Patient Controlled Analgesia: More than twenty-five years in the making: Where are we now?

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Goals and Objectives

• Describe quality improvement models for PCA and the role of nursing and pharmacy in these models
• Discuss pain management in the acute care and ambulatory environment
• Integrate the management of risks associated with PCA use and adequacy of analgesia
• Identify the features of PCA technology that impact nursing workflow and methods for reducing errors

History of the PCA

"Not in the arm, doc...and yes...I'm afraid this one has to be a morpheme..."
Evolution of analgesic delivery

- IM to IV
- Medications used for analgesia
- Intermittent IV bolus by nursing
- Development of the delivery device
- First pumps in use

Pump technology development timeline

- 1963: IM to IV
- 1971: Demand Dropmaster
- 1974: Demanalg
- 1996: Cardif Palliator
- 2004: Alertia™ Medisys PCA module

PCA - In the beginning...

- Roe 1963 - small IV doses of opioids = increased efficacy
- Forrest 1970 – Demand Dropmaster
- Sechzer 1968, 1971 – RN administered doses on patient demand, then by pump
- Keeri Szanto 1974 – Demanalg pump
- “Cardiff Palliator” 1976 1st commercially available PCA pump – Welsh National School of Medicine
2nd wave of Technology
1984 PCA introduced for hospital setting
  - First self contained device allowing the patient to self administer their own pain medication
  - Automated settings allowed:
    • PCA dose from 0.1 to 5.0 ml in 0.1 ml increments
    • Loading dose options from 0.1 to 9.9 ml in 0.1 ml increments
    • Lockout intervals from 5 to 99 minutes in 1 minute increments
  - Used commercially available syringes that decreased compounding errors.

1st Generation PCA Devices
Harvard PCA
Abbott LifeCare
Cardiff Palliator
Prominject

2nd Generation PCA Devices
2nd wave of Technology

- Integration of bar code technology
  - Built into the pump or integrated with device
  - Ability to read vendor generated or custom barcodes
- Concept of combination therapy
  - Enhanced modes of delivery: Bolus Only and Continuous + bolus
- Increased drug and concentration options
- Transaction logs retained in device
- Chronological record of most recent events
  - Allows review at bedside of previous shifts administration

2nd wave of Technology

- Expanded capability to utilize pharmacy filled vials
  - Allowing pharmacy to use custom filled empty sterile vials
    - utilize manufacturer pre-filled vials (~18 months expiration)
  - Pre-filled vials with bar coded & color enhanced labels to aid in the readability of drug and drug concentrations
  - Ability to utilize dispensing cabinets

3rd wave of technology

Introduction of Safety Software with wireless/wired connectivity

- Rule Sets / Profiles
  - Hard / Soft dosing limits configurable for each medication
- Safety programming
  - Final Confirmation Screens
  - Ergonomic design for safer use
- Wireless functionality allows ease of data transfer from pumps
  - Infusion data at a glance
  - Alarms/Events
  - Asset tracking functionality
  - Validation of compliance with policy use
Shift control from provider to patient

- Prior to 1960’s; injectable pain medications given IM; morphine used for surgical anesthesia during Civil War with advent of the hypodermic needle
- Efficacy of small IV doses of pain medication proven in 1960’s
- Delicate balance of patient assessment & adequate analgesia; response to Nurse call; dose administration a challenge

Shift control from provider to patient

Advent of PCA technology allowed transition of control to the patient

- Enhanced Quality of Analgesia
- Benefits of Control
- Barriers to PCA
- Care givers barriers and biases

Pain Management with PCA

Acute Care Setting

- Acute Pain
- Surgical
- Non surgical
- Chronic Pain
- Cancer Pain
## Pain Management with PCA

### Special Populations
- Pediatrics
- Geriatrics
- Oncology

### Ambulatory Care
- Duration of use
- Type of delivery device
  - Disposable vs Non-disposable
- Evolving technology
  - Transdermal delivery systems

### Chronic Analgesia
- Multimodal therapies
Pain Management with PCA
Pharmacology – long acting opioids
• Morphine
• Hydromorphone
• Meperidine

Pain Management with PCA
Pharmacology – short acting opioids
• Fentanyl
• Remifentanil
• Sufentanil

Pain Management with PCA
Pharmacology – non opioids
• Nonsteroidal agents
• Anesthetics
• Other
Non-pain uses of PCA

- Antiemetics
- Supportive therapies

Assessment of the PCA patient

Adequacy of pain management
- Pain scales
- Patient Education
  - Pain reassessment
  - Response to inadequate treatment
    - Escalation of therapy

Assessment of the PCA patient

Side effects
- Respiratory Depression
  - Monitoring
  - Treatment
- Nausea/vomiting
  - Monitoring
  - Treatment
- Itching
- Delirium
Assessment of the PCA patient

Care of the complex patient
- Pediatrics
- Geriatrics

Assessment of the PCA patient

PCA surrogacy
- PCA relies on negative feedback loop
  - If too sleepy, can’t push the button
- Pediatrics
- ISMP assessment
- PCCU assessment

Assessment of the PCA patient

PCA surrogacy
- Adults
  - Lock out mode as a safety feature
Balance of treatment efficacy vs side effects
- Utilization of multimodal therapy
Assessment of the PCA patient
Utilization of multimodal therapy
• Management of the complex patient
  • Dosing
  • Delivery
    • Matching opioid demand to pump delivery capabilities

Multidisciplinary approach to pain management
• Purpose of gathering the team:
  – Explain the technology & pharmacology
  – Develop objectives
  – Plan enduring training for all caregivers
    • Orientation
    • Yearly competencies
    • Web-based or hands-on or both
    • Remediation

Implementation of smart pump technology
• Steering committee
• Interdisciplinary effort
  • RFI – functionality, integration, safety
  • Order Sets, CPOE
  • Drug library creation
    • Translation of order sets, drug information
Implementation of smart pump technology

Drug library creation
- Translation of order sets, drug information
- Linkage between drug files and bar codes
- Allowance for wild card settings
- Hard stops vs soft stops
- Lockouts

Implementation of smart pump technology

Drug library creation
- Definition of special populations
  - Adults
  - Pediatrics
  - Opioid naive
  - Opioid tolerant
  - Sickle Cell crisis
  - Crisis

Implementation of smart pump technology

Drug library creation
- Staff Training
  - Web tools
  - Hands on
  - Simulation
  - Enduring training
Monitoring of smart pump technology

Quality Improvement:
- Wireless functionality = data transfer
- Data to the pump
- Data from the pump
- Patient assessment = profile selected = dosing

Integration with clinical systems
- Closed loop with CPOE/Pharmacy
  - Automated initial programming
- Closed loop with Nursing documentation systems
  - Automated treatment programming based on assessment based on EBM algorithm

Conclusions
- Remember impacts of People, processes, and systems
- Structure to maintain communication
- Literature of pain management ever changing
- Focus on the patient and best treatment
References

References used in this presentation are available on a separate handout.
References

Beresford, L., Pain at the Pump: PCA offers patients greater control but can mean trouble for the inexperienced physician. The Hospitalist. 2007;11(9):36-38


quality of acute and cancer pain management. * Archives of Internal Medicine, * 165, 1574-1580.


Hutchison, Rob. Improving PCA Safety: matching the right products with safety practices. PP&P, Nov 2006; 18-23


Accessed July 11, 2009


Kwan, JW., High technology IV infusion devices. AJHP, 1991;48 S1:S36-S51


Lehmann, KA. Recent Developments in Patient-Controlled Analgesia. J Pain and Symptom Mgt, May 2005 29(5S)


Roe BB. Are postoperative narcotics necessary? Arch Surg 1963;87:912-5


Skryabina, EA., et al., Disposable infusion pumps. AJHP 2006;63:1260-1268


Vincente, K., Human factors researcher alarmed by deaths during PCA. www.apsf.org/resource center/newsletter/2000/fall/06OpinionFumanFactors.htm Accessed 7/7/09