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PATIENT CONTROLLED ANALGESIA

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ABSTRACT

Patient controlled analgesia (PCA) has been available for a number of years and is becoming an increasingly popular method of controlling pain. It is safe and effective, provided there is careful patient selection, adequate patient education, appropriate prescribing and patient monitoring. This technique is based on the use of a sophisticated microprocessor-controlled infusion pump delivers a preprogrammed dose of a drug. Patient Controlled Analgesia (PCA) pumps were developed to address the problem of undermedication. They are used to permit the patient to self-administer small doses of narcotics (usually Morphine, Dilaudid, Demerol, or Fentanyl) into the blood or spinal fluid at frequent intervals. PCA pumps are commonly used after surgery to provide a more effective method of pain control than periodic injections of narcotics. This method of pain control has been found to result in less pain and earlier discharge from the hospital. The present review discusses the PCA types, working of PCA pump, advantages, side effects and applications.

KEY WORDS: analgesia, PCA, patient -controlled, pain.

INTRODUCTION

PCA stands for Patient Controlled Analgesia[1], analgesia (an-el-GEEZ-ee-a) means "relief of pain.[2] Patient-controlled analgesia (PCA) is a delivery system in which patients self-administer predetermined doses of analgesic medication[3] to relieve their pain.[4] This technique is based on the use of a sophisticated microprocessor-controlled infusion pump delivers a preprogrammed dose of a drug[5] when the patient pushes a demand button.[6] Patient Controlled Analgesia or PCA is a form of pain relief controlled by the patient[7] which is electronically controlled relieves pain promptly and effectively, and saves nursing time.[8] The most common pain relief medicines used are morphine and fentanyl.[7] PCA is an effective tool in reducing pain [9]where patients can determine when and how much medication they receive regardless of analgesic technique.[5] It is becoming an increasingly popular method of controlling pain because of its safety, efficacy, careful selection of patients, adequate education of patients, appropriate prescribing and patient monitoring.[10] It is used to releive pain after surgery also.[2]

NEED FOR PCA

The patient is often the best person to judge when and how much pain they have and how much pain medicine they need to make them feel better. With the help of PCA, the pain medicine is given directly. By using the PCA, the patient or child take the medication without any discomfort.[7] Candidates for PCA should have the mental alertness and cognitive ability to manage their pain and communicate their pain level to their caregiver.[11]

THE PCA MACHINE

This technique is based on the use of a sophisticated microprocessor-controlled infusion pump.[12] Patient-controlled analgesia (PCA) involves a push-button device attached to a machine containing pain medication. When the button was pushed, it releases a small dose of pain medicine through IV route. A built-in timer is also set on the machine allows to set a limit on the number of medication doses that can be given to a patient, thus limiting the risk of an overdose. The dose as well as the lockout time can be adjusted according to the pain relief needs. The PCA machine is normally set up to deliver medication depending on patient response, other PCA options are also available. The best alternative is chosen by the anesthesiologist or acute pain service doctor if the patient is having problems with the previous medications.[13]

The features of PCA pump

- The Patient Controlled Analgesia pump (PCA) delivers a pain medication through IV route.
- The pump controls the amount of medication for relief of pain.
- Pain control helps the natural healing process, decreases anxiety and allows for easier movement and the patient can only feel the relief of pain.
- The PCA allows to adjust the medication of required dose according to patient needs.[14]

- If the pump is not working right, it will stop infusing and an alarm will sound.
- The PCA pump automatically records information about how often you wanted the medicine and how much you received. The nurse records this information so the doctor can make changes if needed.[1]
- The pump is programmed to give you an amount of pain medicine that is safe with a safe hourly limit and a safe time in between doses.[7] The diagram of PCA pump is shown in the following figure.[15]

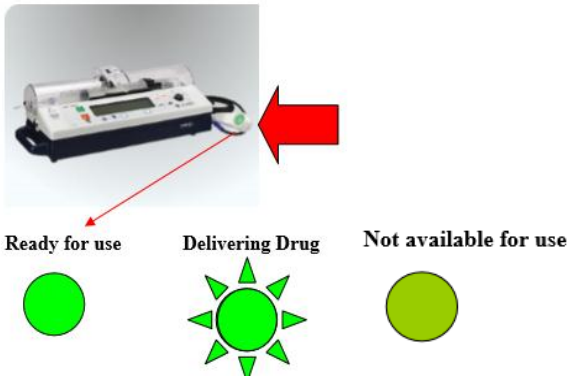

Diagram of PCA pump

MODES OF ADMINISTRATION

The two most common being:

• **Demand dosing** – a fixed dose which is self-administered, as required

• **Continuous infusion plus demand dosing** – i.e., a constant rate background infusion which can be supplemented by demand dosing.[10]

ADVANTAGES OF BALANCED PAIN MANAGEMENT

- Reduces the amount of pain after surgery
- Reduces the amount of analgesic actually needed
- Creates more alertness
- The patient may walk immediately
- The patient may take food immediately.
- The bowel and bladder function will return to normal
- Patients recover faster and leave the hospital sooner.

Common pain relievers used in combination to treat acute pain are

• Tylenol

• Non Steroidal Anti Inflammatory Drugs (NSAIDS) such as Celebrex or Naprosyn

• Opioid pain medications: Morphine, Codeine or Oxycodone

• Long lasting medications: Oxycontin.

SIDE EFFECTS OF PCA

- Nausea and vomiting[15]
- Itching
- Trouble urinating
- **Excessive sedation:** The medicine may cause sleepiness. The increased sleepiness interferes with normal daily activities (such as physical therapy, school, child life, etc.)
- **Respiratory depression:** This may occur along with excessive sedation.[1]

TYPES OF PCA

There are two kinds of PCA

1. Intravenous PCA- A small tube is put into the vein in arm and pain medicine is delivered to body through veins.

2. Epidural PCA- A small tube is put into back and pain medicine is delivered near the nerves in back.

1. Intravenous PCA

Intravenous (IV) means inside the vein. Medicine can be put into the vein in arm through a small needle or a plastic tube called a catheter. A PCA pump is connected to IV in the recovery room after surgery. When the button was pushed, the pump delivers the pain medicine through IV. A beep sound was produced when the button was pressed. In this way the pain medicine was received.

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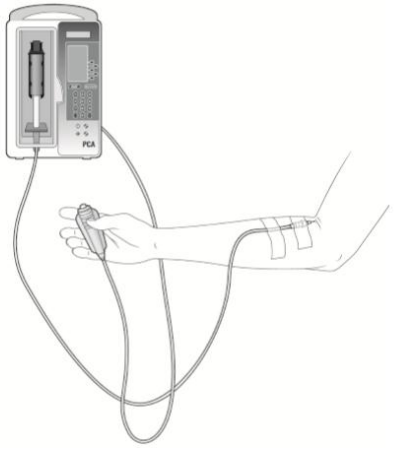
The diagram of intravenous analgesia is shown in the below figure.



Some side effects of intravenous PCA are

Nausea (wanting to throw up), vomiting (throw up), sleepiness, finding it hard to think clearly, slowed breathing, Itching, usually in several small areas on body, trouble emptying of bladder. A small tube is inserted to empty urine from the bladder after surgery.

2. Epidural PCA

An epidural is a small tube placed into back by a doctor. This is the same way that women are given pain medicine when they give birth. The epidural is usually put into back before surgery. To put in the tube, the patient has to lie on his side in a curled up position or sit up and hunch over a little. An anesthesiologist (the doctor who manages pain) will clean an area on back. Then, they will numb that spot and place a needle into back. The patient may feel a little discomfort or pressure when the needle is being placed into his back. A small tube is then placed through the needle. The doctor will remove the needle and tape the small tube to back. Medicine is given through the tube to relieve pain.

Working

A PCA pump is attached to the epidural tubing to give you pain medicine all the time. By pressing the button releases more pain medicine to relieve pain. The diagram of epidural analgesia pump is shown in the below figure.

Some side effects of epidural PCA are

Numbness around where you had your surgery, weakness or heaviness in legs, nausea or vomiting, sleepiness, slowed breathing, itching, having trouble emptying of bladder. Often patients have a small tube inserted to empty urine from their bladder after surgery. This tube will be removed once epidural tube is taken out from back, a mild drop in blood pressure, if blood pressure drops nauseous and dizziness was observed, backache. Very rarely, an epidural may cause problems that continue even after it is taken out. Some of these problems include:

-Weak feeling in your legs
-Unable to move your legs
-Seizures
-Heart attack.[16]

APPLICATIONS

1. PCA technique is used for a variety of pharmacologic agents usually considered under the categories of mild analgesics, non steroidal anti-inflammatory drugs (NSAIDS), opioid and non opioid analgesics and adjuvant agents.[12] These drugs are sometimes used in combination to produce synergistic effects.
2. Acute severe pain is treated with intermittent intravenous use of opioids.[17]
3. Post operative pain can be managed using several options in case of adults as well as children over 5 years of age.[18]
4. Patient-controlled analgesia with target-controlled infusion of Hydromorphone in postoperative pain therapy.[19]
5. Patient controlled analgesia is used in case of patients with advanced cancer.[20]
6. Patient-controlled analgesia (PCA) provides good postoperative analgesia. A mixture of morphine and droperidol reduced greatly the incidence of both nausea and vomiting.[21]
7. Use of Mepiridine in patient controlled analgesia and the development of normepiridine toxic reaction.[22]
8. Use of breath-activated patient controlled analgesia for acute pain management in a patient with quadriplegia.[23]
9. The term patient-controlled analgesia (PCA) covers a variety of techniques where patients self-administer analgesic drugs (e.g. Entonox in labour or oral analgesia postoperatively), the term is usually taken to refer to self administration of intravenous drugs.
10. The technique was developed initially for the relief of pain in labour using a simple mechanical arrangement where patients opened a clamp to self-administer a dilute solution of Meperidine.[24]
11. Patient controlled analgesia (PCA) pumps were developed to address the problem of undermedication.
12. PCA allows the patient to self-administer small doses of narcotics (usually Morphine, Dilaudid, Demerol, or Fentanyl) into the blood or spinal fluid at frequent intervals.
13. PCA pumps are commonly used after surgery to provide a more effective method of pain control than periodic injections of narcotics.
14. A PCEA (patient controlled epidural analgesia) pump delivers pain medication into the patient's epidural space. Dilaudid, Morphine, or Fentanyl is used along with a local anesthetic such as Bupivacaine or Ropivacaine.[25]

PATIENT EDUCATION

The written and verbal patient education includes the following elements.

- Definition of PCA and the patient's responsibility in managing pain.
- Clarification of the goal of pain management: not to completely eliminate pain, but to effectively control pain so the patient can engage in therapeutic activities.
- General pump operation and function of the PCA button.
- Safety features of the pump to prevent overdose, such as pump delay or lockout interval, limit on total dosage in a set time interval, and patient administered dosing.
- Prominent warning on dangers of PCA.
- Elements, purpose, and frequency of ongoing monitoring, so the patient understands and expects to be

awakened/to be monitored frequently to assess level of sedation.

 Description of when to alert the nurse: inadequate pain control.[9]

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