

# Pain Management Issues for the Geriatric Surgical Patient



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## KEYWORDS

- Physiology of aging • Opioid risks • Postoperative delirium • Respiratory depression
- Multimodal analgesia • Pain measurement in older adults • Regional anesthesia

## KEY POINTS

- The geriatric patient population is the fastest growing segment of society. Members of this group routinely undergo complicated surgical procedures with high levels of postoperative pain that require aggressive treatment.
- Because of complex comorbidities, older patients more commonly have adverse events related to pain therapy and complications related to inadequately treated pain.
- Opioids can be safely used in older adults by reducing dosage and being aware of the unique physiology of the older geriatric patient.
- Certain opioids and nonopioid adjuvants are inappropriate in geriatric patients.
- Careful selection of multimodal agents and use of regional and neuraxial anesthetic techniques can improve postoperative outcomes and reduce opioid-related complications.

The alleviation of pain in the perioperative period has generally been an unattained goal over the last half century since postoperative analgesia began to be studied.<sup>1</sup> However accurate this statement holds across the spectrum of age, it is a proven fact that uncontrolled pain is even more common in older adults, particularly those with cognitive impairment.<sup>2,3</sup> Inadequate analgesia contributes to several adverse postoperative outcomes:

- Cardiopulmonary morbidity
- Longer hospitalization
- Lengthier rehabilitation
- Frequent readmissions
- Development of chronic pain syndromes

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These factors take on even more serious meaning when applied to the aged patient with multiple comorbidities who is already at increased risk for nosocomial complications (eg, delirium), or who has preexisting functional limitations or problems with chronic pain.<sup>4</sup> For older patients, successful control of pain can significantly alter the postoperative course in a truly positive way.

Uncontrolled pain is the greatest fear of hospitalized patients, be they surgical or nonsurgical.

- The United States geriatric population is growing at an unprecedented rate, with 10,000 individuals reaching the age of 65 every day.
- This population surge mirrors an upward trend over the last decade of increasing numbers of hospitalized geriatric patients.
- In 2007, adults 65 and older comprised only 13% of the United States population but represented 43% of all inpatient hospital days.<sup>5</sup>
- By 2030, the population older than 65 will be 20%.

Common surgical procedures for older adults include elective surgeries such as joint replacements, emergent orthopedic procedures such as fall-related fractures, and surgeries for cancer. All of these are associated with high levels of postoperative pain. As greater numbers of older patients present for complicated surgery over the next decades, anesthesiologists must be prepared to treat pain with ready cognizance of the physiologic changes and comorbidities that are common in the elderly. All those caring for older patients must also be familiar with the safe and appropriate use of analgesic modalities, both pharmacologic and interventional, in the unique context of the older patient.

Given the aging population and increasing number of patients undergoing surgery, all anesthesiologists must be capable of providing expert-level pain treatment for geriatric patients.

## RISKS OF PAIN TREATMENT

Older adults are at higher risk for adverse side effects from analgesic treatment in comparison with younger patients, for a variety of reasons.<sup>6</sup> Major areas of risk are listed in [Table 1](#). The prevalence of chronic illness and end-organ dysfunction is higher in older adults, but decline in routine organ function is a more specific explanation for increased sensitivity to drugs in the aged. Older adults in the United States take, on average, 5 prescription medications daily; the risk of adverse drug reaction when taking 5 or more is 50%. Pharmacokinetics are altered in a way that predisposes the older adult to drug toxicity. Frail adults are at increased risk not only for side effects and toxicity but also major morbidity and mortality from the complications of analgesics and interventions.

The aged patient with cognitive impairment is at greater risk than cognitively intact patients for undertreatment of pain.<sup>7</sup> Laboratory studies indicate that individuals with cognitive impairment maintain normal pain perception thresholds.<sup>8</sup> Nevertheless, altered central processing of pain stimuli at the cortical level where neurodegenerative deterioration is present alters the way in which pain is expressed by the patient; this is particularly true of the affective component of pain. Because affect and pain behavior strongly influence the clinician's perception of pain, it is easy to understand how significant pain in the cognitively impaired patient could be underappreciated. The type of pain with which a patient presents may also harbor bias toward undertreatment.<sup>9</sup>

**Table 1**  
Major categories of risk for pain therapies in older adults

Risk Category	Mechanism	Example
Decline in organ function	Age-related decline in organ blood flow; slowing of CNS function	Altered metabolism and clearance, especially renally excreted drugs with active metabolites, eg, morphine
Polypharmacy	Higher prevalence of multiple comorbidities	Acute kidney injury, NSAIDs + ACE inhibitors
Pharmacokinetics	Loss of muscle mass; increased adipose. Altered volumes of drug distribution	Lengthened half-life of lipophilic drugs, eg, fentanyl
Drug sensitivity	Decline in cortical mass, decreased drug receptor populations	Delirium related to anticholinergic drugs, eg, meperidine
Frailty	Decline in physiologic reserve to respond to severe complications	Increased mortality from a fall caused by overmedication with opioids

*Abbreviations:* ACE, angiotensin-converting enzyme; CNS, central nervous system; NSAID, nonsteroidal anti-inflammatory drug.

## MEASUREMENT OF PAIN

Appropriate assessment of pain always begins with a complete history and physical examination. Observation of pain behaviors by family members and caretakers provides a useful perspective, but the patient's self-reported pain score provides the most important information. Several well-known pain scoring tools have been validated for use in patients at all stages of cognitive decline (Table 2). As cognitive impairment worsens, the assessment of the patient's pain by family and caregivers takes on greater importance.

## PHYSIOLOGIC CHANGES IN THE OLDER ADULT

Reduced cardiac output and organ blood flow underlie the pharmacokinetic changes that accompany normal aging. Slowing of the central nervous system (CNS) and alterations in drug metabolism account for most of the sensitivities to analgesics.<sup>10</sup> Impaired excretion of active drug metabolites especially increases the risk of adverse reactions. Table 3 summarizes these changes, and articles elsewhere in this issue discuss them in more detail.

## OPIOID METABOLISM

Opioids are all metabolized in the liver by different processes (Table 4). Morphine in older adults has greater potential to cause toxicity because of its active metabolites. Accumulation of these metabolites in patients with renal insufficiency can be harmful, causing respiratory depression, delirium, and myoclonus. In healthy patients receiving typical doses for acute pain, toxicity is unlikely. Opioids with fewer or no active metabolites are preferable in frail patients and those with renal disease.<sup>10</sup> Because elders may have a decline in muscle mass, renal insufficiency may not be reflected by the serum creatinine level. The glomerular filtration rate (GFR) more accurately portrays renal status.

The administration of opioids to older adults with acute pain varies widely in clinical practice, but especially in elders with cognitive dysfunction.<sup>7</sup> Opioid-related

Visual Analog Scale	Marks a score on a graded line representing no pain to severe pain	Cognitively intact patients; difficulty speaking
Numeric Rating Scale	0–10 score for no pain to severe pain	Cognitively intact patients; validated in mild to moderate cognitive impairment. Preferred
Verbal Descriptor Scale	Ranks “mild, moderate, severe pain”	Cognitively intact patients; validated in mild to moderate cognitive impairment. Preferred
Faces Scale	Ranks pain on a series of smiling to frowning faces	Validated in mild to moderate cognitive impairment
Pain Assessment Checklist for Seniors with Limited Ability to Communicate Pain Assessment in Advanced Dementia Doloplus-2	—	Validated in severe cognitive impairment
Visual scales, assistive hearing devices	—	Hearing impairment

Data from Falzone E, Hoffmann C, Keita H. Postoperative analgesia in elderly patients. *Drugs Aging* 2013;30(2):81–90; and Gagliese L, Katz J. Age differences in postoperative pain are scale dependent: a comparison of measures of pain intensity and quality in younger and older surgical patients. *Pain* 2003;103(1–2):11–20.

Central nervous system	↓ Cerebral blood flow, ↓ Cortical mass	Altered perception and affective expression of pain
Peripheral nervous system	↓ Blood flow, nerve damage from higher glucose levels	↓ Sensitivity to pain, temperature, touch
Cardiovascular	↓ Cardiac output	↑ Toxicity due to ↑ peak concentration after bolus
Gastrointestinal	↓ Gastric secretions	Impaired dissolution of some drugs. Gut absorption remains normal
Hepatic	↓ Number of hepatocytes, ↓ Cytochrome P450 function, ↓ synthetic function, ↓ serum protein	Impaired metabolism especially demethylation, ↑ drug-drug reactions, ↓ protein binding, ↑ free serum drug level
Renal	↓ Renal blood flow, ↓ GFR	Impaired clearance of metabolites, ↑ half-lives of renally cleared drugs
Musculoskeletal	↓ Muscle mass, ↑ adipose	↓ Water VD, ie, ↑ dose toxicity, hydrophilic drugs; ↑ Fat VD, ie, ↑ half-life lipophilic drugs

Abbreviations: GFR, glomerular filtration rate; VD, volume of distribution.

**Table 4**  
**Metabolism of commonly used, preferred opioids in older adults**

Morphine	Conjugation	M3G: neurotoxic M6G: analgesic
Hydromorphone	Conjugation	H3G: neurotoxic, produced in clinically insignificant amounts
Oxycodone	CTP 2D6	Noroxycodone: minimally analgesic Oxymorphone: analgesic, produced in clinically insignificant amounts
Fentanyl	Hydrolysis	No active metabolites
Methadone	N-Demethylation	No active metabolites

complications such as constipation and urinary retention are dose dependent. Delirium has not been shown to be related to dose in some studies.

Neuraxial opioid injections can play an important role in multimodal pain treatment strategies. Advanced age is a risk factor for respiratory depression. When a single intrathecal dose of a hydrophilic opioid such as morphine is injected, very little of the drug is absorbed systemically. Only small amounts may affect rostral brain centers involved in respiration.<sup>11</sup> Like other opioid dosing, a reduction of 25% to 50% is reasonable. Hydromorphone will have less rostral spread than morphine because it is more lipophilic. Spinal analgesia can be extremely effective in abdominal, pelvic, and even chest surgery.

#### INITIATING TREATMENT

The World Health Organization pain ladder for cancer pain treatment is widely known and is also accepted as a logical treatment approach for postsurgical pain. It is well advised, if possible, to avoid opioids, which carry the highest risk of adverse effect when minor surgery is performed and there is minimal pain. With most major surgery, opioids should be the first line of treatment, and quickly escalated in combination with nonopioid adjuvants for synergistic analgesia and an opioid-sparing effect. “Start low and go slow” is a wise tenet of geriatric medicine. In some cases, however, more aggressive treatment with opioids may decrease the risk for some patients, such as those with dementia in whom uncontrolled pain may drive delirium.<sup>12</sup>

Start low and go slow—just not *too* slow! Uncontrolled pain contributes to delirium.

Comorbid depression and other psychological factors can also worsen pain intensity and cause difficulty controlling pain. When initiating therapy, it is very important to continue antidepressants and anxiolytics throughout the perioperative period. Patients may be psychologically, and even physically dependent (carisoprodol) on other adjuvants such as centrally acting muscle relaxants. These drugs have unpredictable effects in older patients and, although they are not recommended by the American Geriatric Society, when a patient is physically dependent it is reasonable to continue but reduce the dose of the drug.

Continue antidepressants and anxiolytics (and some muscle relaxants) into the perioperative period.

## OPIOIDS

Compared with other analgesics, opioids carry the highest side-effect profile. Despite older adults being at greater risk than younger patients for harmful effects of these drugs, opioids are still the mainstay of treatment of severe postoperative pain.

- Opioids are safe for use in the aged.
- Awareness of the physiology and the increased sensitivity of older adults is important.
- Older adults are more sensitive to analgesia, sedation, respiratory depression, cognitive impairment, delirium, and constipation.

Intravenous opioids have the highest risk of adverse events. The intravenous route of administration should be utilized in the immediate postoperative period and the ensuing 24 hours after surgery, or longer if patients must be nil per os. Intravenous patient-controlled analgesia (IVPCA) is the gold standard in successful postoperative analgesia and patient satisfaction. The rationale for IVPCA is to allow patients to achieve their own minimum effective analgesic concentration with smaller but more frequent opioid dosing. Because of the higher risk for adverse events with opioids, this makes IVPCA, with its lower cumulative dose, an attractive technique. IVPCA can even be used safely in carefully selected patients with cognitive impairment.<sup>13</sup>

IVPCA settings and continuous opioid infusions (**Table 5**) are as follows.

- A general rule of thumb is to reduce the starting dose of opioid by half compared with that in a younger patient, and maintain the same dosing interval.<sup>14</sup>
- Continuous intravenous infusions are not advised in unmonitored settings and are not appropriate in opioid-naïve patients.
- Fentanyl's brief duration as a bolus makes it less effective to use without a continuous rate of infusion.
- Lockout settings have not been proved to increase safety and actually may worsen pain outcomes.

The estimated morphine consumption by age in the first 24 hours after major surgery is<sup>15</sup>:

100 – patient's age  $\cong$  mg of intravenous morphine

Because intravenous opioids are associated with a higher risk of adverse events, when the patient is able to resume taking fluids and medications by mouth, oral opioids should be substituted.

- Oral opioids are efficacious for acute pain but slower to act in comparison with the intravenous route.
- All oral opioids take 30 to 60 minutes to reach peak effect.
- All immediate-release opioids for acute pain should be scheduled every 3 to 4 hours.

**Table 5**  
Suggested starting doses for intravenous patient-controlled analgesia

Drug	Dose	Bolus Interval (min)	Loading/Rescue
Morphine	1 mg	10	2 mg every 4 h
Hydromorphone	0.1 mg	10	0.2 mg every 4 h
Fentanyl	10 $\mu$ g	5	20 $\mu$ g every 2 h

## CHRONIC PAIN AND OPIOIDS IN THE GERIATRIC PATIENT

Chronic pain has a high prevalence in the aged, and the prescription of opioids for all types of chronic pain has risen strikingly over the last decade. Patients who become pharmacologically tolerant to opioids because of chronic therapy have greater difficulty with postoperative pain control. Tolerance to opioids manifests differently from person to person; some older patients may require surprisingly large doses of opioids for effective analgesia.

- The patient who has chronic pain and uses opioid analgesics regularly will require larger doses of analgesics for acute pain control.
- Long-acting opioids for chronic pain should be continued throughout the perioperative period.
- Patients should take their home dose of long-acting opioid on the day of surgery.
- If oral dosing of home medication is not possible, an equianalgesic parenteral substitute should be given.
- Titration of opioids guided by the patient's reported pain intensity should be done while closely monitoring the level of alertness, respiratory rate, and pulse oximetry.

Abruptly stopping a patient's opioid therapy is not recommended because this can lead to delirium, nausea, and vomiting. In particular, tachycardia and hypertension may be dangerous in patients with cardiovascular disease. Reducing chronic opioid dosing is appropriate in cases of:

- Altered mental status
- Opioid-induced toxicity
- Acute decline in renal function
- Respiratory failure

## MULTIMODAL ANALGESIA

The role of nonopioids in postsurgical analgesia has been greatly expanded over the past years because of increasing awareness of morbidity attributed to opioids.<sup>16</sup> The effectiveness of opioid analgesia is often offset by adverse effects as described earlier, and the elderly are more sensitive to these. Given their increased analgesic sensitivity to nonopioid adjuvants and opioids alike, the older adult population may benefit more than any other group of patients from the synergy of multimodal agents and their opioid-sparing effects.

## NONOPIOID ADJUVANTS

### *Acetaminophen*

Acetaminophen has an excellent history of use in geriatrics. As a nonspecific central cyclooxygenase inhibitor, it has been a useful analgesic for mild to moderate pain for decades. It is very well tolerated in the aged. Acetaminophen has become one of the core components of multimodal analgesic regimens because of its opioid-sparing effect.<sup>17,18</sup>

- No gastrointestinal (GI) disturbance
- Preferred first-line agent for most chronic complaints such as osteoarthritis pain
- Low toxicity risk except in patients with severely impaired liver function
- Hypovolemic surgical patients, malnourished patients, and those with high alcohol consumption are at higher risk for liver damage

- Maximum daily dose in healthy patients 4000 mg
- Reduced dose of 2000 mg in malnourished adults (<50 kg) or with depressed hepatic or renal function

If patients are discharged after surgery on combination analgesics containing acetaminophen, they should be reminded or supervised so as not to exceed the maximum dose of 4000 mg a day. For ease of adherence to a prescribed regimen, it may be best to avoid combination analgesics altogether and instead use a stand-alone drug such as oxycodone. Acetaminophen can then be added as a separate dose, for example, acetaminophen 650 mg every 6 hours. Even if patients exceed the maximum recommended daily dose, it usually takes days to weeks to manifest signs of liver damage.

### ***Nonsteroidal Anti-Inflammatory Drugs***

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Nonsteroidal anti-inflammatory drugs (NSAIDs) have a well-established role in postoperative pain treatment. In surgeries where peripheral inflammation is a primary pain generator, as in orthopedic surgery, the inhibition of cyclooxygenase enzymes is a potent analgesic mechanism. NSAIDs are effective, but may not be tolerated by both the elderly and their younger counterparts.

- GI disturbances, mucosal bleeding, and ulceration are more common in older adults.
- Use of aspirin, other anticoagulants, or glucocorticoid steroids increases GI risk.
- The cyclooxygenase-2 selective drugs (eg, celecoxib) are less associated with GI or bleeding complications.
- All NSAIDs are associated with fluid retention and hypernatremia, which may be dangerous in patients at risk for volume overload, such as those with congestive heart failure (CHF).
- Vasoconstrictive effects increase the risk of ischemia in patients with coronary or cerebrovascular disease.
- In the frail elderly NSAIDs may cause confusion.

Acute kidney injury may occur, and is more likely in anemic or hypovolemic patients. Patients with states of reduced functional blood volume such as occurs in CHF, chronic kidney disease, and diabetes are also at increased risk.<sup>19</sup> The age-related physiologic decline in renal function is best reflected by GFR. Serum creatinine is misleading because of decreased muscle mass. Short-acting NSAIDs are lowest risk. NSAIDs are best avoided in patients with abnormal GFR (<50 mL/min/1.73 m<sup>2</sup>) and any of the disease states listed earlier.

### ***Tramadol***

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Although tramadol is a weak opioid agonist, its lower potency and tricyclic antidepressant properties have led to its inclusion in multimodal plans as a substitute for stronger opioids. It has about one-tenth the potency of morphine and is effective for mild to moderate pain. Similar to codeine, it depends on CYP 2D6 for production of its main active metabolite, O-desmethyl-tramadol.

- Milder analgesic with less respiratory effects
- Possible nausea and delirium in older patients
- Contraindicated in patients with seizures or compromised renal function, which can lead to accumulation
- Because of serotonin/norepinephrine reuptake inhibitory effects, it must be used with caution in patients taking monoamine oxidase inhibitors or other

antidepressants. Complications such as serotonin syndrome are rare, but may occur.

A maximum daily dose of 300 mg is suggested for healthy individuals, with a reduction to 200 mg in patients with other risk factors.<sup>20</sup>

### **Gabapentinoids**

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The excellent track record and efficacy of drugs such as gabapentin and pregabalin in chronic neuropathic pain led to their introduction as nonopioid adjuvants in postsurgical pain. Gabapentinoids have been extensively studied and shown to have opioid-sparing effects in a wide variety of surgical procedures including spine surgery, orthopedics, and hysterectomy.<sup>21–23</sup> Analgesic effects are produced by binding to the  $\alpha_2\delta$  subunit of neuronal calcium channels.

- Opioid-sparing effect with a single preoperative oral dose
- Must be used with greater caution in the elderly because of dose-dependent sedation
- No metabolism, completely excreted renally
- With physiologic decline in renal function, reduced dosing is appropriate
- Other side effects include dizziness, visual disturbances, cognitive complaints, and swelling of lower extremities

Single preoperative doses of 300 to 400 mg orally are reasonable. The uptake of gabapentin is less predictable than that of pregabalin, which is more potent and bioavailable. Pregabalin also causes less sedation. Gabapentin has been studied as a preventive medication against postoperative delirium, as its opioid-sparing effects were thought to be protective.<sup>24</sup>

### **WHAT NOT TO USE: THE BEERS CRITERIA**

In patients of any age, an adjuvant analgesic should be specifically prescribed based on its efficacy for the type of pain being treated. Certain drugs commonly used for analgesia perioperatively in younger patients present significant risks to older patients. Drugs deemed potentially harmful to elders have been stratified into risk groups by the American Society of Geriatrics in its evidence-based Beers Criteria, which were updated most recently in 2012.<sup>25</sup> The decision to prescribe a particular drug must be individually based on the patient, giving careful consideration to the comorbidities present, the patient's level of tolerance for certain drugs, and the type of pain involved. With these factors in mind the Beers Criteria help guide the clinician in making a full risk-to-benefit assessment for selected agents ([Table 6](#)).

### **REGIONAL ANALGESIC TECHNIQUES**

With the goals of optimizing analgesia and minimizing systemic adverse effects in older patients, multimodal analgesia is the best practice. Local anesthetics possess the greatest opioid-sparing capacity. In addition to excellent pain relief, regional anesthetic techniques offer other postoperative benefits important to elders: shorter intensive care stays, earlier ambulation, earlier return of bowel function, and improved mental status.<sup>20</sup>

### **Perineural Blocks**

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Perineural injections of local anesthetic and the insertion of indwelling catheters for continuous infusion of local anesthetics have become an irreplaceable practice in

**Table 6****High-risk medications as per Beers Criteria**

<b>Drug</b>	<b>Use</b>	<b>Problem</b>	<b>Recommendation</b>	<b>Alternative</b>
Meperidine	Pain	Anticholinergic effect, delirium, neurotoxic metabolites	Avoid	Other opioid
Antihistamines, eg, diphenhydramine, promethazine	Opioid-related pruritus, nausea	Anticholinergic effect, sedation, delirium	Avoid	Ondansetron, nalbuphine
Muscle relaxants, eg, methocarbamol	Musculoskeletal pain, spasm	Sedation, synergistic with opioids	Avoid	Local therapy, heat, cold, repositioning
Tertiary tricyclic antidepressants, eg, amitriptyline	Neuropathic pain	Anticholinergic effects, sedation, delirium	Avoid	Duloxetine, low-dose gabapentin
Benzodiazepines, eg, diazepam	Anxiety, nausea	Prolonged half-lives, sedation, delirium	Avoid	Low-dose haloperidol

Data from American Geriatrics Society 2012 Beers Criteria Update Expert Panel. American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. *J Am Geriatr Soc* 2012;60(4):616–31.

the treatment of pain after joint replacement and many other types of surgery. New applications are emerging rapidly. With disposable infusion pumps and newer sustained-release liposomal local anesthetics, earlier hospital discharge and more effective physical therapy are possible. Besides portability in ambulatory surgery, perineural blocks offer additional advantages over neuraxial techniques.

- Minimal effect on hemodynamics
- Do not cause urinary retention and there is no need for a bladder catheter, which may be a source of delirium
- Lower risk for hemorrhagic complications with no special considerations for removal of indwelling catheters

Perineural injection techniques are generally low risk in older patients. Local anesthetic toxicity, however, is of special concern:

- Frail elders are at higher risk for local anesthetic toxicity because of lower serum protein levels that cause higher levels of local anesthetic in the plasma.
- End-organ disease, especially cardiac, hepatic, and renal, should be considered, and the lowest volume bolus of anesthetic possible for a particular block should be administered.
- When multiple perineural catheters are used (eg, femoral and sciatic catheters, bilateral transversus abdominis plane block catheters), the total volume of local anesthetic infused should be reduced accordingly.
- Drugs with lower risk for cardiac and CNS toxicity, such as ropivacaine, are most appropriate for continuous infusion.

Perineural injections may be more technically challenging in some older patients:

- Patients with acute trauma such as hip fractures may be difficult to position for blocks, and the risk-to-benefit ratio of sedation, especially with benzodiazepines, must be considered. Small doses of fentanyl and propofol are useful.
- Loss of muscle mass and poor tissue echogenicity may cause poor visualization of nerves with ultrasonography.
- Obesity in older adults makes challenging the identification of nerves with surface landmarks and nerve stimulator techniques.
- Bedbound patients need vigilant surveillance of indwelling catheter sites for potential skin breakdown.

Some special considerations should be given to older adults with cognitive impairment who are discharged home with blocks and indwelling catheters. Caregiver support at home should be capable of handling several potential problems:

- Supervision of indwelling catheter so that patient does not pull it out prematurely
- Problems such as leakage at the catheter site must be dealt with to avoid causing agitation or confusion
- Motor blockade from lower extremity blocks can lead to falls

When regional blockade recedes after a single dose of anesthetic, or a catheter is removed, an oral analgesic plan appropriate for the patient's age and comorbidities must be ready. Education of the patient and family must also give specific instructions if a catheter migrates outward unexpectedly. Steps should include oral analgesics and emergency contact numbers if analgesics fail to control the pain.

### **Neuraxial Techniques**

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Epidural analgesia has a 3-decade history of proven superior pain relief and improved outcomes compared with conventional methods of systemic opioid delivery. The epidural route of administration for opioid, local anesthetic, or a combination provides superior analgesia for dynamic or rest pain in comparison with systemic opioids.<sup>26</sup> Elderly patients having a higher burden of comorbidities and requiring more complicated surgeries stand to benefit more than younger patients from epidural analgesia. Unfortunately, technical difficulties, the use of anticoagulant drugs in the perioperative period, and the logistical requirements for postoperative management of catheters often prevent older patients from receiving epidural analgesia.

Although improved outcomes shown in studies have not been exclusively demonstrated in older patients, several end points are beneficial to older patients<sup>27,28</sup>:

- Earlier ambulation
- Earlier return of bowel function
- Earlier return of mental capacity
- Shorter hospitalization
- Lowered cardiovascular morbidity

Most of the benefits are due to opioid-sparing effects of local anesthetic and the abolition of the surgical stress response, which leads to many harmful downstream effects. Effects on bowel motility are limited to epidurals that are placed at the thoracic level. Local anesthetic drugs alone alter the stress response; epidural opioids do not.<sup>29</sup>

Combination of low-dose opioid and local anesthetic is most appropriate for limiting the toxic effects of each drug. Just as older adults are more sensitive to systemic opioids, they have increased sensitivity to spinal opioids. Surprisingly, low-dose opioids administered epidurally produce profound analgesia. Elderly patients are also more sensitive to the effects of local anesthetics within the epidural space. Smaller infusion volumes spread much more widely in older individuals. The risk of extended cephalocaudal spread is a more pronounced sympathectomy and, subsequently, hypotension. Bolus doses must be reduced to compensate for this. Careful catheter placement at the spinal level that corresponds to the surgical dermatome will help limit the volume required for coverage of the incision.

### **SUMMARY**

The treatment of postoperative pain of the older adult patient is critically important to a good outcome after surgery. Because of aging physiology, complex comorbidities, high prevalence of chronic pain, and the nature of surgical procedures, the task of pain management is sometimes difficult in older patients. A multimodal analgesic approach with nonopioids and regional techniques is essential to help limit opioid-related complications such as respiratory depression and delirium. Consideration of side effects of medications and complications related to interventional techniques must be thorough. Starting with lower doses and titrating conservatively are important. Extra vigilance and proactive planning are required to avoid complications related to problems of polypharmacy, cognitive decline, and frailty.

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