Managing pain during the first year of life

Managing a child’s pain during the first year of life involves assessing pain intensity, implementing a treatment plan and evaluating the effectiveness of the treatment provided. This paper discusses the fact that infants feel as much pain as older children and investigates the consequences of not managing pain effectively. Ways of assessing pain during the first year of life and the pain-relieving interventions available are outlined.

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Definition of pain
In 1979, The International Association for the Study of Pain defined pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, described in terms of such damage. This definition highlights that pain is subjective and a complex and multi-faceted phenomenon. However, it falls short in relation to those unable to communicate verbally, including neonates and young children. Pain perception is an inherent part of life that appears early in development to serve as a signalling system for tissue damage. The signalling includes behavioural and physiological responses that are valid indicators of pain – behavioural responses which can be detected by observation and the physiological responses by measurement, such as blood pressure and pulse. The definition of the International Association for the Study of Pain has recently been amended to incorporate this aspect:

“The inability to communicate in no way negates the possibility that an individual is experiencing pain and is in need of appropriate pain relieving treatment.” (p.2)

Do infants feel as much pain as adults?
In the past, healthcare professionals often claimed that neonates feel as much pain as older children and adults in a similar situation. However, several papers have reviewed the evidence for such a belief, and shown it is false. Nociception is the detection of a noxious stimulus and the transmission of information from the periphery to the brain. Nociception does not involve evaluating or attributing meaning to the subjective experience called pain; neonates/infants can, therefore, experience pain even if they do not understand what it is they are feeling.

Incomplete nerve fibre myelination was also used as an argument that neonates were incapable of pain perception. However, it is now known that painful stimuli are transmitted by both myelinated and unmyelinated fibres. Incomplete myelination merely implies a slower conduction speed in the nerves, which is offset by the shorter distances the impulse has to travel.

Crying and altered facial responses indicate that infants experience distress. Neonatal responses to heel-prick were videotaped in one study by Franck in which it was demonstrated – immediate withdrawal of both legs followed by crying. The crying was often accompanied by vigorous motor activity involving facial grimacing and movement of all extremities. Owens suggested that:

“The burden of proof should be shifted to those who maintain that infants do not feel pain.” (p.215)

More recent studies confirm Owens’ suggestion and the findings of Franck’s study. Indeed the International Consensus Statement for the Prevention and Management of Pain in the Newborn states that, compared with older age groups, newborns may experience a greater sensitivity to pain and are more susceptible to the long-term effects of pain.

Neonates have repeatedly been shown to demonstrate behavioural responses to pain. Although it is not possible to ask...
neonates how much pain they are experiencing, one study demonstrated that behavioural cues indicative of an infant being in pain, decreased following the administration of analgesic drugs. Thus, an infant’s behavioural cues can provide an indication that they are in pain. Pain pathways (although immature) are present at birth and pain impulses are able to travel to and from the pain centres in the brain.

The effects of unrelieved pain

Painful experiences are part of life for every child and not being able to feel pain results in extensive damage to the body. However, unrelieved pain has a number of undesirable physical and psychological consequences which are summarised in TABLE 1. These demonstrate the importance of managing pain effectively.

- Rapid shallow breathing which can lead to alkalosis
- Inadequate expansion of lungs which can lead to bronchiectasis and atelectasis
- Inadequate cough which can lead to retention of secretions
- Increased heart rate and tissue ischaemia
- Patient will not move spontaneously and will not ambulate
- Increased fluid and electrolyte losses resulting in rapid respiration and increased perspiration and metabolic rate
- Increased risk of intracranial haemorrhage in neonates
- Psychological consequences, resulting in nightmares about pain and surgery – the patient will be less cooperative in the future and will have increased anxiety.
- May disrupt maternal bonding process

TABLE 1 Consequences of unrelieved pain.

Poor pain management in early life can affect children when older. One study examined the pain-related attitudes in two groups of children, aged 8-10 years. One of the groups (very low birthweight) had been exposed as neonates to painful procedures, whereas the other group had not. The two groups of children did not differ in their overall perceptions of pain intensity. However, the very low birthweight children rated medical pain intensity significantly higher than psychosocial pain, suggesting that their early experiences affected their later perceptions of pain. Further, in a separate study, boys who had been circumcised without anaesthesia as neonates, were observed to react significantly more intensely to vaccinations than uncircumcised boys. Effectively managing pain in children during the first year of life is, therefore, imperative.

Assessing pain during the first year of life

Knowing how much pain a child is experiencing is the first step to providing effective relief. Even with patients who can communicate about their pain, pain assessment is complex. With children who are unable to verbalise their pain, assessing pain is even more complicated. However, using a combination of behavioural and physiological indicators, it is possible to obtain a measure of a child’s pain.

Behavioural indicators of pain

Behavioural cues are a useful indicator of pain in children; some of the commoner behavioural cues are outlined in TABLE 2. There are no hard and fast rules about which behaviours indicate pain; a change from normal behaviour can indicate pain. Consulting parents about their child’s normal behaviour is therefore essential. However, because children’s pain behaviours are sometimes misleading, behavioural cues should be used in conjunction with other methods of pain assessment.

These behavioural cues may not be as apparent in the neonate. However, neonates do demonstrate behavioural pain cues. These include facial expression, cry, gross motor movement, and changes in behaviour (such as sleeping and eating patterns). The typical facial expressions of pain are:

- Bulging brows and forehead
- Eyes squeezed tightly closed
- Cheeks raised to form a nasolabial furrow
- Mouth opened and stretched – horizontally and vertically – so that it appears squared

TABLE 2 Behavioural indicators of pain in children.

Physiological signs used to assess pain are:

Table 3

<table>
<thead>
<tr>
<th>Observation</th>
<th>Change in observation</th>
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<tbody>
<tr>
<td>Heart rate</td>
<td>Increases when in pain (after an initial decrease)</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>There is conflicting evidence about whether this increases or decreases, but there is a significant shift from baseline</td>
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<tr>
<td>Blood pressure</td>
<td>Increases when a child is in acute pain</td>
</tr>
<tr>
<td>Oxygen saturation</td>
<td>Decreases when a child is in acute pain</td>
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</table>

TABLE 3 Physiological signs used to assess pain.
assessment tool to use with neonates/infants their gestational age and health status also need considering. An example of a tool used for preverbal children is the FLACC (TABLE 4). This has been validated for postoperative children aged 2 months to 7 years. The scores for each category are added together to give a rating of 0-10. Other pain assessment tools validated for use in this age group are listed in TABLE 5.

Pain-relieving interventions
Once a child's pain has been assessed a treatment plan should be devised. This will include the administration of analgesic drugs and the use of non-drug methods of pain relief.

Analgesic drugs
There are three types of analgesic drugs that can be used to treat pain in neonates and infants: non-opioids, weak opioids and strong opioids. The action of the different types of analgesic drugs are outlined in TABLE 6. The metabolism of neonates/infants differs from that of the older child and thus when prescribing and administering analgesic drugs, the pharmacokinetics and pharmodynamics of analgesic drugs in the neonate/infant need to be taken into account. Some examples of the factors that affect drug metabolism are:
- Gastric emptying is significantly slower in neonates and even slower in premature infants leading to delayed and/or incomplete absorption of some analgesic drugs.
- In infants brain and viscera constitute a greater proportion of body mass meaning that the passage of opioids into the brain is increased.

These are not reasons for not administering analgesic drugs to the neonate/infant. However, when administering analgesic drugs these factors must be considered and appropriate precautions taken. For example, if administering opioid analgesia, careful observations of the neonate/infant's respiratory function should be carried out.

Non-drug methods
There are several non-drug methods that can be used specifically with neonates/infants. These are outlined in TABLE 7.

Documentation
An important aspect of pain management is ensuring that pain intensity scores are documented. The pain-relieving interventions implemented and their effectiveness should also be recorded. Good documentation improves communication about the child's pain management and thus ensures a better continuity of care.

Conclusion
This paper has provided an overview of steps required to manage pain effectively during the first year of life. This includes assessing pain, using analgesic drugs and non-drug pain relieving methods. The importance of good documentation has also been emphasised. The United Nations Organisation, in its Declaration of the Rights of the Child, states that children should, in all circumstances, be among the first to receive protection and relief, and should be protected from all forms of
<table>
<thead>
<tr>
<th>Tool and reference</th>
<th>Validated</th>
<th>Indicators</th>
<th>Comments</th>
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</thead>
</table>
| **CHEOPS**^1,2^ (Children’s Hospital of Eastern Ontario Pain Scale) | Yes | Alertness, calmness/agitation, respiratory response, physical movement, blood pressure, heart rate, muscle tone, facial tension | Disadvantages:  
- Complicated behavioural scale  
- May not track pain well in 3-7 year olds as pain behaviour inhibited  
- 10 categories, 4 of which are similar  
- Confusing (high score = low pain)  
- Cannot be used in intubated or paralysed patients |
| **COMFORT**^6^ | Yes | Alertness, calmness/agitation, respiratory response, physical movement, blood pressure, heart rate, muscle tone, facial tension | Disadvantages:  
- Complicated  
- 8 categories and many sub-categories  
- Cannot be used in intubated or paralysed patients |
| **CRIES**^7^ (Crying, Requires O₂, for saturation above 95, Increased vital signs, Expression and Sleeplessness) | Yes | Cries, oxygen saturation, heart rate/blood pressure, expression, sleeplessness | Advantages:  
- Easy to remember and use  
- Valid and reliable down to 32 weeks' gestational age  
- Reliable between observers  
- Tracks pain and the effect of analgesics  
Disadvantages:  
- Uses oxygenation as a measure, which can be affected by many other factors  
- BP measurements may upset babies |
| **FLACC**^4^ | Yes | Face, Legs, Activity, Cry, Consolability |  
- Behavioural scale  
- Postoperative pain  
- 5 categories to score (0-2)  
- Easy to use in practice  
- Validated for postoperative children aged 2 months to 7 years |
| **LIDS**^2^ Liverpool Infant Distress Score | Yes | Spontaneous movements, spontaneous excitability, flexion of fingers and toes, facial expression, quantity of crying, sleep pattern and amount | Advantages:  
- Assesses postoperative pain  
- 0-5 point scale |
| **NFCS**^4^ Neonates | Yes | Bulging brows, eyes squeezed tightly shut, deepening of nasolabial furrow, open lips, mouth stretched, taut tongue | Anatomically based system for assessing facial expression |
| **NIPS**^9^ (Neonatal Infant Pain Scale) | Yes | Facial expression, cry, breathing patterns, arms, legs, state of arousal | Disadvantages:  
- Uses 6 categories, 2 of which are similar  
- Hard to remember  
- Cannot be used in intubated or paralysed patients |
| **OPS**^10^-^12^ (Objective Pain Scale) | Yes | Blood pressure, crying, movement, agitation, verbal evaluation/body language | Advantages:  
- Easy to use  
- 5 categories  
- Reliable between observers  
- Tracks pain and score decreases with analgesia  
Disadvantages:  
- BP measurements may upset neonates  
- Cannot use in intubated paralysed babies |
| **PIPP**^13^ (Premature Infant Pain Scale) | Yes | Gestational ages, behavioural state, heart rate, oxygen saturation, brow bulge, eye squeeze, nasolabial furrow | Advantages:  
- Each indicator evaluated on a 4 point scale  
- Total score dependent on infant's gestational age  
Disadvantages:  
- 7 indicator pain measures |
| **TPPPS**^14^ (The Toddler/Pre-Schooler Postoperative Pain Tool) | Yes | Verbal pain, complaint/cry, groan/moan/grunt, scream, open mouth squint, brow bulge, restless motor behaviour, rub/touch | Advantages:  
- Validated for postoperative children aged 1-5 years  
- Tracks pain relief and effects of analgesia  
- Correlates with nurse and parental pain assessments  
Disadvantages:  
- 7 categories to score |

**TABLE 5** Pain assessment tools for use with neonates (0-1 month) and infants and toddlers (1 month-3 years) (adapted from Royal College of Nursing, 2000^39^).
neglect, cruelty and exploitation. This can be applied to the management of pain, particularly as good practice guidelines are available. Although some postoperative discomfort is inevitable, children should not have to experience prolonged moderate to severe unrelieved pain. Not providing children of any age with satisfactory pain relief can be considered a violation of their human rights. Indeed, when the consequences of unrelieved pain are taken into account, managing children’s postoperative pain effectively can be seen as an ethical imperative.

References


<table>
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<tr>
<th>Factor</th>
<th>Description</th>
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<tbody>
<tr>
<td>Environmental factors</td>
<td>Managing environmental factors such as bright lights and reducing the volume of monitor alarms are effective ways of reducing and/or preventing pain in the neonate/infant Maintaining a normal sleep/wake cycle within the intensive care unit by dimming lights at night has also shown to promote well-being in the neonate/infant</td>
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<tr>
<td>Developmentally sensitive care</td>
<td>Positioning: Proper positioning affects a neonate/infant’s physiological and behavioral responses Care should be taken to position a neonate/infant as normally as possible despite the need to attach monitors, probes, etc. Containment/swaddling: Containment/swaddling increases an infant’s feelings of security and self-control and reduces stress Swaddling and a neonate/infant reduces the length of time taken for behavioural and physiological cues to return to normal following a painful procedure Non-nutritive sucking: There is an increasing body of research that demonstrates the pacifying effect of a dummy during painful procedures</td>
</tr>
<tr>
<td>Sucrose</td>
<td>The administration of sucrose with and without non-nutritive sucking (dummy) has been used to manage procedural pain in the neonate/infant A systematic review of the efficacy of sucrose suggests that it is a safe and effective method of reducing procedural pain Information about the optimum dose remains inconclusive</td>
</tr>
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</table>

TABLE 7 Non-drug methods of pain-relief for neonates/infants (adapted from Stevens, 1999(36))