

Can the cognitively impaired safely use patient-controlled analgesia?

Eugene Licht, MD
Eugenia L. Siegler, MD
M. Carrington Reid, MD, PhD

ABSTRACT

Although patient-controlled analgesia (PCA) is considered the standard in postoperative pain control, research examining PCA use among cognitively impaired older adults is lacking. The authors reviewed a case series of 10 adults aged 65 years and older admitted to the geriatrics or orthopedic services of an urban tertiary care center in New York City with acute pain and cognitive impairment or dementia who were administered PCA. Four patients from this cohort are presented in detail, demonstrating the challenges of PCA use in this population. A series of clinical pearls follows each case, outlining strategies for improving pain management. The authors' findings suggest that cognitive evaluations limited to alertness and orientation and failure to perform functional assessments may hinder the identification of patients who are poor candidates for PCA. Once PCA has been initiated, clinicians must regularly review device use and document cognitive function and pain score patterns to identify PCA underuse or misuse. Finally, rapid fluctuations in cognitive or functional status may require adoption of a more flexible pain management strategy. Despite these challenges, a subset of cognitively impaired older adults can successfully understand and operate PCA devices. Additional research is needed to (1) develop screening tools for identifying and monitoring older adults who may benefit from PCA and (2) create innovative approaches for improving pain management in the cognitively impaired.

Key words: patient-controlled analgesia, cognitively impaired, dementia, pain

INTRODUCTION

Over the past three decades, patient-controlled analgesia (PCA) has become the standard in postop-

erative pain control.¹ PCA devices enable patients to receive prompt pain relief, and allow practitioners to predetermine how much medication will be administered with each request. The devices have adjustable lockout intervals, and can be programmed to deliver a continuous infusion of medication through diverse routes.² By administering medication only when the patient is sufficiently alert and cognitively intact to push a button, they are also believed to reduce the chance of opioid-related complications.²

PCA's popularity derives from the premise that superior analgesia is best provided by patients themselves.² Indeed numerous studies have demonstrated PCA effectiveness and high patient satisfaction in nonelderly adults.^{1,3,4} There is also evidence that older adults are capable of using the device and are satisfied with the results.⁵ Despite its popularity, this method may not be suitable for all patients. Older adults now comprise the largest population of surgical patients⁶ and may be at particular risk for deleterious outcomes associated with PCA use. Contributing factors can include undiagnosed renal dysfunction, potentially deleterious drug–drug interactions, and undetected cognitive impairment. Although a number of authors have expressed caution regarding PCA use in this patient population, particularly those with dementia,⁷⁻¹⁰ there are no published studies regarding the use of PCAs among older hospitalized patients with cognitive impairment.

We therefore present several cases that highlight some of the obstacles associated with the use of PCAs among cognitively impaired inpatients. A series of clinical pearls follows each case, outlining suggestions for improving the care of these patients.

METHODS

We reviewed a total of 1,690 admission records for patients admitted to the geriatrics or orthopedic

services of an urban tertiary care center in New York City between September 30, 2006 and September 30, 2007. Our review targeted patients aged 65 and older who had either an established diagnosis of dementia or cognitive impairment, documented pain on admission, and were prescribed PCA while hospitalized. The presence of dementia or cognitive impairment was identified by means of initial physician, nursing, and social work assessments, or evidence of current dementia treatment at the time of admission. Pain intensity scores were abstracted when present. Ten cases that met the above inclusion criteria were identified. Of these, four were selected to illustrate clinical pitfalls that can occur in the care of these patients, and did occur in all 10 cases. The four cases are described in detail below.

RESULTS

Case 1

A 91-year-old woman with mild dementia (by clinical impression as no Mini-Mental State Examination [MMSE] was recorded in the chart) was admitted with a femoral neck fracture. She received 2 mg of intravenous morphine three times in the emergency department (ED). The patient underwent a percutaneous pinning procedure on Day 2 and was started on an intravenous PCA pump administering morphine 1 mg/mL in 2 mg demand doses, with a 10-minute lockout.

In the post-anesthesia care unit (PACU), the patient was evaluated for PCA use, was able to verbalize her understanding of pump operation, and demonstrated how to properly use the device. The initial pain service note documented that the patient was "A&O \times 3," while the medical consult attending added that she had a history of mild dementia, but was "quite functional." The patient accessed pain medication via the PCA on Day 2 and Day 3, with no obvious prolonged periods of pump inactivity (ie, lengthy stretches of time without opioid demands). There was no record of confusion, altered mental status, or frank delirium following PCA initiation. The PCA was discontinued on Day 3 after 19 hours of use. During this time, she pressed the demand button 13 times for 11 delivered doses, receiving a total of 22 mg of parenteral morphine equivalents. The patient was subsequently switched to acetaminophen/oxycodone one tab every 4

hours as needed, and requested six doses prior to her discharge to a skilled nursing facility on Day 5.

Clinical pearls. A diagnosis of cognitive impairment alone does not preclude PCA use. Appropriately selected patients can successfully understand and operate the device in the inpatient setting.

Case 2

A 90-year-old woman with moderate dementia (based on clinical impression, as no MMSE was recorded in the chart) was admitted with a femur fracture. She received 2 mg of intravenous morphine in the ED and was prescribed acetaminophen/oxycodone, one to two tabs as needed every 4 hours. The patient underwent trochanteric fixation nail surgery on Day 3 and was started on an epidural PCA pump administering 0.0625% bupivacaine and fentanyl 5 μ g/mL at a 3 mL/hour continuous rate, with 3 mL demand doses, and a 10-minute lockout. Two pain intensity scores were recorded prior to PCA initiation—one by a physician on Day 2 (7/10) and the other by nursing staff on Day 3 (8/10)—indicating significant pain.

The patient's initial pain consult note did not contain any formal cognitive evaluation. While in the PACU, a registered nurse explained the PCA to the patient, who "verbalized understanding and demonstrated [use of the device] appropriately." On Day 4, the orthopedic service examined the patient and reported that she had no complaints and was "doing well." The pain service evaluated the patient soon after and noted that she was "unaware of pain button until now," but following their visit had "adequate pain control with education on PCA." The physical therapist noted that the patient could not distinguish between the hospital and her apartment, reported a pain score of 5/10, and had not used the PCA pump because she still did not know what it was for. Following these visits and reminders, the patient was found to have pressed the button six times for three delivered doses by noon of Day 4. She did not press the demand button again until the early evening.

On Day 5, the orthopedic service examined the patient, and noted that she was without complaints and "doing well." The pain service noted that the patient was "A&O \times 3" and that her pain was well-controlled. No reevaluation was conducted to determine the patient's ability to use the PCA. A physical

therapist conducted a treatment session and documented that the patient reported not knowing how to use the PCA. Despite reeducation, the patient again told the physical therapist that no one had taught her how to use the PCA. The patient complained of 6/10 pain. The patient's PCA was discontinued that same day. On the day of PCA discontinuation, the patient pressed the demand button 19 times for nine doses. Over a 49-hour period of PCA use, she pressed the demand button a total of 39 times for 23 delivered doses, receiving 42 mg of parenteral morphine equivalents. Of note, following PCA discontinuation, the patient received four doses of acetaminophen/oxycodone—one tab for pain prior to discharge to a skilled nursing facility on Day 6. No pain scores were recorded following discontinuation of the PCA and no cognitive improvement was noted while on the acetaminophen/oxycodone.

Clinical pearls. Directing patients to execute a task, rather than simply asking if they comprehend how to perform it, may help to reveal cognitive impairments that often go undetected. Systematically reviewing ancillary team notes for such functional assessments can allow for detection of patient deficits that may interfere with appropriate PCA use and its effectiveness.

Reviewing patterns of PCA use may provide additional insight into a patient's ability to master the device. Active use during periods of interaction with the healthcare team, followed by long stretches of inactivity when not directly observed, may reflect impaired understanding of PCA purpose and operation.

Cognitively impaired patients can provide reliable pain scores, and these may be helpful in tracking PCA effectiveness. Medical record comments such as "no complaints" or "doing well" do not assess whether pain relief is adequate and have limited use in determining how pain changes over time.

Case 3

An 85-year-old woman with moderate dementia (based on medical record notes, as no MMSE was recorded in the chart) was admitted with hematemesis and a right ankle fracture. She received 4 mg of intravenous morphine twice in the ED and was prescribed acetaminophen, 650 mg by mouth as needed every 4 hours. The patient had a history of

atrial fibrillation and her international normalized ratio was supra-therapeutic due to coumadin use. She was given 10 mg of Vitamin K, but a complicated medical course delayed surgery until Day 7, when she underwent an open reduction and internal fixation procedure. Postoperatively, she was started on an intravenous PCA pump administering morphine 1 mg/mL in 2 mg demand doses, with a 10-minute lockout.

On Day 8, the orthopedic service noted that the patient was "without unusual complaints" but did not document a pain assessment, cognitive evaluation, or assessment of PCA use. The pain service noted that the patient evidenced adequate analgesia, but had limited range of motion in the right lower extremity secondary to pain. The patient was "A&O \times 3," but no assessment of cognitive function was noted and no assessment of ability to use PCA was documented. The physical therapist encouraged the patient to use the PCA, but the patient declined. The physical therapist further noted that the patient demonstrated decreased short-term memory and decreased insight regarding her deficits. On the same day, the nursing staff observed that the patient "require[d] frequent checks and reminders regarding PCA use." Subsequent notes did not address these difficulties and whether the patient was capable of using the device.

The patient's PCA was discontinued on Day 9 after she pressed the demand button 20 times for 18 delivered doses over 49 hours, yielding a total of 36 mg of morphine. The patient received 650 mg of acetaminophen on the day of PCA discontinuation and two more 650 mg doses on Day 13. She also received three tabs of acetaminophen/oxycodone on Day 10, one tab on Day 12 and two tabs on Day 14. A review of the patient's recorded pain scores revealed that she had similar pain levels both during PCA use and after its discontinuation. The patient was discharged to a skilled nursing facility on Day 15.

Clinical pearls. All older adults, including those without a known history of cognitive impairment, would likely benefit from formal cognitive assessments prior to PCA initiation. Any such assessment should include an evaluation of whether the patient can understand, demonstrate, and recall how to use the device.

Markedly decreased opioid requirements in the context of similar pain scores following PCA discontinuation may suggest that the patient's family or the

healthcare team is inadvertently encouraging a cognitively impaired patient to overuse the device by providing frequent reminders. It is important to determine whether the patient is not using the device because of cognitive impairment, absence of pain, or both. In either case, continued PCA use is not appropriate. Failure to appreciate that the PCA is not being used because of cognitive impairment can lead to misestimation of opioid requirements.

Case 4

A 72-year-old woman with moderate dementia (by clinical history) was admitted for a small bowel obstruction following recent abdominal surgery. The patient underwent exploratory laparotomy with lysis of adhesions and ileal resection on Day 3 and received one 6 mg and two 4 mg intravenous doses of morphine for pain prior to PCA placement. She was started on an intravenous PCA pump administering hydromorphone 20 mg/100 mL in 0.2 mg demand doses, with a 10-minute lockout. Her postoperative course was complicated by decreased urine output and rapid atrial fibrillation.

Prior to PCA placement, the patient was evaluated by the pain service who noted that “per primary service, dementia is mild and patient will be able to operate PCA.” There was no documentation of a cognitive evaluation by the primary or pain services. An episode of delirium was noted by the surgical service on Day 3, and was treated with reorientation, one-to-one observation, and antipsychotics. The pain service reevaluated the patient, documented that she was not using the PCA, and reported mild-to-moderate pain. They recommended optimizing the non-opioid medication regimen. Her PCA was continued.

The patient’s delirium persisted during Days 4 and 5 along with inconsistent PCA use. Her PCA was discontinued on Day 7. Over the 95 hours of PCA use, the patient pressed the demand button 44 times for 37 delivered doses, receiving a total of 37 mg of parenteral morphine equivalents. She was subsequently prescribed acetaminophen/oxycodone one to two tabs every 4 hours as needed for pain, and was discharged to home with services on Day 11.

Clinical pearls. If a decision is made to use PCA in a cognitively impaired patient, frequent monitoring of device use, patient’s pain levels, and their

clinical status is recommended. Episodes of delirium and confusion should prompt reevaluation of device use and consideration of PCA discontinuation. If PCA is to be discontinued, the rationale should be documented and an effective replacement implemented. Given the importance of satisfactory pain management in preventing perioperative complications, adequate daily documentation of a patient’s continued PCA use should become routine.

In a cognitively impaired patient who encounters difficulty with PCA use, alternative pain management regimens should be implemented promptly. The decision to pursue a “standing” versus an “as needed” regimen should be tailored to the needs of the individual patient and frequently reassessed following its implementation.

DISCUSSION

These cases illustrate several challenges that clinicians face when attempting to manage pain via PCA devices in hospitalized patients with cognitive impairment. The initial challenge involves making a determination as to whether the patient will be able to use the device appropriately. Reviews on the topic of PCA in the elderly state that older patients should understand how and be able to use PCAs prior to writing orders for this device, but do not recommend specific assessment strategies for ensuring that these important criteria are met.^{7,11} On the basis of our clinical experience, cognitively impaired patients should undergo a formal cognitive assessment that extends beyond assessing their level of alertness and/or orientation. Given the high rates of undetected cognitive impairment among hospitalized elders,^{12,13} and that impaired cognition is a risk factor for poor outcomes both during and after hospitalization,^{12,13} all older hospitalized patients should be screened for cognitive functioning, irrespective of a cognitive impairment/dementia diagnosis on admission. Many screening tools are currently available.¹⁴ The MMSE is by far the most commonly administered tool.¹⁵ The MMSE has been criticized for its length (8 minutes to complete the 30-point assessment) and its language and cultural limitations. A popular alternative is the 3-minute “Mini-Cog” exam, which combines the clock drawing and the three-item recall tasks.¹⁶ The Mini-Cog is also easy to score: the screening test is positive for possible cognitive impairment when the patient fails to recall all three words or draws an abnormal clock

and recalls only one or two words. For hospitals that have geriatric consultative services, cognitive and functional assessments can be conducted by this team, which can help to identify and manage other common geriatric conditions (eg, gait disturbance, polypharmacy) that have been associated with poor hospital outcomes.

Documenting whether the patient can comprehend, demonstrate, and recall how to use a PCA device correctly is also strongly recommended. Requiring a patient to demonstrate a task, rather than to simply explain (or report that they understand) the process, can help uncover undetected deficits. These functional assessments are routinely performed by physical therapists; not surprisingly, in our review, these practitioners frequently exposed previously undetected cognitive deficits. The importance of the ancillary team in the management of these patients cannot be overstated. Primary clinicians are therefore strongly encouraged to survey the notes of fellow healthcare providers participating in the care of their older patients.

Assessing whether the PCA is being appropriately used constitutes the second challenge. Evidence that patients are using the device in no way guarantees that they are operating it correctly. For instance, in Case 2, the patient was much more likely to press the demand button in the presence of hospital staff, but ceased using the PCA when left alone. Such clinically important observations are easily missed unless *patterns* of PCA use are carefully scrutinized.

Similarly, the finding that certain patients require less opioid following PCA discontinuation despite similar pain scores (as found in Case 3), may indicate that healthcare providers are inadvertently facilitating unnecessary use of the device. In a well-intentioned effort to encourage a cognitively impaired patient to use the PCA, the hospital staff may provide frequent reminders that lead to device overuse and opioid delivery beyond what is required for adequate pain relief, thereby increasing risk for untoward side effects. Additionally, although we found no evidence in these cases of other individuals (family members or healthcare providers) pressing the PCA button on behalf of the patient, this remains a significant concern.

Effectively examining a patient's experience with PCA and identifying suspicious patterns of use require that physicians document formal pain assessments in the medical record. Unfortunately, virtually none of the patients in our review had

adequately documented pain assessments. When pain was assessed using a standard numeric rating scale, these cognitively impaired patients were usually able to provide pain scores, a finding that has been supported by recent literature.¹⁵⁻¹⁹ On the basis of these observations, quantitative pain scores should be sought with each patient interaction, as they are particularly helpful in tracking PCA effectiveness over time.

The third challenge involves the timing of PCA discontinuation. PCA use in this population requires continual reassessment and documentation of its effectiveness. Cognitively impaired patients are at particular risk for delirium^{20,21} and any changes in mental status demand prompt attention. If difficulties with PCA are noted, an alternate means of pain management should be considered. Once the decision to discontinue PCA is made, the primary team must choose between a "standing" versus an "as needed" regimen. Some authors suggest that a standing regimen with the ability to refuse doses may be more appropriate for cognitively impaired patients.^{9,22} However, the appropriate choice is highly patient specific and should be frequently reassessed.

Our findings provide preliminary evidence for the need to develop and implement evidence-based approaches to screen older adults who may be candidates for PCA use, as well as develop and test tools to monitor patients prescribed opioids using this approach. Research reexamining the growing popularity of PCA as a means of pain control is also needed. Meta-analyses investigating PCA effectiveness, when compared with conventional opioid treatment, have found less than a 10-point pain score decrease out of 100 possible points,^{1,3} a difference that may not be clinically significant.

One of the most impressively consistent benefits of PCA use has been patient satisfaction with the device.^{1,3,4} Some authors have noted, however, that the relatively small decrease in pain scores with PCA, combined with the high patient preference for the device, suggests that the underlying cause may be a sense of increased autonomy rather than simply improved analgesia.¹ Without additional inquiry, it remains unclear to what extent older, cognitively impaired patients appreciate and benefit from such subtle factors.

This case series highlights the need for future research focused on improving pain control in cognitively impaired patients. Poorly managed

postoperative pain interferes with physical therapy and ambulation, thereby slowing recovery and increasing length of stay.⁷ In addition, the level of pain and the method of pain management have a large impact on the development of postoperative delirium.^{22,23} It is likely that advancing age, cognitive impairment, and poor pain control all interact to increase the risk of this deleterious outcome.²⁰⁻²³ Delirium not only interferes with PCA use, but also serves as a particularly poor prognostic sign. Considering the 22-76% mortality rate in hospitalized patients with delirium, as well as the 35-40% 1-year mortality, the consequences of poorly managed postoperative pain are quite substantial.²¹⁻²³

In conclusion, PCA can be used successfully in cognitively impaired older adults. Numerous challenges remain, however, and additional research can improve the management of pain in this particularly vulnerable population.

Eugene Licht, MD, Department of Medicine, Weill Cornell Medical College, New York, New York.

Eugenia L. Siegler, MD, Division of Geriatrics and Gerontology, Weill Cornell Medical College, New York, New York.

M. Carrington Reid, MD, PhD, Division of Geriatrics and Gerontology, Weill Cornell Medical College, New York, New York.

ACKNOWLEDGMENTS

The authors thank Dr. Sonal Mehta for all of her assistance in the preparation of this manuscript. This work was supported by grants from the John A. Hartford Foundation (a Hartford Center of Excellence in Geriatric Medicine Award) and the National Institute on Aging (An Edward R. Royball Center for Research on Translational Aging Research Award (P30 AG22845-02). None of the authors have any commercial associations or financial interests with any entities/organizations that would create a conflict of interest with the findings presented in this article.

REFERENCES

- Hudcova J, McNicol ED, Quah CS, et al.: Patient controlled opioid analgesia versus conventional opioid analgesia for postoperative pain. *Cochrane Database Syst Rev.* 2006; (4): CD003348.
- Grass JA: Patient-controlled analgesia. *Anesth Analg.* 2005; 101(5 Suppl): S44-S61.
- Ballantyne JC, Carr DB, Chalmers TC, et al.: Postoperative patient-controlled analgesia: Meta-analyses of initial randomized control trials. *J Clin Anesth.* 1993; 5(3): 182-193.
- Walder B, Schafer M, Henzi I, et al.: Efficacy and safety of patient-controlled opioid analgesia for acute postoperative pain. *Acta Anaesthesiol Scand.* 2001; 45(7): 795-804.
- Gagliese L, Jackson M, Ritvo P, et al.: Age is not an impediment to effective use of patient-controlled analgesia by surgical patients. *Anesthesiology.* 2000; 93(3): 601-610.
- Hernandez AF, Newby LK, O'Connor CM: Preoperative evaluation for major noncardiac surgery. *Arch Intern Med.* 2004; 164(16): 1729-1736.
- Pasero C, McCaffery M: Orthopaedic postoperative pain management. *J Perianesth Nurs.* 2007; 22(3): 160-172.
- Lavand'Homme P, De Kock M: Practical guidelines on the postoperative use of patient-controlled analgesia in the elderly. *Drugs Aging.* 1998; 13(1): 9-16.
- Robinson S, Vollmer C, Jirka H, et al.: Aging and delirium: Too much or too little pain medication? *Pain Manag Nurs.* 2008; 9(2): 66-72.
- Keita H, Geachan N, Dahmani S, et al.: Comparison between patient-controlled analgesia and subcutaneous morphine in elderly patients after total hip replacement. *Br J Anaesth.* 2003; 90(1): 53-57.
- Aubrun F, Marmion F: The elderly patient and postoperative pain treatment. *Best Prac and Res Clin Anaesthesiol.* 2007; 21(1): 109-27.
- Sabine J, Wietlisbach V, Bula CJ: Cognitive impairment in elderly medical inpatients: Detection and associated six-month outcomes. *Am J Geriatr Psychiatry.* 2004; 12(6): 639-647.
- Sands LP, Yaffe K, Covinsky K, et al.: Cognitive screening predicts magnitude of functional recovery from admission to 3 months after discharge in hospitalized elders. *J Gerontol Med Sci.* 2003; 58A(1): 37-45.
- Woodford HJ, George J: Cognitive assessment in the elderly: A review of clinical methods. *QJM.* 2007; 100(8): 469-484.
- Folstein MF, Folstein SE: Mini-mental state. A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975; 12: 189-98.
- Borson S, Scanlan J, Brush M, et al.: The mini-cog: A cognitive 'vital signs' measure for dementia screening in multi-lingual elderly. *Int J Geriatr Psychiatry.* 2000; 15(11): 1021-1027.
- Huffman JC, Kunik ME: Assessment and understanding of pain in patients with dementia. *Gerontologist.* 2000; 40(5): 574-581.
- Pautex S, Herrmann F, Le Lous P, et al.: Feasibility and reliability of four pain self-assessment scales and correlation with an observational rating scale in hospitalized elderly demented patients. *J Gerontol A Biol Sci Med Sci.* 2005; 60(4): 524-529.
- Pautex S, Michon A, Guedira M, et al.: Pain in severe dementia: Self-assessment or observational scales? *J Am Geriatr Soc.* 2006; 54(7): 1040-1045.
- Gleason OC: Delirium. *Am Fam Physician.* 2003; 67(5): 1027-1034.
- Inouye SK: Delirium in older persons. *N Engl J Med.* 2006; 354(11): 1157-1165.
- Vaurio LE, Sands LP, Wang Y, et al.: Postoperative delirium: the importance of pain and pain management. *Anesth Analg.* 2006; 102(4): 1267-1273.
- Morrison RS, Magaziner J, Gilbert M, et al.: Relationship between pain and opioid analgesics on the development of delirium following hip fracture. *J Gerontol A Biol Sci Med Sci.* 2003; 58(1): 76-81.