*Clinical Note*

# Patient-Controlled Analgesia for Children at Home

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## Abstract

**Context.** Pain is a common and significant symptom experienced by children with advanced malignant disease. There is limited research on pain management of these children at home.

**Objectives.** To describe and review the indications for using patient-controlled analgesia (PCA) in the form of a Computerized Ambulatory Drug Delivery device (CADD®) in the home setting.

**Methods.** A retrospective chart review was conducted in children discharged home with opioid infusions using a CADD. Charts from January 2008 to February 2012 were surveyed.

**Results.** Thirty-seven CADDs were dispensed during the study period, and of these, 33 were prescribed for patients with cancer-related pain. A third of the CADDs were commenced at home and almost all PCA CADDs were used for end-of-life care. Hydromorphone was the most commonly prescribed opioid. Patients remained at home and pain control was achieved by either increasing the opioid dose or switching the opioid and using adjuvant therapy. Sixteen patients were readmitted to hospital from home and three admissions were related to pain. The median duration on a PCA CADD at home was 33.7 days (range, 1–150 days), and the mean morphine equivalent dose was 2.13 mg/kg/day.

**Conclusion.** PCA with a CADD can be used to manage pain in the home setting. Dose adjustments and opioid switches were performed with no adverse incidents. J Pain Symptom Manage 2015;■:■–■. 

***Key Words***
*PCA, CADD, palliative care, analgesia, cancer, morphine, hydromorphone, fentanyl, end-of-life care*

## Introduction

Pain is a major complaint in many pediatric palliative care patients and, in particular, children with cancer. More than 75% of children dying from cancer experience pain, with some children having suboptimal pain control.[1–4] Opioids are recommended to effectively manage severe pain and can be administered as an infusion in the form of patient-controlled analgesia (PCA). PCA is known to be an effective and safe modality, with children from the age of five able to self-administer "rescue" doses of analgesics for either breakthrough or incidental pain and have control over their pain management.[5–10] In children who are either too young or unable to use PCA, their parents can use PCA by proxy, which has been shown to be safe and with infrequent occurrence of complications.[5,7]

Children at the end of life treated with PCA are reported to have variable and increasing need of opioids.[8,11–13] Research also describes pain management during the end of life in some cases to be satisfactory in only 20% of patients and others report up to 95% satisfaction.[2–4,10,14] Portable PCA exists in the form of a computerized ambulatory drug device (CADD®) and there are few published reports, predominantly in adult patients, regarding CADD use in the outpatient setting.[10,15–18]

This study describes and reviews the indications for using PCA with a CADD in the home setting for pediatric palliative care patients during end-of-life care and in advanced disease.

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## Methods

A retrospective chart review of pediatric oncology patients discharged home with PCA in using a CADD device between January 2008 and February 2012 was conducted at the Children's Hospital at Westmead (CHW), Sydney. The patient population, indication and duration of PCA CADD use, opioid type, and dose used were reviewed. The audit was submitted and approved by the Sydney Children's Hospital Network (SCHN/CHW Quality Improvement Ethics Review Process. Ethics approval number: QIE-2012−08-10).

The CADD-Legacy® PCA Ambulatory Infusion Pump, Model 6300 was used. A 100 mL cassette is loaded with the opioid and attached securely to the device. The cassettes were ordered through the hospital's Pharmacy Department and supplied by Baxter Australia preloaded with the prescribed opioid. All dose alterations required a new prescription and supply. The CADDs were programmed with either a five-minute lockout time for children able to use the device for PCA or a 10-minute lockout time when the device was used by proxy for children who were unwell or unable to comprehend usage. A preset hourly maximum dose that could be delivered was set by the palliative care team. The CADDs begun in hospital were observed as per departmental policy using an age-appropriate pain scale. At home, the reported pain scores were documented using a verbal rating scale during the consultations with children capable of estimating their pain.

The record of patients dispensed CADD cassettes between January 2008 and February 2012 was obtained from the Pharmacy Department. The list was verified in the imaged medical records on Power Chart, a hospital multi-entity electronic medical record software program. The patient medical charts and electronic entries were reviewed. The data obtained were transferred onto a spread sheet file (Microsoft Excel 2010, Microsoft, Inc., Redmond, WA) after it was cross-checked. Opioid doses other than morphine were converted to intravenous morphine equivalent doses referenced to body weight.[19] Missing data were excluded.

## Results

### Study Patients

Thirty-seven PCA CADDs were dispensed in the study period, and of these 33 were prescribed to oncology patients. Patient demographics are summarized in Table 1.

*Table 1*
**Patient Demographics ($N = 33$)**

| | *n* | Percentage |
|---|---|---|
| Age (yrs), mean (range) | 10 (0.6−23) | |
| Sex | | |
| Male | 22 | 67 |
| Female | 11 | 33 |
| Cancer type | | |
| Neuroblastoma | 10 | 30 |
| Leukemia | 7 | 21 |
| Soft tissue tumors and sarcomas | 7 | 21 |
| Brain tumors | 5 | 15 |
| Bone tumors | 4 | 12 |
| Weight (kg), mean (range) | 20.45 (5−106) | |
| Place of residence | | |
| Metropolitan | 33 | 100 |
| Language | | |
| English-speaking background | 26 | 79 |
| Non-English-speaking background[a] | 7 | 21 |
| Place of death | | |
| Home | 16 | 50 |
| Hospital | 10 | 31 |
| Bear Cottage[b] | 6 | 19 |

[a]Non-English speaking background was defined as a person whose first language is not English or whose cultural background is derived from a non−English-speaking country.
[b]Bear Cottage is a Pediatric Inpatient Hospice, a unit of the Sydney Children's Hospital Network.

### Opioid Consumption

The total opioid consumption is illustrated in Fig. 1. The PCA CADDs were prescribed mostly for bone pain from metastatic disease in 61% of the patients, for severe abdominal pain in 14%, and for severe headache in 8%. The remainder was prescribed for end-of-life care or pain that was unspecified.

Approximately one-third of the patients required an opioid switch to effectively manage pain and in the presence of difficult side effects. Hydromorphone was prescribed in more than half of the children; the rest received fentanyl, morphine, or methadone. The treatment characteristics are listed in Table 2.

The side effects reported were itch, sedation, nausea, and urinary retention. Safety issues encountered were depleted batteries in two cases and a delivery problem as a result of the infusion line kinking.

Thirty-nine percent of PCA CADD infusions were commenced at home and the remainder in hospital a few days before discharge. These opioid infusions were continued until death in 97% of the patients.

## Discussion

Approximately 40% of children with progressive malignant disease referred to the Palliative Care Service at CHW each year will require opioid analgesia via a PCA CADD.

The indications for PCA CADD use at home include 1) an opioid is required for pain management or terminal dyspnea; 2) patient requires opioid therapy and the oral route is not tolerated; 3) family's desire to be or remain at home and the child has already commenced intravenous opioids in hospital; 4) inadequate analgesia using oral medications; and 5) incident or breakthrough pain inadequately treated with oral opioid analgesia.