

CLINICAL REVIEW

Managing infants who cry excessively in the first few months of life

Pamela Douglas *general practitioner, clinical lead; adjunct senior lecturer*^{1,2}, Peter Hill *associate professor*³

¹Possums, Clinic for Unsettled Babies, UQ Healthcare, Annerley, QLD 4103, Australia; ²Discipline of General Practice, University of Queensland, Royal Brisbane and Women's Hospital, Herston, QLD 4029, Australia; ³School of Population Health, University of Queensland, Herston, QLD, Australia

Community cohort studies report that a fifth of parents say that their otherwise healthy baby has cry-fuss problems at two months of age.^{1,2} Excessive crying is usually a transient neurodevelopmental phenomenon, although it may herald problems that are more long term and serious. Various studies have found that it is often difficult for parents to access the help they need when they experience problem crying; that they resort to use of multiple health services, including of emergency departments; and that they receive conflicting advice.^{3, w1} We review evidence from heterogeneous studies across multiple health disciplines to provide a practical guide to the management of term infants who cry excessively in the first few months of life. Our review is aimed at paediatricians, general practitioners, community child health nurses, and midwives. Although definitions of infant crying vary considerably, for practical purposes we use the terms cry-fuss behaviour, excessive crying, colic, and unsettled infant behaviour interchangeably to refer to any crying behaviour that parents report as problematic in the first few months of life.⁴

What is normal and what is problem crying?

A recent meta-analysis of 24 studies of unselected populations with diary data concluded that cry-fuss behaviours vary greatly between babies, with a stable mean duration of 110-118 minutes total daily crying from birth for the first 6 weeks, which reduces to 72 minutes a day by 10-12 weeks.² Most babies have bouts of unsoothable crying in the first few months of life, but problem crying is usually reported as being more frequent and of longer duration.⁵ Healthy babies signal their need for a response from their care giver along a gradient of progressively intense cues, beginning with changed breathing patterns or colour fluctuations, to increasingly agitated postural and movement patterns and vocalisations, to the motor disorganisation of a full blown cry. Some infants learn to bypass pre-cry cues and are more susceptible to crying that is difficult to soothe. This may depend

on temperament, neurodevelopmental maturity, ability to adapt to the environment, or other unknown factors.⁵

Although two international consensus statements by expert committees agree that acid peptic gastro-oesophageal reflux disease is not a cause of cry-fuss problems in the first months of life,^{6, w4} many parents with crying babies still consider that cry-fuss problems are caused by "reflux," or that "colic" is always caused by gut pain.

Is problem crying in infancy related to adverse outcomes?

Five per cent of crying babies continue to be unsettled at 5 months of age according to longitudinal studies,^{1,7} although it isn't possible to predict which baby will continue with persistent crying beyond 3-4 months. Although most babies who cry excessively in the first 3 months have no long term adverse effects, excessive crying is not a trivial thing because it places families under measurable strain. In a study of 3259 families, 6% of parents retrospectively reported engaging in physically abusive behaviours towards their baby when he or she cried.⁸ A multicentre trial found that mothers who report colic or excessive infant crying have higher scores on the Edinburgh postnatal depression scale (EPDS), with increased odds of high scores at six months even if the crying is resolved.⁹ This supports the findings of earlier reports that linked cry-fuss behaviours with maternal perinatal anxiety and depression.^{w5} A prospective study of 700 mother-baby pairs found that a diagnosis of colic predicted shorter duration of breast feeding.¹⁰ A meta-analysis of 22 selected longitudinal studies found that babies with cry-fuss problems that persisted at 5 months of age were at increased risk of behavioural problems later in childhood.¹¹ The risk is greatest for infants who also have feeding or sleeping problems (or both) at 5 months, and in families who face adversity or have particular psychosocial risk factors; these associations make it difficult to establish cause and effect.¹²

Correspondence to: P Douglas pameladouglas@uq.edu.au

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Summary points

- Excessive crying in the first months of life is usually benign and self limiting, although in a minority of families it is linked with more long term and serious problems
- No routine investigations are needed for an afebrile child with no signs of illness on a thorough history and examination
- Cry-fuss behaviour is linked to feeding problems; assess babies for feeding difficulties as early as possible and refer to experts
- Assess mothers for psychosocial factors that may put the baby at risk of adverse outcomes; screen for perinatal anxiety and depression and refer as necessary
- Gastro-oesophageal reflux disease is not linked to excessive crying in the first months of life and proton pump inhibitors are not indicated
- Cue based care and even moderate levels of physical contact from birth are associated with reduced crying

Sources and selection criteria

We searched Medline, PubMed, and CINAHL for systematic reviews, clinical trials, and cohort studies and the Cochrane database for systematic reviews (from 1990 to June 2011). Multiple key index terms were used in search categories that covered the breadth of causes and interventions thought to be relevant. We used meta-narrative mapping, a method appropriate for the systematic review of a large and heterogeneous literature, to organise the evidence into the domains of medical conditions, maternal health, feeding management, sensory integration, and sleep management.^{w2} One of the authors (PD) also interviewed 24 experts in infant cry-fuss behaviour from the disciplines of paediatrics, general practice, perinatal psychiatry, midwifery, community child health, speech pathology, lactation, social work, psychology, occupational therapy, and physiotherapy.^{w3}

However, all these findings emphasise the importance of taking parents who report excessive infant crying seriously and trying to detect and treat any problems that may underlie the cry-fuss behaviour.^{13 14}

Which treatable factors may underlie infant cry-fuss behaviours?

When parents present with a baby who cries excessively, serious underlying medical conditions must be excluded.

Gastro-oesophageal reflux disease

According to expert consensus, gastro-oesophageal reflux disease is not a cause of excessive crying in the first months of life.^{6 w4} Proton pump inhibitors increase the baby's risk of infection and possibly of food allergies.^{15 16 w6} These drugs are not indicated for a baby whose only problem is excessive crying, even if the crying is associated with back arching and refusal to feed.^{w7 w8} Frequent vomiting is a normal phenomenon in young infants, peaking at 3-4 months of age, and parents can be reassured that—because of the buffering effect of milk—refluxate is pH neutral for two hours after a feed and does not cause discomfort.^{w9} Disease states that may cause excessive vomiting, such as pyloric stenosis, are uncommon.

Feeding problems

There is an important link between feeding difficulties and excessive crying. This was initially thought to be related to acid peptic gastro-oesophageal reflux disease, because observational studies that found an association between refusal to feed and excessive crying in infants in the first months of life interpreted both behaviours as symptoms of “reflux.”^{w10} However, experts now agree that refusal to feed and excessive crying are not related to gastro-oesophageal reflux disease. This highlights the association between feeding problems and excessive crying as well as the importance of dealing with feeding difficulties early. Inadequate management of breast feeding is an important confounder in research on crying babies.^{w11} Observational studies have shown an association between biological and psychosocial risk factors in mother-baby pairs and impaired mutual regulation of feeding that result in entrenched patterns of difficult feeding.¹⁷⁻¹⁹ Difficulties with breast feeding—such as problems of attachment and positioning, functional lactose overload, oral motor dysfunction, ankyloglossia, and sensory processing

problems—may put susceptible infants at risk of entrenched cry-fuss and aversive feeding behaviours.^{20 w12 w13} A multicentre study of 4427 neonates, who were born by caesarean, born preterm, or had birth or neonatal complications, showed that babies who still had crying and feeding problems at 5 months of age were more likely to have feeding and behavioural problems at 4-5 years of age.⁷ Many doctors, child health nurses, and midwives, including those with positive attitudes to breast feeding, are unaware of their knowledge deficits regarding the identification and management of feeding problems.^{21 22 w14}

Functional lactose overload

As a breast feed progresses and the volume of milk consumed by the baby decreases, the proportion of lipid in the feed rises. This creamier milk slows the baby's gut transit time and stimulates cholecystokinin to produce satiety. Functional lactose overload occurs when the breast feeds do not contain enough fat, resulting in rapid milk transit through the intestine. Undigested lactose then ferments in the colon, and the baby may have poor satiety, explosive or frothy stools, a tympanic abdomen, crying, and the desire to feed very often.²³ A randomised controlled trial of 77 infants at 5 weeks of age showed that those with colic had lower plasma cholecystokinin concentrations.²⁴ A randomised controlled trial of 302 breastfeeding mother-baby pairs that compared different breastfeeding techniques also found that functional lactose overload was significantly associated with infant crying.²⁵

Allergy

Cow's milk allergy, the most common paediatric food allergy, may be a contributory factor in infant cry-fuss behaviour, although further research is needed to determine the prevalence of this condition in babies who cry excessively.²⁶⁻²⁸ Currently, there is no convincing evidence that food allergies other than cow's milk allergy are implicated in cry-fuss behaviours in the first months of life. Although a randomised controlled trial of 107 breastfeeding infants with colic concluded that a low allergen maternal diet (in which dairy products, soy, wheat, nuts, and fish are eliminated) shortened the duration of crying, this study did not distinguish between the effects of cow's milk protein and other allergens.²⁹ Other studies supporting the claim that food allergies other than cow's milk allergy are associated with unsettled infant behaviour have been conducted in toddlers

and older children, and in not crying babies in the first months of life.³⁰

A randomised double blind placebo controlled trial of 46 fully breastfed crying infants between 2 and 16 weeks of age, whose mothers were on a cow's milk protein elimination diet, showed significant improvement in cry-fuss behaviours and healthier gut microbacteria when drops of the probiotic *Lactobacillus reuteri* DSM 17931 were administered daily, suggesting that some breastfed crying babies may have low grade inflammation of the gut.³¹ More research that takes into account the effects of appropriate feeding management on the low grade gut inflammation of functional lactose overload and also the bidirectional interactions between the infant brain, gut, and gut flora (such as the effect of sustained high levels of sympathetic nervous system reactivity) is needed before *L reuteri* can be considered to be robustly efficacious.^{w15}

Infection

Infection must be excluded in an unsettled infant. A retrospective study of 237 afebrile infants less than one year of age who presented to an emergency department because of unsoothable crying found that 5% had underlying illness, which was most commonly urinary tract infection.³² However, in the absence of other signs and symptoms of illness excessive crying should not prompt routine urinalysis in an afebrile baby under 3 months.³³

How to assess the crying baby

History

A thorough history will include a history of feeds and elimination patterns (box 1) and a history of any perinatal problems. Any history suggestive of pathology (for example, a report of blood in stool or vomit) should prompt appropriate referral. Regarding the pattern of crying, ask about timing and duration, triggers, and what strategies help to settle the baby (if any). Enquire about where the baby sleeps. Does the baby pull away or cry with touch or movement? If this occurs at the breast, it indicates feeding problems; less commonly, it may indicate sensory processing or vestibular problems. It is important to enquire about parental psychosocial risk factors, and to administer the EPDS, remembering that the score is a marker of risk that should not over-ride clinical judgment. Check that the parents understand what normal crying is and try to determine if they are having difficulty reading and responding to their baby's cues. Tactfully determine whether the parents ever feel at risk of harming the baby.

Physical examination

Assess vital signs, hydration, and subcutaneous fat to determine if feeding difficulties are having a clinically measurable effect. Check that the baby has been gaining at least an average of 125 g per week in the first 3 months. A thorough physical examination will exclude any system abnormalities. Note if the baby cries in response to movement or touch. Check for tongue tie. Poor eye contact and lack of interest in interaction with care givers are developmental red flags.

Investigations

Investigations should be guided by abnormalities noted on history and physical examination. Routine investigation of an otherwise healthy infant is not warranted.³²

Management strategies that may be effective in otherwise healthy babies

Advice on breast feeding

If a baby is demanding very frequent feeding, has signs of functional lactose overload, or has other feeding difficulties (box 1), mother and baby require prompt assessment by a feeding expert, preferably an international board certified lactation consultant if the mother is breast feeding (or a speech pathologist if she is not breast feeding). Once functional lactose overload has been properly managed, a baby cannot overfeed at the breast. Two well conducted randomised controlled trials in healthy babies and a Cochrane review of cue based versus scheduled feeding in premature infants conclude that frequent cue based breast feeding is more likely to succeed than scheduled three to four hourly feeds.^{w18-w20} Breasts have variable storage capacities, and babies have varying gastric capacities and metabolism. Each mother's breasts are trained by her infant's cue based suckling to meet the baby's unique and variable nutrient need. Most babies in the first weeks to months of life need eight to 12 feeds a day, with at least one breast feed between midnight and 6 am. Babies may sometimes seek cluster feeds, taking the breast every 30-60 minutes for a period, most commonly in the evening. Although infants who take frequent small breast feeds have the same daily overall intake as those who take infrequent large breast feeds, routinised three to four hourly feeds may cause inadequate breast stimulation and drainage. This can result in the production of an inadequate volume of milk and may contribute to cry-fuss behaviours.

A well conducted observational study compared three Western infant care approaches that differ in the amounts of physical contact parents offer and the way that they respond to infant cues. The study found that cue based care from birth, combined with on average 10 hours of physical contact (whether awake, feeding, or sleeping) in a 24 hour period, was associated with 50% less crying and fussing.³⁴ A meta-analysis of cross cultural prevalence of problematic infant crying seems to corroborate this.² It is difficult to distinguish between cues or cries that indicate tiredness, boredom, and hunger in young infants. We advise mothers of crying babies to respond in a relaxed manner to pre-cry cues with an offer of a feed, if breastfeeding, before the baby becomes distressed and difficult to soothe. If a baby has moved to full blown cries we advise calm holding or skin to skin contact until the baby has quietened enough to feed. A Cochrane review concluded that use of a pacifier does not interfere with prevalence or duration of breast feeding in mothers who are motivated to ensure breast feeding is successful.^{w21} If not breast feeding, cue based formula feeding enhances mother-infant bonding.¹⁸

Dealing with maternal mental health

Mothers of otherwise healthy infants should be reassured that infant crying is common and usually self limiting; that their baby may be predisposed to excessive crying as a result of temperament, neurodevelopment, or other unknown factors; and that they are not to blame. Randomised controlled trials have shown that instructing care givers to place a crying baby in a safe place and walk away if they feel at risk of harming the baby and to return when they feel in control again reduces the risk of child abuse.^{w22-w23} Postnatal anxiety and depression have been associated with decreased maternal responsivity to infant cues.^{w24-w26} Although it is not easy to establish the direction of causality for this association, it is good practice to refer a new mother who seems to be depressed or has a high EPDS score

Box 1 Taking a feeding history

The following may indicate poor milk intake in the first weeks of life:

- Fewer than six wet cloth nappies or four heavily wet disposable nappies daily
- Strong smelling dark coloured urine
- Fewer than three to four yellow curdy liquid stools a day if the baby is breast fed

If the mother is breast feeding, ask her following:

- Do you have breast or nipple problems?
- Do you have any trouble attaching the baby to the breast?
- Does the baby feed fewer than eight or more than 12 times in 24 hours?
- Does the baby regularly fall asleep or slip off the breast in the first 10 minutes of feeding?
- Does the baby regularly take longer than 30-40 minutes of active feeding (not including fussing, interacting, dozing)?
- Is there a clicking sound when the baby feeds?

Regardless of whether the mother is breast feeding or formula feeding, ask the following questions:

- Does the baby have increased breathing effort during or after feeds?
- Are there no audible swallowing sounds?
- Does the baby have difficulty sucking or wet or gurgly vocalisations during feeding?
- Does the baby refuse feeds?

If the answer is yes to any of these questions, refer for assessment by a feeding expert^{w16 w17}

to perinatal and infant mental health experts, who can support both maternal mental health and parent-infant interactions.^{w27}

Cow's milk allergy

Substitution of breast milk with formula is not indicated if the crying baby has signs of possible cow's milk allergy, including rashes, but the mother should try eliminating cow's milk from her own diet. Improvement in cry-fuss behaviours after a two week trial of eliminating cow's milk is diagnostic of cow's milk allergy. It may also be worth trying this strategy in babies without signs of cow's milk allergy if other approaches have failed to help. In babies who are not breast feeding, if the baby has signs of allergy or if other strategies have not helped, consider an extensively hydrolysed formula.^{w28 w29}

Advice about sleep

A recent analysis of data from two longitudinal studies found that infants who cry excessively at 5-6 weeks do not wake more often at night than other infants.³⁵ A large prospective study concluded that infants have very variable sleep needs. It found that in normal infants the average total sleeping time per 24 hours varied from nine to 19 hours at birth and from 12 to 21 hours at 2 months, with wide daily variations in each baby's total sleeping times.^{w30} An analysis of 26 selected infant sleep studies found that only 37% of healthy 3 month old infants regularly sleep 8 hours at night without disturbing their parents.^{w31} Co-sleeping and breast feeding are associated with more night waking from when the baby is 12 weeks of age,³⁴ although night waking associated with breast feeding does not equate with less total sleep for parents overall.^{w32} Once feeding problems have been dealt with and satiety assured, parents can be reassured that their crying baby's night waking is developmentally normal. Two randomised controlled trials found that parent delivery of a behavioural sleep intervention for babies in the first 3 months of life did not decrease crying.^{w33} ^{w34} The weight of evidence is strongly towards the positive effects of parent-infant reciprocity and co-sleeping (in the same room) rather than behavioural sleep management to soothe crying babies in the first few months of life. Problematic night waking in older infants is amenable to behavioural approaches.^{w35}

Sensory integration

Babies with cry-fuss problems who cry in response to touch, movement, or sound may have sensory over-responsivity. Such infants may need to be referred to a paediatric occupational therapist or physiotherapist.^{w13} However, inadequate sensory stimulation in preterm and term infants has been associated with neurodevelopmental problems,^{w36} so it is important to reinforce the idea that cue based care and physical contact from birth, even at moderate levels, is associated with more settled babies.^{2 34} Cochrane reviews concluded that early maternal skin to skin contact for healthy newborns reduces crying and improves interactions between mothers and babies,^{w37} and that there is weak evidence that massage therapy benefits unsettled infants under 6 months of age.^{w38} Other systematic reviews have found that chiropractic, craniosacral, nutritional, and other complementary medicine interventions do not reduce crying in infants,^{w39-w41} and that wrapping may help settle some babies, although satiety should be ensured and safe wrapping practices taught.^{w42} Parents should respond to pre-cry cues in a relaxed manner and offer their baby the diverse sensory stimulation that results from pursuing their own social life and activities, and also from the amount of physical contact that they find manageable. Parents could also try infant massage and safe wrapping if they wish.

Conclusion

The causes of infant cry-fuss behaviours are multifaceted. Difficulty in controlling for interacting and coevolving variables may explain why well conducted randomised controlled trials of high profile programmatic approaches like "The Period of Purple Crying" and "The Happiest Baby" seem not to help—and may even increase—parental stress and infant crying.^{w22 w43} We recommend early intervention with an individually tailored mother and family centred approach, after assessing for feeding difficulty and postnatal mental health problems and excluding underlying disease, including cow's milk allergy (box 2). There is a pressing need for the evaluation of such an approach.

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Box 2 Ten step guide for the clinician

- 1 Take a thorough history, including feeding and perinatal history; perform a thorough physical examination
- 2 Once satisfied that the baby has no serious underlying disease, reassure the parents that the problem is not their fault, that it will pass, and that there are some things that might help
- 3 Assess for feeding problems and refer to a feeding expert if indicated (an international board certified lactation consultant if breast feeding, a speech pathologist if not breast feeding)
- 4 Assess parents for psychosocial risk factors, administer the Edinburgh postnatal depression scale, and refer to a perinatal and infant mental health expert if indicated
- 5 Encourage the parents to experiment with relaxed cue based care, sleeping in the same room as the baby, physical contact that may include skin to skin contact, and offering the baby diverse sensory experiences during the day in a manner that they consider appropriate
- 6 If the baby has signs of cow's milk allergy or the above strategies prove unsuccessful, breastfeeding mothers may try eliminating dairy products from their diet for two weeks because this diagnoses or excludes infant cow's milk allergy. An unsettled baby who is not breast feeding may benefit from an extensively hydrolysed formula
- 7 Caregivers who feel at risk of harming a crying baby should put the baby in a safe place and walk away
- 8 Safe wrapping and infant massage may be helpful for some, but not all, mothers and babies
- 9 Refer parents to suitable education materials
- 10 Follow the case up regularly

Additional educational resources*Resources for healthcare professionals*

Stanford Newborn Nursery Professional Education (<http://newborns.stanford.edu/Breastfeeding/>)—Uses photographs, videos, and text to demonstrate the basics of lactation support, including the “ABC” of breast feeding, hand expression, safe storage of breast milk, how to maximise milk production during pumping, and frenotomy

Academy of Breastfeeding Medicine (www.bfmed.org)—Provides clinical protocols for management of common breastfeeding problems, including mastitis, engorgement, co-sleeping, use of antidepressants, and appropriate use of supplemental feeds

Email PIMH@health.qld.gov.au to receive a DVD training module on universal psychosocial screening after birth

SIDS and Kids (www.sidsandkids.org/safe-sleeping/)—Includes handouts on safe sleeping

Resources for parents

The Period of PURPLE Crying (www.purplecrying.info)—Website developed in association with the universal postnatal education programme of the same name that informs parents about infant cry-fuss behaviours and advises strategies in both text and video form

Zero to Three (www.zerotothree.org)—Includes an interactive baby brain map; a podcast about infant crying; and articles such as “Crying after being put down,” “Steps for soothing a fussy baby,” and “Wanting to be held all the time”

Mothers Matter (www.mothersmatter.co.nz)—Provide information for families about postnatal depression and related conditions; it also includes information about baby states and cues, managing infant crying, and coping with angry feelings towards the baby

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