

Medical Policy



Title: Adjustable Cranial Orthoses for Positional Plagiocephaly and Craniosynostoses

Professional

Original Effective Date: July 13, 2004
 Revision Date(s): October 11, 2011;
 September 5, 2013; July 8, 2015;
 January 4, 2017; September 28, 2017;
 January 1, 2018; April 11, 2018;
 September 11, 2019; May 5, 2021
 Current Effective Date: September 11, 2019

Institutional

Original Effective Date: July 13, 2004
 Revision Date(s): October 11, 2011;
 September 5, 2013; July 8, 2015;
 January 4, 2017; September 28, 2017;
 January 1, 2018; April 11, 2018;
 September 11, 2019; May 5, 2021
 Current Effective Date: September 11, 2019

State and Federal mandates and health plan member contract language, including specific provisions/exclusions, take precedence over Medical Policy and must be considered first in determining eligibility for coverage. To verify a member's benefits, contact [Blue Cross and Blue Shield of Kansas Customer Service](#).

The BCBSKS Medical Policies contained herein are for informational purposes and apply only to members who have health insurance through BCBSKS or who are covered by a self-insured group plan administered by BCBSKS. Medical Policy for FEP members is subject to FEP medical policy which may differ from BCBSKS Medical Policy.

The medical policies do not constitute medical advice or medical care. Treating health care providers are independent contractors and are neither employees nor agents of Blue Cross and Blue Shield of Kansas and are solely responsible for diagnosis, treatment and medical advice.

If your patient is covered under a different Blue Cross and Blue Shield plan, please refer to the Medical Policies of that plan.

Populations	Interventions	Comparators	Outcomes
Individuals: <ul style="list-style-type: none"> With open or endoscopic surgery for craniosynostosis 	Interventions of interest are: <ul style="list-style-type: none"> Postoperative cranial orthosis 	Comparators of interest are: <ul style="list-style-type: none"> Cranial vault remodeling without a cranial orthosis 	Relevant outcomes include: <ul style="list-style-type: none"> Change in disease status Morbid events Functional outcomes Quality of life Treatment-related morbidity
Individuals: <ul style="list-style-type: none"> With positional plagiocephaly 	Interventions of interest are: <ul style="list-style-type: none"> Cranial orthosis 	Comparators of interest are: <ul style="list-style-type: none"> Positioning therapy 	Relevant outcomes include: <ul style="list-style-type: none"> Change in disease status Morbid events Functional outcomes Quality of life Treatment-related morbidity

DESCRIPTION

Cranial orthoses involve an adjustable helmet or band that progressively molds the shape of the infant cranium by applying corrective forces to prominences while leaving room for growth in the adjacent flattened areas. A cranial orthotic device may be used to treat postsurgical synostosis or positional plagiocephaly in pediatric patients.

OBJECTIVE

The objective of this evidence review is to determine whether the use of an adjustable cranial orthosis improves the net health outcome in infants who have undergone open or endoscopic surgery for craniosynostosis or who have positional plagiocephaly without synostosis.

BACKGROUND**Craniosynostoses**

An asymmetrically shaped head may be synostotic or nonsynostotic. Synostosis, defined as premature closure of the sutures of the cranium, may result in functional deficits secondary to increased intracranial pressure in an abnormally or asymmetrically shaped cranium. The type and degree of craniofacial deformity depend on the type of synostosis. The most common is scaphocephaly, a narrowed and elongated head resulting from synostosis of the sagittal suture. Trigenocephaly, in contrast, is a premature fusion of the metopic suture and results in a triangular shape of the forehead. Unilateral synostosis of the coronal suture results in an asymmetric distortion of the forehead called plagiocephaly and fusion of both coronal sutures results in brachycephaly. Combinations of these deformities may also occur.

Treatment

Synostotic deformities associated with functional deficits are addressed by surgical remodeling of the cranial vault. The remodeling (reshaping) is accomplished by opening and expanding the abnormally fused bone.

In a review of the treatment of craniosynostosis, Persing (2008) indicated that premature fusion of 1 or more cranial vault sutures occurs in approximately 1 in 2500 births.¹ Of these craniosynostoses, asymmetric deformities involving the cranial vault and base (e.g., unilateral coronal synostosis) will have a higher rate of postoperative deformity, which would require additional surgical treatment. Persing (2008) suggested that use of cranial orthoses postoperatively may serve 2 functions: (1) they protect the brain in areas of large bony defects, and (2) they may remodel the asymmetries in skull shape, particularly when the bone segments are more mobile.

Plagiocephaly

Plagiocephaly without synostosis, also called positional or deformational plagiocephaly, can be secondary to various environmental factors including, but not limited to, premature birth, restrictive intrauterine environment, birth trauma, torticollis, cervical anomalies, and sleeping position. Positional plagiocephaly typically consists of right or left occipital flattening with the advancement of the ipsilateral ear and ipsilateral frontal bone protrusion, resulting in visible facial asymmetry. Occipital flattening may be self-perpetuating in that once it occurs, it may be increasingly difficult for the infant to turn and sleep on the other side. Bottle feeding, a low proportion of "tummy time" while awake, multiple gestations, and slow achievement of motor milestones may contribute to positional plagiocephaly. The incidence of plagiocephaly has increased rapidly in recent years; this is believed to be a result of the "Back to Sleep" campaign

recommended by the American Academy of Pediatrics, in which a supine sleeping position is recommended to reduce the risk of sudden infant death syndrome. It has been suggested that increasing awareness of identified risk factors and early implementation of good practices will reduce the development of deformational plagiocephaly.

REGULATORY STATUS

Multiple cranial orthoses (helmets) have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process and are intended to apply passive pressure to prominent regions of an infant's cranium to improve cranial symmetry and/or shape in infants from 3 to 18 months of age. Multiple marketed devices are labeled for use in children with moderate to severe nonsynostotic positional plagiocephaly, including infants with plagiocephalic- and brachycephalic-shaped heads. FDA product code: MVA.

POLICY

- A. Use of an adjustable cranial orthosis may be considered **medically necessary** following cranial vault remodeling surgery for synostosis.
- B. Use of an adjustable cranial orthosis for synostosis in the absence of cranial vault remodeling surgery is considered **not medically necessary**.
- C. Use of an adjustable cranial orthosis as a treatment of plagiocephaly or brachycephaly without synostosis is considered **medically necessary** when all of the following conditions have been met:
 - 1. The patient is between 3 months and 18 months old.
 - 2. Documented failure of conservative therapy (repositioning and physical therapy) of at least 2 months' duration.
 - 3. The patient has a cephalic index that is at least 2 standard deviations above or below the mean for the appropriate gender and age.
- D. Use of an adjustable cranial orthosis is considered **not medically necessary** for all other indications not outlined above.

Policy Guidelines

1. Procedures are considered medically necessary if there is a significant physical functional impairment AND the procedure can be reasonably expected to improve the physical functional impairment (ie, improve health outcomes).
2. Assessment of plagiocephaly in research studies may be based on anthropomorphic measures of the head, using anatomical and bony landmarks. However, there is no accepted minimum objective level of asymmetry for a plagiocephaly diagnosis, there are definitions that have been adopted by convention.
 - a. Brachiocephaly: Shortened front to back dimension of the skull that results from premature fusion of the coronal suture
 - b. Cranial base: Asymmetry of the cranial base is measured from the subnasal point (midline under the nose) to the tragus (the cartilaginous projection in front of the external auditory canal)
 - c. Cephalic index: The cephalic index, which describes a ratio of the maximum width to the head length expressed as a percentage, is used to assess abnormal head shapes without asymmetry. The maximum width is measured between the most lateral points of the head located in the parietal region (i.e., euryon). The head length is measured from the most prominent point in the median sagittal plane between the supraorbital ridges (i.e., glabella) to the most prominent posterior point of the occiput (i.e., the opisthocranium), expressed as a percentage. The cephalic index can then be compared to normative measures for age and gender. See Table PG1 (as developed by AAOP 2004).
 - d. Cranial Vault Asymmetry: is assessed by measuring from the frontozygomaticus point (identified by palpation of the suture line above the upper outer corner of the orbit) to the euryon, defined as the most lateral point on the head located in the parietal region.
 - e. Plagiocephaly: Flattening of the skull on the back or one side of the head.
 - f. Sagittal suture: Skull joint that separates the left and right halves of the skull.

Table PG1. Cephalic Index

Sex	Age	-2SD	-1SD	Mean	+1SD	+2SD
Male	16 days to 6 months	63.7	68.7	73.7	78.7	83.7
Male	6 to 12 months	64.8	71.4	78.0	84.6	91.2
Female	16 days to 6 months	63.9	68.6	73.3	78.0	82.7
Female	6 to 12 months	69.5	74.0	78.5	83.0	87.5

RATIONALE

This evidence review has been updated regularly with searches of the PubMed database. The most recent literature update was performed through January 24, 2021.

Evidence reviews assess the clinical evidence to determine whether the use of technology improves the net health outcome. Broadly defined, health outcomes are the length of life, quality of life, and ability to function-including benefits and harms. Every clinical condition has specific outcomes that are important to patients and managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of technology, two domains are examined: the relevance, and quality and credibility. To be relevant, studies must represent one or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. Randomized controlled trials are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

This review was informed by a TEC Assessment (1999) that concluded the evidence on adjustable cranial orthoses as a treatment of positional plagiocephaly was insufficient to permit conclusions.²

CRANIAL ORTHOSES FOR CRANIOSYNOSTOSIS

Clinical Context and Therapy Purpose

The purpose of postoperative cranial orthosis is to provide a treatment option that is an alternative to or an improvement on existing therapies, such as cranial vault remodeling without a cranial orthosis, in patients with open or endoscopic surgery for craniosynostosis.

The question addressed in this evidence review is: Does the use of an adjustable cranial orthosis improve the net health outcome in infants who have undergone open or endoscopic surgery for craniosynostosis?

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with open or endoscopic surgery for craniosynostosis.

Interventions

The therapy being considered is postoperative cranial orthosis.

Comparators

Comparators of interest include cranial vault remodeling without a cranial orthosis. Treatments for craniosynostosis include surgeries such as strip sagittal craniectomy, frontal-orbital advancement, and frontal-occipital reversal.

Outcomes

The general outcomes of interest are a change in disease status, morbid events, functional outcomes, quality of life, and treatment-related morbidity. The existing literature evaluating postoperative cranial orthosis as a treatment for open or endoscopic surgery for craniosynostosis has varying lengths of follow-up, ranging from 13 to 25 months. While studies described below all reported at least 1 outcome of interest, longer follow-up was necessary to fully observe outcomes. Therefore, 12 to 24 months of follow-up is considered appropriate to demonstrate

efficacy. Patients with open or endoscopic surgery for craniosynostosis are actively managed by neurosurgeons, plastic surgeons, and primary care providers in an inpatient clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Early literature consisted of a few case series that described the use of cranial orthoses following either open or endoscopically assisted surgery for craniosynostosis. For example, Kaufman et al (2004) reported on 12 children who used a cranial orthosis for 1 year after extended strip craniectomy.³ They found that the orthoses improved Cephalic Index score (100 times the ratio of cranial biparietal diameter and occipitofrontal diameter) more than a similar type of surgery without an orthosis reported elsewhere. The Cephalic Index score improved by 4 (range, 67-71) from baseline to 1 year in studies using surgery alone but improved by 10 (range, 65-75) with combined treatment (Cephalic Index normal range, 75-90). Stevens et al (2007) reported on a study that evaluated 22 patients from a single institution, on the effect of postoperative remolding orthoses following total cranial vault remodeling.⁴ The children's ages at the time of surgery ranged from 4 to 16 months (average age, 7.5 months). For the 15 (68%) of 22 children treated who completed helmet use and were not lost to follow-up, helmets were worn an average of 134 days. Summary analyses were not provided, because each patient case differed by location of fused suture, extent, and duration of the fusion, and surgical methods used.

Jimenez et al (2002, 2007, 2012) reported on routine use of helmets for 12 months following endoscopically assisted surgery for craniosynostosis in 256 consecutive children.^{5,6,7} Anthropomorphic measurements at 3, 6, 9, and 12 months after surgery showed continued improvement in symmetry in most patients. Jimenez and Barone (2010) reported on the treatment of 21 infants with multiple-suture (nonsyndromic) craniosynostosis with endoscopically assisted craniectomies and postoperative cranial orthoses.⁸ Helmet therapy lasted an average of 11 months (range, 10-12 months). The decision to discontinue therapy was based on the child reaching the 12-month postoperative mark or 18 months of age. After the first year post surgery, patients were followed annually or biannually (range, 3-135 months). The mean preoperative Cephalic Index score was 98. The postoperative Cephalic Index score (>1 year) was 83, a 15% decrease from baseline.

Since these initial reports, literature updates have identified a larger series describing endoscopically assisted strip craniectomy and postoperative helmet therapy for craniosynostosis. They include a series of 97 children with nonsyndromic single-suture synostosis reported by Gociman et al (2012) and a series of 73 children reported by Honeycutt (2014).^{9,10} Honeycutt (2014) asserted that because head-shape correction occurs slowly after surgery, helmet therapy is as important as the surgery to remove the abnormal suture.

Shah et al (2011) prospectively collected outcomes from endoscopically assisted vs open repair of sagittal craniosynostosis in 89 children treated between 2003 and 2010.¹¹ The endoscopic procedure was offered starting in 2006 and has become the most commonly performed approach. The 42 patients treated with open-vault reconstruction had a mean age at surgery of 6.8 months and a mean follow-up of 25 months. Mean age of the 47 endoscopically treated patients at surgery was 3.6 months and a mean follow-up was 13 months. Of the 29 endoscopically treated patients who completed helmet therapy, the mean duration for helmet therapy was 8.7 months. Noncompliance with helmet therapy has also been reported in a substantial proportion of patients.¹²

Section Summary: Cranial Orthoses for Craniosynostosis

The evidence on the efficacy of cranial orthoses following endoscopically assisted or open cranial vault remodeling surgery for craniosynostosis is limited and includes only case series. In the postoperative period after craniosynostosis repair, the role of cranial orthoses is to continue remodeling the skull after surgery. Functional impairments are related to craniosynostosis, including the potential for increased intracranial pressure and the risk of harm from additional surgery when severe deformity has not been corrected. This indirect evidence is considered sufficient to suggest an improvement in health outcomes with postsurgical use of cranial orthosis for craniosynostosis.

CRANIAL ORTHOSES FOR POSITIONAL PLAGIOCEPHALY

Clinical Context and Therapy Purpose

The purpose of cranial orthosis is to provide a treatment option that is an alternative to or an improvement on existing therapies, such as positioning therapy, in patients with positional plagiocephaly.

The question addressed in this evidence review is: Does the use of an adjustable cranial orthosis improve the net health outcome in infants who have positional plagiocephaly?

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with positional plagiocephaly. Some increase in the prevalence of positional plagiocephaly may be related to the change in recommended sleep practice (back to sleep) to prevent sudden infant death syndrome.

Interventions

The therapy being considered is cranial orthosis. Custom-fitted cranial orthoses are designed to be worn 23 hours a day for several months.

Comparators

Comparators of interest include positioning therapy. Treatment for positional plagiocephaly includes head repositioning and helmet therapy. It is estimated that about two-thirds of plagiocephaly cases may auto-correct spontaneously after regular changes in sleeping position or following physical therapy aimed at correcting neck muscle imbalance. A cranial orthotic device is usually requested after a trial of repositioning fails to correct the asymmetry, or if the child is too immobile for repositioning.

Outcomes

The general outcomes of interest are a change in disease status, morbid events, functional outcomes, quality of life, and treatment-related morbidity. Guideline-related systematic reviews reported a mean duration of cranial orthotic as 4 - 6 months depending on the age of the patient with longer-term outcome assessments reported at 2 years. Patients with positional plagiocephaly are managed by neurologists, pediatricians and other primary care providers in an outpatient clinical setting.

Study Selection Criteria

Methodologically credible studies were selected using the following principles:

- To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
- In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
- To assess long-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
- Studies with duplicative or overlapping populations were excluded.

Review of Evidence

Positional Plagiocephaly and Anthropometric Outcomes

Results from a pragmatic multicenter, single-blinded, randomized controlled trial, Helmet therapy Assessment in Deformed Skulls, were reported in 2014.¹³ The trial included 84 infants ages 5 to 6 months with moderate-to-severe skull deformation (oblique diameter difference index $\geq 108\%$ or cranioproportional index $\geq 95\%$) who were randomized to cranial orthoses for 6 months or to the natural course (observation). It should be noted that 3% of infants recruited were excluded from the trial due to very severe deformation (oblique diameter difference index $> 113\%$ or cranioproportional index $> 104\%$). Of the 42 infants randomized to a cranial orthosis, 10 (23%) wore a cranial orthosis until 12 months of age. Parents of 10 infants discontinued treatment before 12 months due to adverse events. The primary outcome (change score for plagiocephaly [oblique diameter difference index] and brachycephaly [cranioproportional index] at 24 months) was similar for the 2 groups. Full recovery was reported for 26% of children in the orthoses group and 23% of children in the observation arm (odds ratio, 1.2; 95% confidence interval, 0.4 to 3.3; $p=0.74$).

A systematic review by McGarry et al (2008) described 9 publications involving the use of cranial orthoses.¹⁴ More than half of the studies were retrospective cohorts; none was randomized. For studies comparing orthoses with active counter positioning, 1 reported greater decreases in posterior cranial asymmetry (from 12 to 0.6 mm) than treatment of infants using repositioning alone (from 12 to 10 mm); other studies found faster, but ultimately similar, reductions in asymmetry with helmets.^{15,16} Another 2008 systematic review identified 7 cohort studies meeting selection criteria.¹⁷ In most studies, physicians offered (and parents elected) the method of treatment, resulting in a bias toward older infants and greater deformity in the molding groups. One study (2005) included 159 infants with molding therapy and 176 treated with repositioning and physical therapy.¹⁸ Molding therapy was recommended for infants older than 6 months with more severe deformity, and repositioning was recommended for infants 4 months or younger. Both treatments were offered for infants between 4 and 6 months of age, although anthropomorphic measurements indicated that molding therapy was effective in 93% of infants,

while repositioning was effective in 79% of infants. In this review, the relative risk was 1.3 favoring molding therapy. A prospective longitudinal study by Kluba et al (2014) evaluated 128 infants treated with or without a helmet; authors found that, although children treated with a helmet had more severe asymmetry originally, they showed significantly more improvement (68% vs 31%).¹⁹ In a study of 1050 infants, Couture et al (2013) reported on the successful use of off-the-shelf helmet therapy.²⁰ Infants with an Argenta classification type I (minimal deformity) were treated with repositioning while infants with an Argenta severity rating of II to V were treated with a helmet. Correction (overall rate, 81.6%) took longer in patients with an Argenta severity of III, IV, and V compared with Argenta type II, but was not significantly affected by age.

Positional Plagiocephaly and Functional Outcomes

Since the publication of the TEC Assessment (1999), few studies have examined the association between positional plagiocephaly and functional impairments. Some, such as that by Fowler et al (2008), found no difference in the neurologic profile, posture, or behavior of 49 infants with positional plagiocephaly compared with 50 age-matched concurrent controls.²¹

Other studies have compared developmental outcomes in children using positional plagiocephaly with normative values. Panchal et al (2001) reported that scores from a standardized measure of mental and psychomotor development differed significantly from the expected standardized distribution, with 8.7% of children categorized as severely delayed on the Mental Development Index compared with the expected 2.5%.²² A study by Miller and Clarren (2000) obtained responses on long-term developmental outcomes in 63 of 181 children asked to participate in this study.²³ Results were limited by the lack of concurrent controls and potential self-selection population bias. In addition, these studies did not evaluate the possible causal relation for the observed association. For example, children with preexisting development delays or weakness might be at a higher risk for plagiocephaly if they were more apt to lie in 1 position for extended periods of time.

The effect of treatment for positional plagiocephaly on health outcomes has also been investigated. For example, Shamij et al (2012) surveyed parents of 80 children treated for positional plagiocephaly to assess the cosmetic outcome, school performance, language skills, cognitive development, and societal function.²⁴ Analysis indicated that the children of respondents were representative of the total pool. Positional therapy was applied in all children, while 36% also used helmet therapy. At a median follow-up of 9 years, a normal head appearance was reported in 75% of cases. Compared with right-sided deformation, left-sided plagiocephaly was associated with a need for special education classes (27% vs 10%), fine motor delay (41% vs 22%), and speech delay (36% vs 16%).

Section Summary: Cranial Orthoses for Positional Plagiocephaly

Results from the HELmet therapy Assessment in Deformed Skulls trial have suggested that, in a practice setting, the effectiveness of cranial orthoses may not differ from the natural course of development for infants with moderate to severe plagiocephaly and brachycephaly. However, the validity of these results is limited by the low percentage of infants who wore the cranial orthoses for the duration of the trial and the relatively low percentage of infants who achieved recovery in either group. In addition, the efficacy of cranial orthoses in infants with very severe plagiocephaly was not addressed. A few reports have assessed the association between positional plagiocephaly and functional impairments. The largest controlled study found no difference in

function between infants with plagiocephaly and age-matched concurrent controls. While some series have suggested an association between plagiocephaly and developmental delay, they lacked controls and did not evaluate the possible causal relation to observed association. Results of a study on right-sided vs left-sided plagiocephaly suggested an association between left-sided and functional performance but these results have not been confirmed. During the 2019 update for this policy, although the evidence limitations were acknowledged, given that multiple medical organization guidelines have supported use of orthoses for positional plagiocephaly with criteria, use of cranial orthoses were made medically necessary for certain conditions.

Summary of Evidence

For individuals who have open or endoscopic surgery for craniosynostosis who receive a postoperative cranial orthosis, the evidence includes case series. Relevant outcomes are a change in disease status, morbid events, functional outcomes, quality of life, and treatment-related morbidity. Overall, the evidence on the efficacy of cranial orthoses following endoscopic-assisted or open cranial vault remodeling surgery for craniosynostosis is limited. However, functional impairments are related to craniosynostosis, and there is a risk of harm from additional surgery when severe deformity has not been corrected. Because cranial orthoses can facilitate remodeling, use of a cranial orthosis is likely to improve outcomes after cranial vault remodeling for synostosis. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have positional plagiocephaly who receive a cranial orthosis, the evidence includes a comparative study and case series. Relevant outcomes are a change in disease status, morbid events, functional outcomes, quality of life, and treatment-related morbidity. Overall, evidence on an association between positional plagiocephaly and health outcomes is limited. The largest controlled study found no difference in function between infants with plagiocephaly and age-matched concurrent controls. Taking into consideration the limited number of publications over the past decade and the low likelihood of development of high-level evidence from controlled studies, the scientific literature is limited in support of an effect of deformational plagiocephaly on functional health outcomes. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

SUPPLEMENTAL INFORMATION

The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

Clinical Input From Physician Specialty Societies and Academic Medical Centers

While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

In response to requests, input was received from 3 physician specialty societies (4 reviews) and 2 academic medical centers while this policy was under review in 2008. Input was mixed about whether the use of helmets or adjustable banding for treatment of plagiocephaly or brachycephaly without synostosis should be considered medically necessary or not medically necessary. Input agreed that cranial orthoses may be indicated following cranial vault surgery.

Practice Guidelines and Position Statements

Guidelines or position statements will be considered for inclusion in 'Supplemental Information' if they were issued by, or jointly by, a US professional society, an international society with US representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

Congress of Neurological Surgeons and Section on Pediatric Neurosurgery

In 2016, the Congress of Neurological Surgeons and the Section on Pediatric Neurosurgery commissioned a systematic review to inform a joint evidence-based guideline on the role of cranial molding orthosis therapy for patients with positional plagiocephaly.^{25,26} The guideline was issued by a multidisciplinary task force that included clinical and methodological experts; all task force members were required to disclose potential conflicts of interest. The guideline was endorsed by the Joint Guidelines Committee of the American Association of Neurological Surgeons and the Congress of Neurological Surgeons and American Academy of Pediatrics (AAP). The guideline provided level II recommendations (uncertain clinical certainty) on the use of helmet therapy "for infants with persistent moderate to severe plagiocephaly after a course of conservative treatment (repositioning and/or physical therapy)" and "for infants with moderate to severe plagiocephaly presenting at an advanced age." The recommendations were based on a randomized controlled trial, 5 prospective comparative studies, and 9 retrospective comparative studies (all rated as class II evidence).

National Institute of Neurological Disorders and Stroke

In 2019, the National Institute of Neurological Disorders and Stroke has stated that "Treatment for craniosynostosis generally consists of surgery to improve the symmetry and appearance of the head and to relieve pressure on the brain and the cranial nerves [although] for some children with less severe problems, cranial molds can reshape the skull to accommodate brain growth and improve the appearance of the head."²⁷

American Academy of Pediatrics

In 2011,²⁸ the American Academy of Pediatrics (AAP) revised its 2003 policy²⁹ on the prevention and management of positional skull deformities in infants. The AAP indicated that in most cases, the diagnosis and successful management of deformational plagiocephaly can be assumed by the pediatrician or primary health care clinician and that mechanical methods if performed early in life, may prevent further skull deformity and may reverse existing deformity. In most cases, improvement is seen over a 2- to 3-month period with repositioning and neck exercises, especially if these measures are instituted as soon as the condition is recognized. The AAP indicated that use of helmets and related devices seems to be beneficial primarily when there has been a lack of response to mechanical adjustments and exercises, and the best response to helmets occurs in the age range of 4 to 12 months of age. An important limitation of this 2011 policy is that it was retired in 2018.³⁰

The AAP also recommended placing infants on their backs for sleep with supervised "tummy time" for the prevention of plagiocephaly.³¹

U.S. Preventive Services Task Force Recommendations

Not applicable.

Ongoing and Unpublished Clinical Trials

Some currently ongoing trials that might influence this review are listed in Table 1.

Table 1. Summary of Key Trials

NCT No.	Trial Name	Planned Enrollment	Completion Date (Status)
<i>Ongoing</i>			
NCT02370901 ^a	Cranial Orthotic Device Versus Repositioning Techniques for the Management of Plagiocephaly: the CRANIO Randomized Trial	226	Nov 2020 (unknown)

^a Denotes industry-sponsored or cosponsored trial.

NCT: national clinical trial.

CODING

The following codes for treatment and procedures applicable to this policy are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

CPT/HCPCS

97799	Unlisted physical medicine/rehabilitation service or procedure
S1040	Cranial remolding orthotic, pediatric, rigid, with soft interface material, custom fabricated, includes fitting and adjustment(s)

ICD-10 Diagnoses

M95.2	Other acquired deformity of head
M99.80	Other biomechanical lesions of head region
Q67.2	Dolichocephaly
Q67.3	Plagiocephaly
Q67.4	Other congenital deformities of skull, face and jaw
Q75.0	Craniosynostosis
Q75.1	Craniofacial dysostosis
Q75.8	Other specified congenital malformations of skull and face bones
Q75.9	Congenital malformation of skull and face bones, unspecified

REVISIONS

10-11-2011	Policy added to the bcbsks.com web site.
09-05-2013	Updated Description. In the Policy section: <ul style="list-style-type: none"> ▪ Revised Item B from: " An adjustable cranial orthosis as a treatment of moderate to severe plagiocephaly without synostosis is considered medically necessary when all the following criteria are met:

	<ol style="list-style-type: none"> 1. The infant is at least 3 months of age but not greater than 18 months of age; AND 2. Marked asymmetry has not been substantially improved following conservative therapy of at least 2 months duration with cranial repositioning therapy. Due to the mobility of infants greater than 4 months of age, repositioning therapy is not effective and thus, a trial of repositioning is not indicated; AND 3. Asymmetry of the cranial base as documented by any of the following: <ol style="list-style-type: none"> a. <i>Skull Base Asymmetry</i>: At least 6 mm right / left discrepancy measure subnasally to the tip of the tragus (cartilaginous projection of the auricle at the front of the ear); or b. <i>Cranial Vault Asymmetry</i>: At least a 8 mm right / left discrepancy, measured from the frontozygomatic point (identified by palpation of the suture line above the upper outer corner of the orbit) to the contralateral euryon, defined as the most lateral point on the head located in the parietal region; or c. <i>Asymmetry of the orbitotragial distances</i>, as documented by at least 4 mm right / left asymmetry measure from the lateral aspect of orbit to tip of ipsilateral tragus. 4. The custom molded orthotic is designed to fit a child's head from 2-4 months. A second helmet or band may be required if the asymmetry has not resolved or significantly improved after 2-4 months." <ul style="list-style-type: none"> ▪ Revised Item C from: "Use of an adjustable cranial orthosis for synostosis in the absence of cranial vault remodeling surgery and as treatment of brachycephaly is considered medically necessary."
	Updated Rationale section.
	In Coding section: <ul style="list-style-type: none"> ▪ Added ICD-10 Diagnosis codes. (<i>Effective October 1, 2014</i>)
	Updated Reference section.
07-08-2015	Updated Rationale section.
	Updated References section.
01-04-2017	Updated Description section.
	In Policy section: <ul style="list-style-type: none"> ▪ In Item C, added "Use of" to read, "Use of an adjustable cranial orthosis as a treatment of plagiocephaly or brachycephaly without synostosis is considered not medically necessary." ▪ In Policy Guidelines Item 2, removed "The following table presents normative values and the mean pretreatment asymmetries reported in large case series. These may be useful in determining if a significant variation from normal is present." and Table 1. ▪ Removed Policy Guidelines Item 3.
	Updated Rationale section.
	Updated References section.
09-28-2017	Updated Description section.
	Updated Rationale section.
	Updated References section.
01-01-2018	In Coding section: <ul style="list-style-type: none"> ▪ Deleted CPT code: 97762. ▪ Removed ICD-9 codes.
04-11-2018	Updated Description section.
	Updated Rationale section.
	Updated References section.

09-11-2019	<p>Updated Description section.</p> <p>In Policy section:</p> <ul style="list-style-type: none"> ▪ In Item C, removed “not” and added “when all of the following conditions have been met: 1. The patient is between 3 months and 18 months old. 2. Documented Failure of conservative therapy (repositioning and physical therapy) of at least 2 months’ duration. 3. The patient has a cephalic index that is at least 2 standard deviations above or below the mean for the appropriate gender and age.” to read, “Use of an adjustable cranial orthosis as a treatment of plagiocephaly or brachycephaly without synostosis is considered medically necessary when all of the following conditions have been met: 1. The patient is between 3 months and 18 months old. 2. Documented failure of conservative therapy (repositioning and physical therapy) of at least 2 months’ duration. 3. The patient has a cephalic index that is at least 2 standard deviations above or below the mean for the appropriate gender and age. ▪ Added new Item D, “Use of an adjustable cranial orthosis is considered not medically necessary for all other indications not outlined above.” ▪ In Policy Guidelines 2, added definitions for brachiocephaly, cranial base, cephalic index, cranial vault asymmetry, and plagiocephaly. ▪ In Policy Guidelines, added table PG1. Cephalic Index.
	Updated Rationale section.
	Updated References section.
05-05-2021	Updated Description section.
	Updated Rationale section.
	Updated References section.

REFERENCES

1. Persing JA. MOC-PS(SM) CME article: management considerations in the treatment of craniosynostosis. *Plast Reconstr Surg.* Apr 2008; 121(4 Suppl): 1-11. PMID 18379381
2. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Cranial Orthosis for Plagiocephaly without Synostosis. *TEC Assessments.* 1999;Volume 14:Tab 21.
3. Kaufman BA, Muszynski CA, Matthews A, et al. The circle of sagittal synostosis surgery. *Semin Pediatr Neurol.* Dec 2004; 11(4): 243-8. PMID 15828707
4. Stevens PM, Hollier LH, Stal S. Post-operative use of remoulding orthoses following cranial vault remodelling: a case series. *Prosthet Orthot Int.* Dec 2007; 31(4): 327-41. PMID 18050005
5. Jimenez DF, Barone CM, Cartwright CC, et al. Early management of craniosynostosis using endoscopic-assisted strip craniectomies and cranial orthotic molding therapy. *Pediatrics.* Jul 2002; 110(1 Pt 1): 97-104. PMID 12093953
6. Jimenez DF, Barone CM. Early treatment of anterior calvtimes craniosynostosis using endoscopic-assisted minimally invasive techniques. *Childs Nerv Syst.* Dec 2007; 23(12): 1411-9. PMID 17899128
7. Jimenez DF, Barone CM. Endoscopic technique for sagittal synostosis. *Childs Nerv Syst.* Sep 2012; 28(9): 1333-9. PMID 22872245
8. Jimenez DF, Barone CM. Multiple-suture nonsyndromic craniosynostosis: early and effective management using endoscopic techniques. *J Neurosurg Pediatr.* Mar 2010; 5(3): 223-31. PMID 20192637
9. Gociman B, Marengo J, Ying J, et al. Minimally invasive strip craniectomy for sagittal synostosis. *J Craniofac Surg.* May 2012; 23(3): 825-8. PMID 22565892
10. Honeycutt JH. Endoscopic-assisted craniosynostosis surgery. *Semin Plast Surg.* Aug 2014; 28(3): 144-9. PMID 25210508

11. Shah MN, Kane AA, Petersen JD, et al. Endoscopically assisted versus open repair of sagittal craniosynostosis: the St. Louis Children's Hospital experience. *J Neurosurg Pediatr.* Aug 2011; 8(2): 165-70. PMID 21806358
12. Chan JW, Stewart CL, Stalder MW, et al. Endoscope-assisted versus open repair of craniosynostosis: a comparison of perioperative cost and risk. *J Craniofac Surg.* Jan 2013; 24(1): 170-4. PMID 23348279
13. van Wijk RM, van Vlimmeren LA, Groothuis-Oudshoorn CG, et al. Helmet therapy in infants with positional skull deformation: randomised controlled trial. *BMJ.* May 01 2014; 348: g2741. PMID 24784879
14. McGarry A, Dixon MT, Greig RJ, et al. Head shape measurement standards and cranial orthoses in the treatment of infants with deformational plagiocephaly. *Dev Med Child Neurol.* Aug 2008; 50(8): 568-76. PMID 18754893
15. Mulliken JB, Vander Woude DL, Hansen M, et al. Analysis of posterior plagiocephaly: deformational versus synostotic. *Plast Reconstr Surg.* Feb 1999; 103(2): 371-80. PMID 9950521
16. Loveday BP, de Chalain TB. Active counterpositioning or orthotic device to treat positional plagiocephaly?. *J Craniofac Surg.* Jul 2001; 12(4): 308-13. PMID 11482615
17. Xia JJ, Kennedy KA, Teichgraeber JF, et al. Nonsurgical treatment of deformational plagiocephaly: a systematic review. *Arch Pediatr Adolesc Med.* Aug 2008; 162(8): 719-27. PMID 18678803
18. Graham JM, Gomez M, Halberg A, et al. Management of deformational plagiocephaly: repositioning versus orthotic therapy. *J Pediatr.* Feb 2005; 146(2): 258-62. PMID 15689920
19. Kluba S, Kraut W, Calgeer B, et al. Treatment of positional plagiocephaly--helmet or no helmet?. *J Craniomaxillofac Surg.* Jul 2014; 42(5): 683-8. PMID 24238984
20. Couture DE, Crantford JC, Somasundaram A, et al. Efficacy of passive helmet therapy for deformational plagiocephaly: report of 1050 cases. *Neurosurg Focus.* Oct 2013; 35(4): E4. PMID 24079783
21. Fowler EA, Becker DB, Pilgram TK, et al. Neurologic findings in infants with deformational plagiocephaly. *J Child Neurol.* Jul 2008; 23(7): 742-7. PMID 18344457
22. Panchal J, Amirshaybani H, Gurwitch R, et al. Neurodevelopment in children with single-suture craniosynostosis and plagiocephaly without synostosis. *Plast Reconstr Surg.* Nov 2001; 108(6): 1492-8; discussion 1499-500. PMID 11711916
23. Miller RI, Clarren SK. Long-term developmental outcomes in patients with deformational plagiocephaly. *Pediatrics.* Feb 2000; 105(2): E26. PMID 10654986
24. Shamji MF, Fric-Shamji EC, Merchant P, et al. Cosmetic and cognitive outcomes of positional plagiocephaly treatment. *Clin Invest Med.* Oct 06 2012; 35(5): E266. PMID 23043707
25. Tamber MS, Nikas D, Beier A, et al. The Role of Cranial Molding Orthosis (Helmet) Therapy. 2016; <https://www.cns.org/guidelines/browse-guidelines-detail/5-role-of-cranial-molding-orthosis-helmet-therapy>. Accessed January 28, 2021.
26. Tamber MS, Nikas D, Beier A, et al. Guidelines: Congress of Neurological Surgeons Systematic Review and Evidence-Based Guideline on the Role of Cranial Molding Orthosis (Helmet) Therapy for Patients With Positional Plagiocephaly. *Neurosurgery.* Nov 2016; 79(5): E632-E633. PMID 27759675
27. National Institute of Neurological Disorders and Stroke (NINDS). Craniosynostosis Information Page. 2017; <https://www.ninds.nih.gov/Disorders/All-Disorders/Craniosynostosis-Information-Page>. Accessed January 28, 2021.
28. Laughlin J, Luerssen TG, Dias MS, et al. Prevention and management of positional skull deformities in infants. *Pediatrics.* Dec 2011; 128(6): 1236-41. PMID 22123884

29. Persing J, James H, Swanson J, et al. Prevention and management of positional skull deformities in infants. American Academy of Pediatrics Committee on Practice and Ambulatory Medicine, Section on Plastic Surgery and Section on Neurological Surgery. Pediatrics. Jul 2003; 112(1 Pt 1): 199-202. PMID 12837890
30. AAP Publications Reaffirmed or Retired. Pediatrics Jul 2018, 142 (1) e20181297; DOI: 10.1542/peds.2018-1297
31. Moon RY, Moon RY, Darnall RA, et al. SIDS and other sleep-related infant deaths: expansion of recommendations for a safe infant sleeping environment. Pediatrics. Nov 2011; 128(5): 1030-9. PMID 22007004

Other References

1. Blue Cross and Blue Shield of Kansas Family Practice Liaison Committee, July 13, 2004; July 2012; July 2013; July 2014.
2. Blue Cross and Blue Shield of Kansas Pediatric Liaison Committee, July 28, 2004; July 2011; July 2013; July 2014.
3. Blue Cross and Blue Shield of Kansas Pediatric Liaison Committee, July 27, 2011.
4. Blue Cross and Blue Shield of Kansas Medical Consultant Review, May 2, 2011.
5. Blue Cross and Blue Shield of Kansas Family Practice Liaison Committee Consent Ballot, August 2011; August 2019.
6. Blue Cross and Blue Shield of Kansas Pediatric Liaison Committee Consent Ballot, August 2019.
7. Blue Cross and Blue Shield of Kansas National Consultant, Practicing Board Certified Plastic Surgeon (462), November 2012.