unexpected death in infancy, babies should sleep on their back and have their head and face uncovered. For further information go to <a href="https://rednose.org.au/">https://rednose.org.au/</a>.

# How should I pick-up and carry my baby?

It can help if your baby is carried and cuddled so that they are encouraged to turn their head to the right.





# How should I position my baby to play?

To decrease flattening of your baby's head, it is important to place your baby in a variety of positions. This means you are not always putting pressure on the same part of their head.

Some examples are: supported sitting, side-lying and tummy time. You should place your baby on both sides to play.

Positions toys to encourage your baby to turn to the right.











# Why does my baby need tummy time?

This is a good position for your baby to practise lifting their head, developing strength in their back and neck muscles, and taking weight through their arms.

In this position, use toys to encourage your baby to turn their head to the right.

When your baby is little, a rolled towel or small pillow may be placed under their chest to help them maintain this position.











# Rotation stretches

Your physiotherapist will advise if these stretches are necessary.

# Stretch A

- Place your baby on their back.
- Encourage your baby to turn their head to the right by following your face or a toy. Keep one hand on their left shoulder (to stop your baby rolling over) and your other hand on the side of their face, gently turn their head to the right until a resistance is felt.
- Hold this position for at least thirty seconds.
- Repeat five times.
- Do this exercise \_\_\_\_ times per day.





# Rotation stretches

Your physiotherapist will advise if these stretches are necessary.

# Stretch B

- Hold your baby flat against your chest.
- Encourage your baby to turn their head to the right by following a toy or by looking in a mirror. Then, gently push the left side of your baby's head flat against your chest. This is to assist to turn their head to the right as far as comfortably possible.
- Hold this position for at least thirty seconds.
- Repeat five times.
- Do this exercise \_\_\_\_ times per day.



The source of the information in this handout is from the Physiotherapy Department at the Sydney Children's Hospital, Randwick.

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Page 53 of 53