

Exploring infant deformational or positional plagiocephaly prevention and management by Maternal Child Health Nurses and Paediatric Physiotherapists

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KEY WORDS

Plagiocephaly, infant, maternal child health nurse, paediatric physiotherapist

ABSTRACT

Objectives

To explore Maternal Child Health (MCH) nurses' and Paediatric Physiotherapists' (Physiotherapists) experience with infant deformational or positional plagiocephaly (plagiocephaly).

Design

Cross-sectional online survey.

Setting

Community health setting in Victoria, Australia.

Subjects

MCH nurses and Paediatric Physiotherapists in Victoria were invited to participate.

Main outcome measures

Survey results were collated and analysed descriptively.

Results

Surveys were completed by 183/961(19%) MCH nurses and a sample of 16 Physiotherapists, from a cross section of metropolitan (62%), regional (18%) and rural/remote (24%) Victoria. All MCH nurses and Physiotherapists reported seeing infants with plagiocephaly in the previous 12 months. Responses indicated MCH nurses saw between 11-50 infants with plagiocephaly (n=110). These were first diagnosed by MCH nurses at one to three months. Infants first presented to Physiotherapists on average at four to six months. All MCH nurses and Physiotherapists implemented prevention strategies and both groups thought it was effective subject to parents' implementing the advice. Strategies for prevention and management of plagiocephaly included early prone play (tummy-time) and counter positioning. Physiotherapists also included gross motor exercises, stretches if torticollis was present and, if appropriate, referral for helmet therapy. Referrals of infants with plagiocephaly by MCH nurses were made to Physiotherapists, General Practitioners, Chiropractors and Osteopaths.

Conclusions

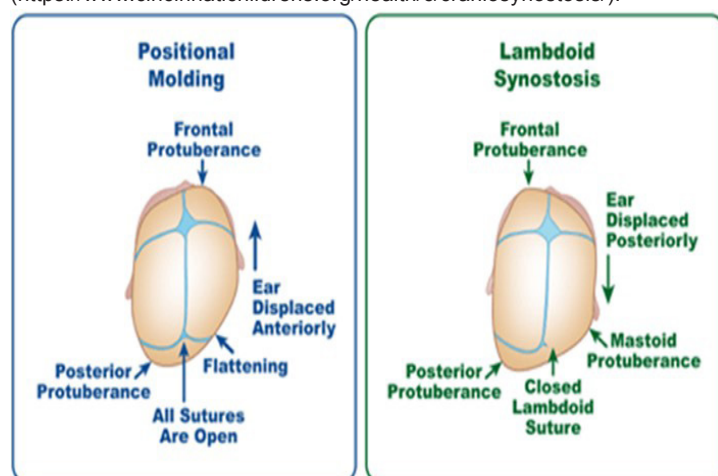
All MCH nurses and Physiotherapist respondents see infants with plagiocephaly, MCH nurses earlier than Physiotherapists. The effectiveness of plagiocephaly prevention advice can be called into question because of the high numbers of infants presenting and subsequent referrals to different health professionals. Recommendations from respondents included a review of past initiatives including extensive education for Maternal Child Health Nurses, Pamphlets in their Home visiting pack and video for demonstration at first time mothers group and the provision of clearer early prevention advice in the Government Key Ages and Stages (KAS) Framework for MCH nurses.

INTRODUCTION

The term plagiocephaly is nonspecific and used 'to denote an asymmetrical head shape' (Inverso et al 2015, p348). In this report plagiocephaly is referring to non-synostotic, positional, or deformational plagiocephaly, colloquially, a flat head. Differential diagnosis between plagiocephaly and posterior craniosynostosis (premature closure of cranial suture) is critical (Kluba2013 et al 2014; Saeed et al 2008; Kabbani and Raghuvver 2004). In true lambdoid craniosynostosis, the ear on the affected side is displaced posteriorly. In positional or deformational plagiocephaly the ear is displaced anteriorly and the frontal protuberance is ipsilateral (Kabbani and Raghuvver 2004) (figure 1).

Figure 1: Positional or deformational plagiocephaly (left) and lambdoid craniosynostosis (right)

(<https://www.cincinnatichildrens.org/health/c/craniosynostosis/>).



Plagiocephaly is an unexpected outcome of the successful strategy to prevent Sudden Infant Death Syndrome (SIDS) which was endorsed by the American Academy of Pediatrics (AAP) introduced in 1992. It recommends that babies sleep in supine, the 'Back to Sleep' campaign (AAP 2005; 1992). Concurrently, the incidence of plagiocephaly has risen from 5% in the early 1990s to an estimated 46.6% in 7 to 12 week old infants in 2013 (Mawji et al 2013; Kane et al 1996). Research attention is now being directed to the financial cost of management (Inverso et al 2015) as well as to plagiocephaly prevention (Aarnivala et al 2015; Cavalier et al 2011).

The 'Back to Sleep' campaign has saved lives, and there is no reason to question it. However, there is controversy about how plagiocephaly should be managed, the effectiveness of current guidelines such as helmet therapy (van Wijk et al 2014; Graham et al 2005), whether it causes developmental delay (Collett et al 2013; Darrah and Bartlett 2013) or is an indication of prior risk of delayed development (Branch et al 2015; Knight et al 2013; Shweikeh et al 2013; Bialocerkowski et al 2008; Biggs 2004; Persing et al 2003).

Recommendations for prevention and management of plagiocephaly include early introduction of counter-positioning of the infant's head and cot location, with supervised play in prone or 'tummy-time' when the infant is awake, adding physiotherapy referral if there torticollis (Mawji et al 2013; Saeed et al 2008; Persing et al 2003; Davis et al 1998).

While both the nursing (Flannery et al 2012; Looman and Flannery 2012;) and physiotherapy (Kenndey et al 2009; Darrah and Bartlett 2013) professions have expressed concern about the high incidence of plagiocephaly and its effect on motor development, there is no published information about the experience of MCH nurses and physiotherapists with infant plagiocephaly in their clinical practice.

The aim of this study was to survey Victorian MCH nurses and Physiotherapists to explore:

- their experience with plagiocephaly;
- plagiocephaly prevention strategies used; and
- how they managed plagiocephaly.

METHOD

Setting

The Maternal and Child Health Service in Victoria is a free service which supports a child's health and development from birth until school age. The service is funded by local and state governments and all parents are eligible to attend with their infant. MCH nurses are registered nurses with midwifery qualifications and postgraduate training in maternal and child health nursing (Kruske and Grant 2012). Physiotherapists for this study were registered health professionals who specialise in paediatrics (working with infants and children less than 18 years of age) and form a small percentage of the physiotherapy profession. Physiotherapists in this speciality area work in the tertiary health sector such as the Royal Children's Hospital, in community health and in private practice.

Participants

Participants were MCH nurses practising in MCH centres or other primary care settings, and physiotherapists from the Plagiocephaly Clinic at the Royal Children's Hospital (RCH) Melbourne, community health or in private practice.

Data source

A survey instrument with both fixed choice and open ended questions was developed in collaboration with key stakeholders in MCH and RCH. The 24 item survey was divided into three sections: 1) background of health professionals and experience with plagiocephaly, 2) prevention of plagiocephaly and 3) management of plagiocephaly. Some questions allowed open-ended responses.

Procedure

The survey was hosted online from 1 December 2014 to 1 February 2015. An emailed invitation to participate and providing an online survey link was sent to local government representatives, who then emailed MCH co-ordinators. Co-ordinators forwarded this email to MCH nurses. The email to physiotherapists was sent to the Director of Physiotherapy at RCH and to publicly available private physiotherapy websites from where it was forwarded to clinicians.

Ethics approvals

This project was approved by the University of Melbourne Human Research Ethics Committee (No: 1442919.1) and by the Victorian Government Department of Early Childhood Development (No: 2014_002570).

Data analysis

Data from fixed choice questions were analysed using descriptive statistics. Responses to open-ended questions and comments were sorted into themes, which were summarised. Concept maps were generated using Mindjet Mind Manager Software (Mindjet 2016) to illustrate the relative frequencies of responses within themes (figures 2-4). The sizes of the 'bubble' and font reflect the number of responses representing each theme relative to the number of responses in other themes.

RESULTS

Professions surveyed

One hundred and eighty-seven of 961 MCH nurses responded to the survey (19% of 174 fulltime and 787 part-time MCH nurses, with 26 reporting midwifery qualifications). Four surveys were incomplete, so the final total was 183 responses from MCH nurses. Sixteen physiotherapist respondents completed surveys, 15 were paediatric physiotherapists and one was a general physiotherapist. At the time of the survey the total number of physiotherapists in paediatric practice was not known, but a sample of 16 were invited to participate and 100% responded.

Geographical distribution

The overall geographical spread was metropolitan 62%, regional 18% and rural/remote 24%. There were proportionately fewer MCH nurses than physiotherapists from metropolitan areas, a similar proportion of MCH nurses and physiotherapists working in regional areas, but more MCH nurses employed in rural or remote areas.

Workplace and experience of respondents

Results are summarised in table 1. MCH nurses worked predominantly in Maternal Child Health Centres, but they also worked in other settings such as emergency or midwifery departments. Half reported that they had higher degrees, including Masters in Nursing or Child and Family Health or Postgraduate Diplomas, and also worked as lactation consultants.

MCH nurses mostly saw infants aged 0-1 year and were experienced, with many working with infants for over 10 years. Only three respondents had worked less than one year and eight had been working 25 - >40 years. The majority of MCH nurses had each seen over 50 infants in the previous year, others responded that they had seen 'hundreds' and '250-350 approximately' and '50 babies per week for 11 months of the year'.

Physiotherapists worked in the hospital outpatient setting, private practice or early childhood or community services (table 1). They saw infants and children aged 1-10 years, but also youth 11-18 years. Twelve had been in practice with infants for over 10 years and had seen 10-25 infants in the previous year, five had seen over 50 and one had seen over 350 in a specialist clinic.

Table 1: Workplace, experience and number of infants seen in previous year

	Workplace				Experience (years)		Age of infants seen (years)			No. of infants seen in previous year			
	MCHC	CC	OP	PP	1-5	>10	0-1	1-10	11-18	<5	10-25	26-50	>50
MCHN	182	12	0	0	24	126	140	96	1	0	4	17	149
PT	1	6	12	7	4	12	11	13	8	2	12	1	6

MCHN=Maternal Child Health nurse, PT=Physiotherapist, MCHC = MCH Centre CC=Community Centre, OP=Outpatients, PP=Private Practice

Age and number of infants with plagiocephaly seen in previous year

All MCH nurses and physiotherapists reported that infants with plagiocephaly attended their clinic and results are summarised in table 2.

MCH nurses reported seeing an average of 11-25 infants with plagiocephaly in a year, many responding 26-50 infants (n=47) and over 50 in 28 responses. The average age at which infants were first seen by MCH nurses was 5 - 8 weeks (one to two months).

Physiotherapists saw fewer infants with plagiocephaly than MCH nurses, although one reported reviewing over 350 infants in the previous year in a specialist clinic. The age at which infants first presented to physiotherapists with plagiocephaly averaged 3 - 6 months.

Table 2: Plagiocephaly: numbers seen in previous year and age of first attendance at clinic

	No of infants seen with plagiocephaly					Age of infants when first seen with plagiocephaly					
	<4	5-10	11-25	26-50	>50	0-4w	5-8w	9-12w	4-6m	7-10m	>11m
MCHN	0	34	63	47	28	99	127	109	77	41	29
PT	5	3	5	0	2	2	8	13	13	6	1

MCHN=Maternal Child Health nurse, PT=Physiotherapist, w=weeks, m=months

Prevention strategies and effectiveness

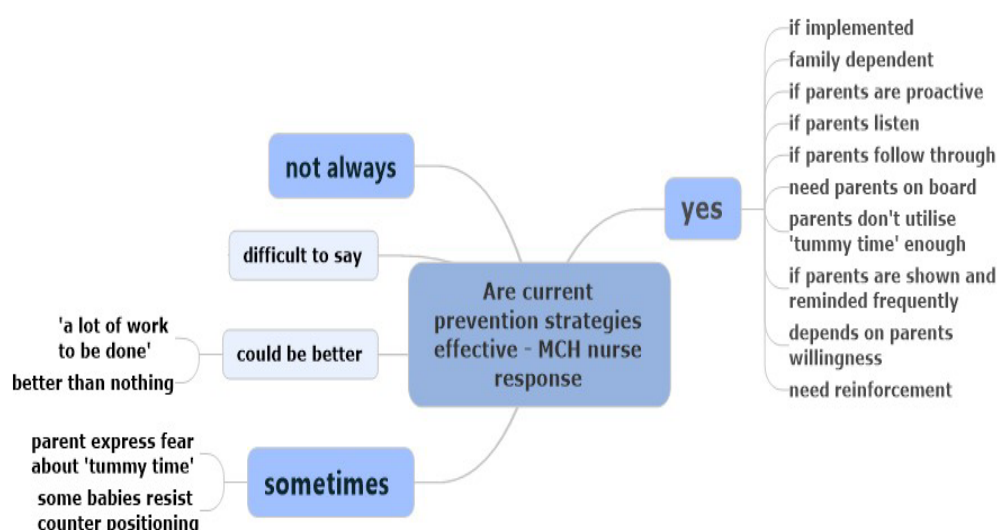
The majority of MCH nurses implemented prevention strategies with only three stating they did not. The results are summarised in table 3. Strategies used in practice were parent education, positioning including 'tummy-time', information brochure or video, with some recommending equipment such as a modified pillow. MCH nurses reported using early tummy time and counter positioning. The majority of MCH nurses believed that the prevention strategies were effective.

Table 3: Prevention strategies and responses to open-ended

	Prevention strategies implemented			Type of strategy	Effectiveness of strategies	
	Yes	No	PE	Positioning with TT'	Yes	No
MCHN	169	0	155	180	121	13
PT	15	0	13	14	9	2

MCHN=Maternal Child Health nurse, PT=Physiotherapist, PE=Parent Education, TT=Tummy-time

Themes from responses to the open-ended question "Do you believe current prevention strategies are effective?" are summarised in figure 2. It is noted that many of the 'Yes' responses were conditional on parents willingness to implement advice.

Figure 2: Themes emerging from MCH nurse comments (n=46) to 'Do you believe current prevention strategies are effective?' Font size indicates frequency of response.

All Physiotherapists implemented prevention strategies with one responding that prevention of plagiocephaly was discussed even if the infant was being seen for other issues. Responses by Physiotherapists also believed that the parents' role was key, e.g. 'if implemented - many parents I see are hesitant to position babies in prone regularly' and 'parents still express a lot of fear about tummy time'.

Interventions recommended for plagiocephaly

The common interventions recommended by both MCH nurses and physiotherapists for the infant with plagiocephaly were counter positioning, 'tummy time', and referral to other health professionals. Recommendations for intervention are summarised in table 4.

Table 4: Interventions recommended for plagiocephaly, and evidence for them

	Interventions recommended			Number of infants referred			Evidence for intervention		
	Positioning	TT	Referral on	<5	5-10	>10	Yes	No	Not sure
MCHN	174	182	160	77	47	53	117	8	51
PT	16	16	5	10	2	1	5	4	5

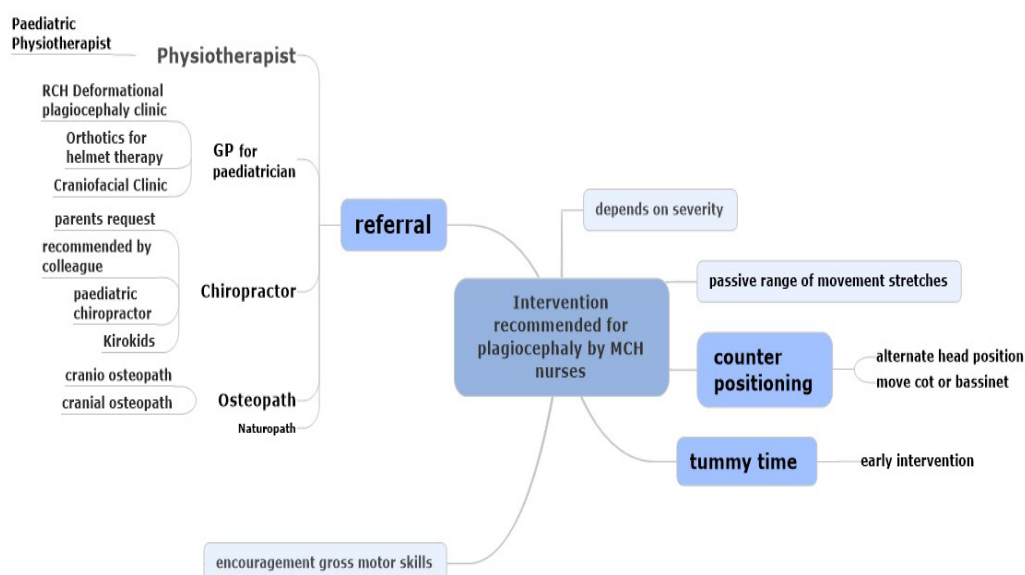
MCHN=Maternal Child Health nurse, PT=Physiotherapist, TT=Tummy-time

MCH nurses indicated referrals for plagiocephaly management were to physiotherapists, general practitioner (for referral to Royal Children's Hospital or a paediatrician), chiropractor or osteopath (figure 3).

Most MCH nurses believed the interventions were evidence-based, but 51 were not sure and seven doubted that the interventions were evidence-based.

Physiotherapists reported using counter positioning and tummy time, included gross motor exercises, stretches if torticollis was present with ten referring to orthotists for helmet therapy or to community physiotherapists. In response to the question as to whether there was an evidence base for interventions, seven physiotherapists responded 'yes', with one providing a reference, four responded 'no', and five 'not sure'. The reference cited was Flannery et al (2012).

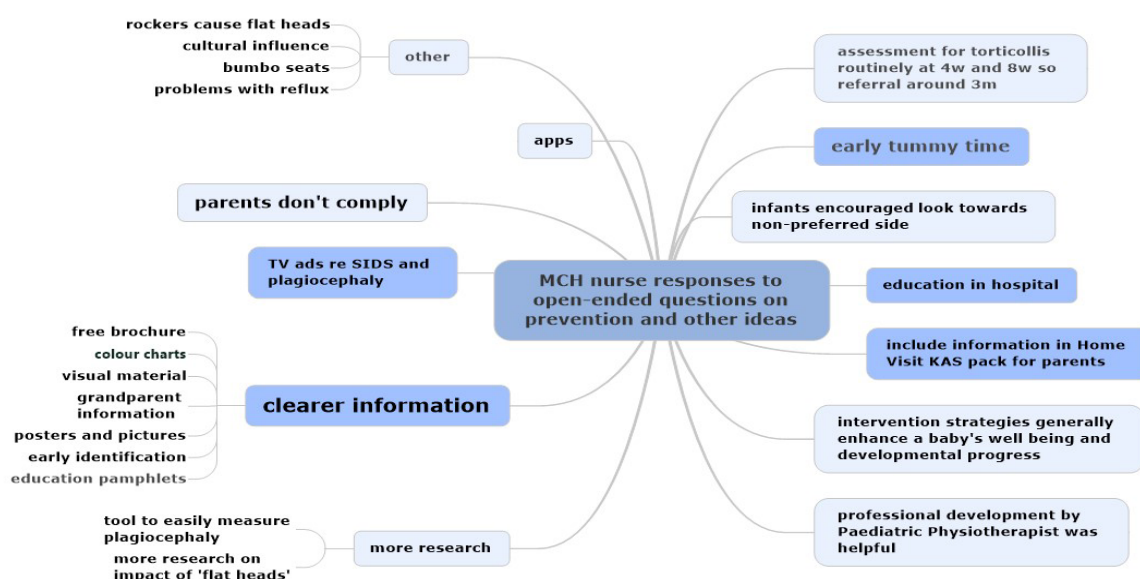
Figure 3: Themes emerging from MCH nurse responses (n=122) to 'What intervention do you recommend for plagiocephaly?' Font size indicates frequency of response



Responses requesting ideas about plagiocephaly that could be useful for parents and health professionals

Additional responses were elicited as to what information could be provided which would be useful to parents or health professionals. Forty-two MCH nurses responded to this question and the themes for these responses are illustrated in figure 4. The most common themes were: clearer information, early tummy time, education in hospital and TV advertisements on SIDS and plagiocephaly.

Figure 4: Themes emerging from MCH nurse responses to ‘Do you have any additional comments you would like to share about ideas you think would be useful to parents or health professionals?’ KAS = MCH nurse Key Ages and Stages Framework. Font size indicates frequency of response.



DISCUSSION

The results of this survey suggest that plagiocephaly is a common occurrence in Victorian infants and supports other studies reporting a similar increase in incidence in other countries (Branch et al 2015; Mawji et al 2013). Responses indicated that prone play or ‘tummy time’ and counter positioning are accepted as both prevention and management strategies. Plagiocephaly is frequently observed in infants by both MCH nurses and physiotherapists, although the physiotherapists see infants with plagiocephaly at a later age than MCH nurses. Many infants are referred for further management by MCH nurses although concern was expressed about lack of access to physiotherapists, delays in appointments.

The reported effectiveness of current prevention and management strategies can be called into question by the large number of young infants with plagiocephaly referred for further management by both MCH nurses and physiotherapists. Respondents suggested the reasons that current prevention strategies are not effective are parental non-compliance with advice or reluctance to do tummy time.

Although many infants were referred to other health professionals by MCH nurses for management, there was inconsistency in referral patterns, with MCH nurses responding they referred to physiotherapists (80%), to general practitioners (GPs, 32%) for further referral to a paediatrician or RCH, and often at parents’ request, to chiropractors (20%) and osteopaths (20%) (figure 2).

Physiotherapists referred infants with severe plagiocephaly to orthotists for helmet therapy. The management of plagiocephaly with helmet therapy is controversial. A randomised controlled trial of helmet therapy compared to conservative management concluded that there was equal effectiveness of helmet therapy and skull

deformation following its natural course. Moreover, because of the high prevalence of side effects, and high costs associated with helmet therapy, the authors discouraged the use of a helmet as a standard treatment for healthy infants with moderate to severe skull deformation (van Wijk et al 2014).

Referral to chiropractors or osteopaths is also controversial in the literature. Uncertainty was expressed by respondents about the appropriateness of referral of infants for chiropractic management and some referrals were made at the parent's request or if they had a regular chiropractor. A Cochrane Systematic Review (Brand et al 2005) concluded that manual therapy, chiropractic, and osteopathy should not be used in infants. The authors used the term 'Kinetic Imbalance due to Sub occipital Strain (KISS)' Syndrome in infants with positional preference, plagiocephaly, and colic. This syndrome is not recognised in the medical literature. .

Early intervention was universally recommended by respondents. This strategy has been confirmed by a recent randomised controlled trial in Finland, which showed that an early educational intervention in the maternity ward reduced the prevalence and severity of DP at three months (Aarnivala et al 2015).

Forty-two MCH nurses provided ideas that could be useful to parents and health professionals. They highlighted the need for clearer information for prevention and management of plagiocephaly. Suggested ideas were free brochures or pamphlets, more visual representation of ideas for tummy time, colour charts, easy to read information, TV advertisements and Apps. The MCH nurses reported that tummy time, if implemented, is an effective prevention measure. Counter positioning is important and infants need to be encouraged to look towards the non-preferred side. MCH nurses expressed the need for better professional development on plagiocephaly. Other suggestions included more research, a tool to easily measure the degree of plagiocephaly, and investigation of 'bumbo' seats and pillows. There is a clinical measure for plagiocephaly 'the Severity Assessment' (Ohman 2012), but this tool appears not to be widely known.

A randomised controlled trial for management of plagiocephaly comparing physiotherapy stretching exercises and use of bedding/pillow concluded that both resulted in improvement (Wilbrand et al 2013). It is important to note that the Sudden Infant Death Syndrome (SIDS) Foundation recommends that pillows, doonas, soft toys, cot bumpers or lambswools should not be used when preparing a baby's cot (SIDS and Kids 2016).

The responses to this survey confirm that the experience of plagiocephaly by MCH nurses and Physiotherapists in Victoria is similar to that documented in other countries and is sufficiently significant to warrant further investigation of the implementation of the advice on plagiocephaly prevention.

CONCLUSIONS

The MCH nurses and physiotherapists who responded to this survey routinely saw infants with plagiocephaly in their clinical practice, and expressed concern about the high number of these infants. The common themes among respondents regarding prevention and management of plagiocephaly were counter positioning and tummy time. However, respondents also expressed the need for clearer, illustrated prevention material, preferably delivered in the Victorian Government (2006) Key Ages and Stages (KAS) Framework at the first visit.

RECOMMENDATIONS

1. Review past initiatives in regard to plagiocephaly; including extensive education for Maternal Child Health Nurses, pamphlets in their home visiting pack and video for demonstration at first time mothers groups.
2. Clearer advice for early prevention and management of infant plagiocephaly is indicated. Since MCH nurses see infants at the earliest age, they are best placed to deliver clear advice if the busy maternity ward is not appropriate.

3. The KAS Framework (Victorian Government 2006) given to parents when they come home with a new baby should be revised, in consultation with the Department and MCH nurses, to include clear advice on prevention of infant plagiocephaly.

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