The development of a respiratory assessment tool

**Patient-controlled analgesia uses an infusion pump to administer analgesia to the patient intravenously in small bolus doses. Administration of the doses is controlled by the patient up to a prescribed maximum dose (Pasero and McCaffrey, 1994). The use of PCA is increasing in hospitals, partly due to the range of reported benefits it has for patients (Thomas, 1993). It is particularly useful in the control of postoperative pain (Thomas, 1993), and avoids the need for other pain relief methods such as intramuscular injections.**

PCA has been shown to increase patients’ feelings of independence over their pain management (Thomas and Rose, 1993). It may also help to reduce anxiety in patients if they know they can administer analgesia as soon as they experience pain. However, there are potential problems associated with the administration of intravenous opioids by PCA and there is an identified need for skilled nursing observations.

**Effects of opioids** Opioids work at many sites in the body. However, it is their effects on the respiratory centre in the brainstem, and the chemoreceptors in the aorta and common carotid arteries that cause respiratory depression.

Effects on the brainstem include a decrease in respiratory drive. Opioids also decrease the sensitivity of the chemoreceptors to the partial pressure of carbon dioxide (pCO₂) which means that CO₂ in the blood does not stimulate an increase in respiratory rate. When CO₂ chemoreceptors are desensitised by opioids, the body must rely on the oxygen-driven respiration-regulating mechanism, which is less sensitive.

It must be noted that respiratory depression is a normal side-effect of opioid use and in most cases requires no medical intervention. It is standard practice to give patients prescribed supplementary oxygen therapy in the immediate postoperative period to correct hypoxaemia (low oxygen levels in the tissues). However, there still remains the potential for depression of respiratory function (Pasero and McCaffrey, 1994).

**Respiratory depression and PCA** Some authors have attributed problems of respiratory depression associated with PCA to the failure or system deprogramming of software that runs infusion pump devices (Notcutt and Morgan, 1990). Other possible contributory factors include misprogramming by staff, or patients tampering with the device (Denning, 1993). However, although errors may occur when using PCA equipment, it is the actual opioid, not the device, that causes respiratory depression (Williams, 1996).

**Incidence of respiratory depression** Little is known about the incidence of respiratory depression associated with opioids administered by PCA. However, anecdotal evidence is available. In a study of 5,759 patients who received PCA, 14 developed potentially life-threatening complications. Eleven of these involved respiratory depression and resulted in the administration of naloxone, which is used to reverse opioid-induced respiratory depression (Sidebotham et al, 1997). Whipple et al (1994) analysed the data of 4,669 patients receiving opioids via PCA pumps. From this sample, 294 possible overdoses were detected, of which 11 were thought to be clinically significant. Although the incidence of respiratory depression occurring in patients using PCA appears low, the risk, should respiratory depression occur, is potentially life-threatening and is, therefore, significant.

**Patients at risk of respiratory depression** There is an increased risk of respiratory depression associated with PCA occurring in patients who:

- are over the age of 65;
- have had intra-abdominal surgery;
- have received a bolus dose of opioids greater than 1mg morphine (Sidebotham et al, 1997);
- have compromised respiratory function – for example, patients with chronic obstructive pulmonary disease, or those who smoke.

Patients who use opioids on a regular basis build up a tolerance to the effects on respiratory function and so have a decreased risk of serious respiratory depression. However, patients who have not had opioids before do not have this adaptive tolerance, and so are at most risk of respiratory complications.

There are also postoperative risks associated with the sedative effects of anaesthetic drugs combined with the opioid drug, both of which contribute to hypoventilation (Dubose and Berde, 1997).

**Monitoring the patient using PCA** Notcutt and Morgan (1990) found frequent problems with PCA management due to the failure of staff to carry out basic monitoring of patients in the first two hours after surgery. Opioid-induced respiratory depression is characterised by a decrease in respiratory rate and tidal volume (the volume/depth of a breath), irregular or periodic breathing, and shallow respirations (Dubose and Berde, 1997). However, the literature includes several suggestions about the pattern in which they occur.

For example, Davis and Mathewson (1999) state that in most patients, respiratory rate initially slows. However, they note that in some patients shallow respirations may...
is commonly used as a threshold for the clinical determination of severe respiratory depression. Assessing the patient’s level of sedation is important, as there is a close relationship between sedation and respiratory insufficiency. If the patient is unrousable and drifts off to sleep during conversation, respiratory failure may be imminent (Pasero and McCaffrey, 1994).

Developing a respiratory assessment tool
Nurses have a professional duty to be aware of the dangers of opioid-induced respiratory depression and to take steps to prevent it occurring in their patients (NMC, 2002a).

It can be concluded from the evidence that effective assessment of respiratory function for people using opioids must include the monitoring of respiratory rate, tidal volume and sedation – the latter done by using an adequate sedation scoring system (Whitely et al, 1998).

Before giving the opioid analgesia, Pasero and McCaffrey (1994) recommend baseline data is collected to give a picture of the patient’s normal respiratory function against which further observations can be compared.

Identifying the need for an assessment tool
An audit of respiratory assessment on a gastrointestinal surgical ward showed evidence that inconsistencies existed in its practice and documentation, even though most of the patients had high risk factors for respiratory depression. It was felt that the implementation of an evidence-based assessment tool would provide the means to standardise and monitor practice. It would also help to ensure that the patients’ respiratory status was monitored appropriately to detect and prevent respiratory problems.

The assessment tool
Guidelines were developed, based on recommendations for safe monitoring identified in the literature (Fig 1). Assessment documentation was developed to enable the results of respiratory assessment to be recorded (Fig 2).

The recording of information is fundamental to nursing care (NMC, 2002b), enabling better communication and dissemination of information between professionals. It also helps them to plan treatment, monitor the patient’s condition and promote high standards of care.

Staff were told the purpose of the assessment document and how to use it. Parameters for normal and abnormal observations were provided. The document was included in patients’ preoperative theatre notes and the assessment tool became part of the standard documentation. This overcame the problem of nurses needing to find the form when the patient returned from theatre and also reminded nurses to use it.
The assessment tool was developed by fourth-year BSc nursing students during their final clinical placement.

Effectiveness of the assessment tool The initial aims of the assessment tool and documentation were to improve the assessment and monitoring of respiratory function of patients on PCA, and to reduce any inconsistencies in practice.

A repeat audit was carried out after implementation. Comparisons were made to assess any improvements in the standard of respiratory assessment of patients using PCA on the wards. The results indicated that the documentation of patients’ respirations per minute, oxygen saturations and sedation score – which all used to be recorded on the standard observation chart – had improved.

Although only a small improvement, it suggests an increase in awareness of the importance of respiratory assessment. Staff also started recording rate and depth of breathing – a new practice and a direct response to the implementation of the assessment tool.

Conclusion The use of a simple assessment tool increased awareness of the potential dangers of respiratory depression associated with PCA and resulted in an improvement in the recording of respiratory observations. By observing current practice, it was possible to identify where improvement should be made.

Although more experienced staff may be able to assess patients and detect problems of respiratory function at a glance, the more junior nurses or nursing students require guidelines to lead their practice (Benner, 1984).■

<table>
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**CODE**

- Resps per min: Number of respirations in one minute
- O₂ saturations: Pulse oximetry reading of oxygen saturation
- Depth: D=deep breathing S=shallow breathing ✔=regular X=irregular
- Breathing rate: ✔=regular

**REFERENCES**


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