REVIEW

Management of chronic pain in elderly, frail patients: finding a suitable, personalized method of control

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Abstract: The elderly population is projected to make up 20% of the total United States population by the year 2030. In addition, epidemiological data suggests increasing prevalence of chronic pain and frailty with advancing age. Pain, being a subjective symptom, is challenging to manage effectively. This is more so in elderly populations with age-specific physiological changes that affect drug action and metabolism. Elderly patients are also more likely to have multiple chronic health pathologies, declining function, and frailty. The barriers present for patients, providers, and health systems also negatively impact efficient and effective pain control. These factors result in disproportionate utilization of health resources by the older population group. The scientific literature is lagging behind in age-specific studies for the elderly population. As a result, there is a lack of age-specific standardized management guidelines for various health problems, including chronic pain. Increasing efforts are now being directed to studies on pain control in the elderly. However, pain management remains inconsistent and suboptimal. This article is an attempt to suggest an informed, comprehensive guide to achieve effective pain control in the presence of these limitations.

Keywords: elderly, chronic pain, frailty, geriatric pain

Introduction

Advancements in the field of medicine over the last century have resulted in a significant increase in mean survival age[1] and have changed the age distribution curve by adding older adults in the canvas of global population. While investigators must continue finding solutions to medical problems of younger populations, the increasingly aging population brings a different set of puzzles to medicine. We are testing the limits of the health care system with additional physical, social, and economical stress.

Epidemiology of old age

Aging is a normal physiological process characterized by a dynamic, irreversible decline in physiological function.[2] Old age (or the older adult) is defined as the age of 65 or older, and the last century had seen escalation in the aging population. This older age population has risen from 4% of the total population in 1900 to 13% in 2010. The trend suggests that the older age population will expand to reach 20%–21% of total population by the year 2030.[3] Continuous advancements in medicine, and improved hygiene and nutrition are tempering some of the rise of chronic disability in the elderly ie, 81% older adults identified themselves as nondisabled in 2005 in comparison with 73% in 1982.[4]

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Frailty

Altered physiology and increases in degenerative disease prevalence have influence on the health status of older adults. In one estimate 30%–50% of adults 65 years and older have two or more health problems affecting their life. For those 85 years and over, this statistic rises to 50%–75%.

The interaction of various medical pathologies with age-related body changes results in a physiologic change characterized by decreased ability to respond to stressors. It causes vulnerability to adverse health outcomes, such as functional impairment, falls, fractures, social isolation, hospitalization, etc. This vulnerability is defined as frailty.[5] Frailty is diagnosed upon presence of three out of these five factors: (a) weight loss, (b) extreme fatigue, (c) weakness in hand grip, (d) slow walking speed, and (e) low physical activity in older adults.[5] Altered cognition, depression, and loss of muscle mass is very common in a frail patient. Pain remains the most common complaint in this group.

Geriatric pain

Along with increasing chronic degenerative changes and multiple medical comorbidities, the prevalence of pain also increases with advancing age. It ranges from 50%–75% and remains underdiagnosed and undertreated.[6] Poorly controlled pain, in turn, causes impaired activities of daily living (ADLs), mood disturbances, decreased ambulation, and cognitive alteration. Collectively, these comorbidities lead to other medical morbidities, such as deep vein thrombosis (DVT), pulmonary embolism, fractures, and poor quality of life.[7] Thus, it is of utmost priority to diagnose and manage pain early and effectively.

Pain cure is still an elusive target. The lack of optimal guidelines and inconsistent management make pain even more difficult to manage. Thus, the International Association of Study for Pain (IASP) accepted the declaration "Pain management – a fundamental human right" at Montreal in 2010.[8]

Pain is an unpleasant, subjective, multifaceted, biopsychosocial experience.[9] It encompasses sensory-discriminative, affective-motivational, and cognitive-interpretive dimensions. Each of these components is influenced by physical, psychological, social, and spiritual factors.[10] To achieve effective pain control, all of these factors should be addressed.

Challenges in geriatric pain management

There are several factors that make delivery of effective pain management in geriatric population a challenging task. In order to provide effective pain management, we should understand the pathophysiology of pain and the barriers to delivery of appropriate pain care.

Pain process

The pain process[11] is comprised of four stages: (1) Nociception – stimulation of the peripheral pain receptors; (2) Pain Transmission – travelling of pain signals through C- and A-delta fibers from the periphery to the dorsal horn and ascending in the spinal tracts to the central level; (3) Pain Modulation – modulation of pain signals along the neuraxial pain pathway; and (4) Pain Perception – projection of the pain signal onto the somatosensory cortex.

There are various receptors and neurotransmitters along this pathway that help in translating this action potential from the nociceptors at the periphery into pain perception. Alterations at these stages are the targets for pain management.

Physiologic alterations in older adults

With advancing age, multiple physiological changes occur in the body, altering the pharmacodynamics and pharmacokinetics of drugs. This in turn complicates pain management. Changes that occur with aging are summarized in Table 1.[12,13]

Barriers in geriatric pain management

Beside the physiological and pathological changes, there are several other factors that hinder optimal pain care delivery.[14,15] The shareholders invested in the goal of pain relief also bring their individual prejudices and limitations:

a. Patient themselves through
   - Misconceptions (increasing disease, pain as part of aging, nontreatable, medicines should be a last resort),
   - Fear (of addiction, masking disease progression, being labeled as a weak or bad patient, adverse effects from drugs, loss of independence),
   - Personality (noncompliance, not wanting to be "a complainer," denial, negative attitude towards younger practitioners),
   - Personal (cultural and religious beliefs, language, monetary status, comfort with health care setting, ambulatory status, social support),
   - Comorbidities (depression, dementia, altered cognition, etc);

b. Medical professionals through
   - Lack of knowledge/training (for pain diagnosis, assessment, nonpharmacologic modalities, medication's side effects and dependence or addiction) resulting in inability to diagnose early, manage effectively, interpret symptoms and side effects, and delay in referral,

Table 1 Physiologic changes with aging and its effects

System	Changes	Effect	Effect of drug use
Gastrointestinal	Altered secretions Decreased blood flow Altered motility Altered absorptive surface	Altered drug absorption Altered bioavailability Altered transit time	Altered oral bioavailability
Liver	Small liver mass Reduced hepatic blood flow Decreased hepatic enzymes (oxidation and cytochrome p-450) Decreased protein synthesis Decreased regeneration rate	Decreased serum albumin Decreased metabolism of drugs by 30%–40%	Increased bioavailability Higher toxicity risk
Cardiac	Decreased cardiac index	Rapid and high drug peak	Higher toxicity risk
Renal	Reduced size Decreased renal blood flow Reduced renal function (gfr), 1% per year after age 50	Decreased renal elimination	Required dose adjustment
General	Increased body fat Decreased body water	Increased volume of distribution for lipophilic medication Increased plasma concentration of hydrophilic drugs	Delayed elimination and onset of drug of action Higher frequency of side effects
Nervous system	Decreased cerebral blood flow Neuronal loss/atrophy Decreased synthesis of neurotransmitters Decreased opioid receptor density	Decreased descending inhibitory pain control and altered pain processing	Increased pain with noxious stimuli Altered response to pain
Muscle	Decreased muscle mass	Decreased functioning	

Abbreviation: gfr, glomerular filtration rate.

- Lack of standardized guidelines and protocols for pain management,
- Personal biases (towards fear of opioid dependence, addiction, opioid toxicity, legal scrutiny, patient satisfaction),
- Time constraints;

c. Health system through
- Accessibility (distance, transportation, insurance coverage, economics, social support, etc),
- Facility and health care deficiencies (clear guidelines and protocols, trained professionals, insufficient supportive and ancillary staff, insufficient resources, excessive documentation, fear of legal scrutiny);

d. Medications/interventions through
- Insurance coverage,
- Geographic availability,
- Medicine (availability, polypharmacy, complex dosage regimen, adverse effects, generic vs brand name medications, packaging),
- Off-label usage of medications or interventions.

Adverse effects and compliance in elders

An undesired and potentially harmful response from medications is more prevalent in the older adult population. In several studies, the incidence of these adverse reactions ranges from 6% to 30%, and the majority of them are preventable.[16]

Polypharmacy, multiple prescribers, inappropriate use, suboptimal monitoring, and patient compliance are risk factors for adverse events. This is in addition to variances seen secondary to age-related pharmacodynamic and pharmacokinetic changes of drug metabolism.[17]

Adverse reactions should not be confused with therapeutic failure, which is described as "given medication but unable to achieve goal of therapy." A combination of any of the following factors may be responsible for therapeutic failure: poor adherence to medicine, inadequate dosing, drug interactions, and unaffordable cost of medications.[18]

In the presence of multiple health problems, the elderly population is often at risk for polypharmacy.[19] Prior to instituting a new medication, a clear goal, end point, rate of taper and duration, appropriate monitoring, possible side effects, and drugs interactions should be considered to prevent these adverse events. Ongoing efforts are directed at the development of screening tools and lists of high-risk medications to help health care providers choose safe and effective medications for older adults.

A list of medications that pose potential risks outweighing potential benefits for the older population was suggested in 1991, called the "Beers Criteria for Potentially Inappropriate Medication Use in Older Adults."[20] The list was recently updated and modified into three broad categories of high-risk

medications for elders (a) in general, (b) in certain specific diseases, or (c) to be used with caution. Concomitant use of the Beers criteria and the "screening tool for older persons prescriptions (STOPP)/screening tool to alert to right treatment (START)" criteria[21] helps health care providers to deliver safe and effective medicinal management.

Management of geriatric pain

"Access to pain management is a fundamental right,"[8] and accurate assessment and delivery of effective treatment in timely fashion are critical for better outcomes and patient satisfaction. Understanding the complexities associated with pain management should further challenge medical practitioners. They must put in diligent effort to provide effective pain control through optimal use of knowledge and tools.

Pain assessment

Pain assessment is the key to optimal pain control and determination of its mechanism in elderly populations.

Patient's self-reporting is the most reliable source in pain assessment.[22] Comprehensive pain assessment is an ongoing process in elderly patients, and information may be gained by comparing repeated interactions with health care workers.

A medical history inclusive of pain symptoms detailing location, duration, character, radiation, temporal relationships, and associated neural symptoms helps to narrow down the differential diagnosis. History of medication use and effects is also an essential part of the assessment.

This is further aided by a physical examination, with focus on the patient's complaints. The patient's cognitive capacity may be diminished by other comorbidities. Thus, a thorough physical examination and history is essential. Relevant diagnostic tests further compliment the clinical assessment.

Although pain is a subjective symptom, its accurate measurement helps to compare and improve the outcomes of management modalities. Choices of pain measurement tools are dependent upon the patient's cognitive, visual, auditory, and communicative status. Pain can be rated using: (a) unidimensional scales – these include numeric pain rating scales and pictorial pain rating scales (ie, faces pain scale, colored visual analogue scale, pain thermometer, etc) and are commonly used to rate the intensity of pain; or (b) multidimensional verbal descriptor scales, such as the McGill Pain Questionnaire[23] (describes sensory and emotional effect of pain), the Multidimensional Pain Inventory, etc.[24]

Pain assessment is not complete without evaluating the impact of the pain on the patient. Pain affects the patient's psychological and functional status and its impacts may also extend to affect cultural, spiritual and social function of the family and community. It is critical to understand these impacts to provide multidisciplinary pain management. Patient's mood, coping skills, ability to perform ADLs, use of aids, social and family interactions, etc must be evaluated before formulating the management plan.

Pain assessment is especially challenging in patients with cognitive impairment and dementia, placing this group at risk of under diagnosis and undertreatment.[25] When self-report is unavailable, as in the cognitively impaired person, observation of the patient's behavior pattern will be the primary assessment tool.

Attempts have been made to develop common instruments or guidelines for assessing pain in communicatively and cognitively impaired patients. A hierarchical Pain Assessment Algorithm[26] was proposed that can be utilized for patients who are self-reporting as well as for cognitively impaired patients. It consists of (a) a self-report from patient (or reason for not doing it); (b) behavioral assessment tools for observation of pain behaviors during clinical assessment; (c) an assessment report by the patient's caregivers; and (d) a listing of analgesic trials and nonpharmacologic interventions and their outcomes.

Management of pain

Managing pain is a challenging task to begin with and it is especially difficult in the elderly population, secondary challenges in their pain assessment. With the lack of age-specific scientific evidence, it is often common to extrapolate the data from young adult studies for clinical decision-making in elders. There is an increased risk of medicine-associated adverse events from polypharmacy, lack of age-appropriate treatment guidelines and protocols, lack of age-appropriate drug safety data, multiple comorbidities, and age-related physiological changes. On the other end, aging is also a very individualized process, and age-related changes are extremely varied among individuals.

It is important to keep all these challenges, diagnoses, resources, and patient expectations in perspective, to formulate comprehensive multidisciplinary management strategies (Figure 1). Pain is a multifaceted problem and is best addressed through an individualized approach. The goal should be not only to improve pain control, but also, to improve function and alter pain behaviors.

Education

Educating both the patients and their health care providers can overcome the prominent barriers to the implementation and delivery of effective pain management.

Nonpharmacological modalities

Nonpharmacological modalities[27] is essential component for comprehensive multimodal management strategies as it helps patient in coping better with pain and suffering along with improvement in daily functions. Thus these modalities including physical therapy, psychobehavioral therapies,[28] pastoral and social work consultation should not be overlooked.

In the frail elderly, it is even more important to improve function, as one of the key modalities in the prevention and management of frailty. Adequate analgesia enables the patient to participate fully and progress in a tailored exercise program, preferably one provided by a physical therapy specialist.

Identification of patients who are at high-risk for fall and fractures is essential. Ergonomic adjustment in patient's lifestyle can be made to prevent falls or bad outcome from falls. Examples of adjustments include clearing obstacles from passages, softer padding along the passages, and use of walking aid.

A nutritional consultation could be very beneficial for better nutrition, to prevent loss of muscle mass, osteoporosis, and better control of chronic conditions.

Pharmacological modalities

The multidimensional character of pain makes it more difficult for researchers to develop clear, standard protocols for pain management. Geriatric pain thus can be best managed using individualistic and mechanistic treatment strategies.

Pain is classified into broad categories as: nociceptive, neuropathic, psychosocial, visceral, and mixed. Analgesics such as opioids, acetaminophen, and nonsteroidal anti-inflammatory drugs are known to be more effective for nociceptive pain. Meanwhile, adjuvants medications, including antiepileptics and antidepressants, are more helpful in neuropathic pain. One should determine the particular type of pain prior to prescribing first-line medications.

Several of these pharmacological agents have multiple delivery routes ie, oral, intravascular, sublingual, mucosal, rectal, transdermal, and intramuscular. Selection of the least invasive route of drug delivery should be the priority in elderly patients.

Upon selection of the medication, this should be started in the lowest effective dose, followed by a gradual and slow titration of dosage.[29] There should be adequate intervals between the escalations of medication during titration, to prevent overdosage and side effects from accumulative doses. Although these intervals are not clearly defined in the literature, titration schedules should consider the expected half-life of the medication; in general it takes five times the

elimination half-life to reach steady state.[30] Titration may also be influenced by a patient's response to medication use. All along this therapeutic trial, the patient should receive medications around the clock, be closely monitored for therapeutic effect, and report any adverse effect or intolerability. Since mixed pain can often occur, the addition of medications with different mechanisms should not be delayed. Providers should be very careful about drug–drug or drug–disease interactions.

The WHO three-step "analgesic ladder"[31] was initially recommended for the management of cancer pain, with emphasis on oral opioids as per the intensity of pain. In time, its use has expanded for managing noncancer pain, including pain in the geriatric population. The goal remains the slow escalation of analgesic dosing to achieve the desired therapeutic goal. Adjuvant medications should be used at the same time, to achieve better analgesia and reduce the opioid consumption. Use of the analgesic ladder has been validated through various studies and achieves the goal of pain relief in 70% of cases,[31] but its use is limited to communicative patients who can take oral medications.

Attention should be given to the patient's physiological, cognitive, and comorbid status. Avoid usage of strong opioids, nonsteroidal anti-inflammatory agents, and tricyclic antidepressants in the elderly patient.[29]

Pain medications can be classified according to three broad categories: nonopioid analgesics, opioid analgesics, and adjuvant medications.

Nonopioid analgesics

Acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), and steroids are the most commonly used nonopioid analgesics. Acetaminophen is a centrally acting analgesic without anti-inflammatory properties. It is metabolized by liver and excreted through the renal system. It is used as an analgesic and also as coanalgesic, meaning it potentiates the effect of opioid analgesics and provides opioid sparing. Acetaminophen is an initial analgesic used for mild pain and for ongoing persistent pain. Caution should be exercised in liver or renal impairment, when doses should be adjusted. Dose escalation is limited, secondary to a ceiling of its effect on analgesia. Dosages should be limited to 2000 mg per day in the elderly.

Chronic usage of NSAIDS should be avoided in the elderly population as these carry a high risk for gastrointestinal toxic effects, and renal and cardiac dysfunction. Short-term use is suggested, upon cautious assessment of patient comorbidities and with close monitoring for gastrointestinal

and renal adverse effects as well as for drug to drug interactions. Concomitant use of a gastro-protective agent (ie, proton pump inhibitor) is recommended with NSAIDs use.[29] Topical NSAIDs may be a safe alternate, secondary to their reduced systemic absorption.[32]

Opioid analgesics

Opioid analgesics are commonly used for moderate to severe pain and pain associated with frailty. They provide analgesia through action on opioid receptors that are present both peripherally as well as in the central nervous system. The WHO analgesic ladder[31] guides in the selection and dosing of opioids for moderate pain and severe pain; thus, they are clinically divided in to mild and strong opioids. Hydrocodone, tramadol, and oxycodone are considered mild opioids and can be used for moderate pain that is not controlled by use of nonopioid analgesics. Upon failure to achieve appropriate analgesia with mild opioids, stronger opioids, such as morphine, oxycodone, oxymorphone, hydromorphone, fentanyl, and methadone, should be used. Most of the strong opioids are available in fast-acting and long-acting formulation. In the case of fast-acting opioids, the formulation half-life is usually 2–6 hours, based upon metabolism of the drug. The long-acting formulations allow 8–12 hours of analgesia through sustained-release drug delivery systems ie, matrix-based slow-release MS Contin® or reservoir-based fentanyl patches. The exception is methadone, which is limited by its pharmacodynamic profile.[33]

Patients should be reassessed frequently with every change in dosing, to monitor its efficacy and side effects.[29] In order to prevent side effects from progressing to a poor outcome, it is essential that the provider manage preemptively. Depending upon the patient's health status and severity of pain, a fast-acting opioid formulation should be started at the lowest effective dose and allowed to titrate slowly. Titration of the dose should be done by increasing each dose by 30%–50% of the current total daily dose[33] at a minimum interval of every 24 hours until stabilization at the dose of effective analgesia.[34] For severe pain, more frequent titration is recommended. It may be appropriate to initiate use of a long-acting opioid formulation after monitoring the usage of a short-acting opioid formulation. The metabolism of hydromorphone, oxycodone, and methadone is directly dependent on liver function, while elimination of morphine depends upon renal function. Thus, fentanyl could be a preferential opioid in liver dysfunction,[35] while methadone and fentanyl are the agents of preference for patients with impaired renal function.[36] Morphine, hydromorphone, and

hydrocodone should be used with caution in hepatic and renal impairment; methadone use is commonly avoided in these situations, secondary to its complex and variable metabolism.[35,36]

Propoxyphene, meperidine, pentazocine, and high-dose tramadol (>200 mg/day) should be avoided in elderly patients, secondary to the risk that accumulation of their metabolites could lead to undesired side effects.[29] Early in a patient's management, long-acting opioid formulations should be avoided, secondary to their altered metabolism, presence of polypharmacy, and increased risk of side effects. For chronic pain management, long-acting formulations may be reasonable choices, while fast-acting formulations are utilized for breakthrough and incidental pain.

Methadone is a complex medication in comparison with the other opioids. Although it may be cost effective, there are unpredictable differences in its drug action and clearance. Classically understood, methadone is characterized by an analgesic half-life of 3–6 hours, while the elimination half-life may range from 20 hours to in excess of 120 hours. This creates real challenges for practitioners when titrating the medication on an outpatient basis. Thus, the use of methadone requires a physician with experience and understanding of the medication, along with the need for frequent monitoring and cautious and slow titration of doses.[37]

Common opioid-induced side effects are constipation, sedation, nausea, endocrine dysfunction, and altered cognition. These effects should be monitored closely and managed promptly, sometimes even preemptively. In addition to treatment with specific medications, side effects can be also managed with dose alteration, change in the route of administration, or change to other opioid formulation.

Constipation is the most common side effect of opioids and requires prophylaxis in the form of stool softener or laxative. Constipation that occurs should be managed aggressively after excluding bowel obstruction. In this setting, it may also be necessary to use additional medications for the bowel regimen, including lactulose and polyethylene glycol. Refractory cases can be managed with peripheral opioid antagonist ie, methylnaltrexone.[38]

Constipation is the most common reason for nausea, so its management will be essential for nausea control. There are several other antiemetic targets: (a) chemoreceptor trigger zone blockade, managed through droperidol, prochlorperazine, and serotonin antagonism with ondansetron; (b) improvement of gastric motility using prokinetic agents, such as metoproclamide; and (c) reduction in vestibular sensitivity by using antihistaminic and anticholinergics.

Sedation and altered cognition are usually managed by reducing the dosages of opioids, but occasionally stimulants such as dextroamphetamine and methylphenidate will be necessary to negate the central nervous system depressive effect of opioids. Similarly androgen replacement may be needed in opioid-induced hypogonadotropic hypogonadism.[39]

Opioid rotation is the practice of changing from a poorly responsive opiate medication to another in hopes of improved analgesia and better tolerability. Although a popular strategy, the practitioner must have a clear understanding of the relative potencies of various opioids for effective opioid rotation. These are described in the Opioid Equianalgesic Conversion Table (Table 2).

Current guidelines help to ensure patient safety by recommending two key dose adjustments when converting to a new opioid: first, calculate the 24-hour requirement of the previous opioid and reduce the initial dose of new opioid by 25%–50%, using the equianalgesic table. This is done in order to negate an "incomplete cross tolerance" among opioids. Second, in high-risk patients (elderly, renal-impaired, or cognitively impaired), the dose should be further reduced by 15%–30%. These guidelines do not apply for methadone, where the initial reduction of dose should be 75%–90% to incorporate its variable pharmacokinetics and pharmacodynamics; and fentanyl patch doses should not be reduced initially.[40]

Titration of opioids using 5%–15% increments of the total daily dose can be safe when utilizing an appropriate frequency of administration and providing medication on an "as needed" basis. In time, the patient will achieve the desired level of analgesia, and steady state of opioid with subsequent administration.[40]

Upon selection of opioids for chronic use, providers should also be mindful of compliance, adherence, dependence, tolerance, and addiction issues. Older adults may have difficulty adhering to the plan of care, but educating them can help to overcome this problem.

Adjuvants

Adjuvants are pharmacological agents that were primarily developed for indications other than analgesia. Several medications belong to this group, including antidepressants, antiepileptics, corticosteroids, local anesthetics, muscle relaxants, etc. They are commonly used in conjunction with other analgesics for persistent and refractory pain, but some adjuvants are drugs of choice for neuropathic pain.

Tricyclic antidepressants cause anticholinergic side effects, cognitive impairment, and cardiac dysfunction; thus, it is recommended to avoid these in the elderly population.[29] Antiepileptics (ie, gabapentin, pregabalin, lamotrigine, levetiracetam, tiagabine, and topiramate) are the effective agents in treatment of the neuropathic component of pain. Titration should be done very slowly as all of these agents can produce mild sedation and cognitive alteration. With the exception of lamotrigine and tiagabine, all antiepileptic dosages should be adjusted on the basis of renal function. Gabapentin, pregabalin, and levetiracetam are better choices for patients with hepatic dysfunction but adequate renal systems.[41] Alternatively tiagabine and lamotrigine may be better tolerated by patients with renal impairment.[42]

Presence of frailty sometimes warrants the use of replacement hormones ie, androgens and/or growth hormones for improvement of muscle mass.

Interventional modalities

All practitioners are fully cognizant of the limitations of medication and other modalities. In certain situations, an interventional approach could be significantly beneficial in pain control. These interventions are targeted to the pain pathways, to either obliterate or modulate pain signals through chemical, electrical, or ablative means.
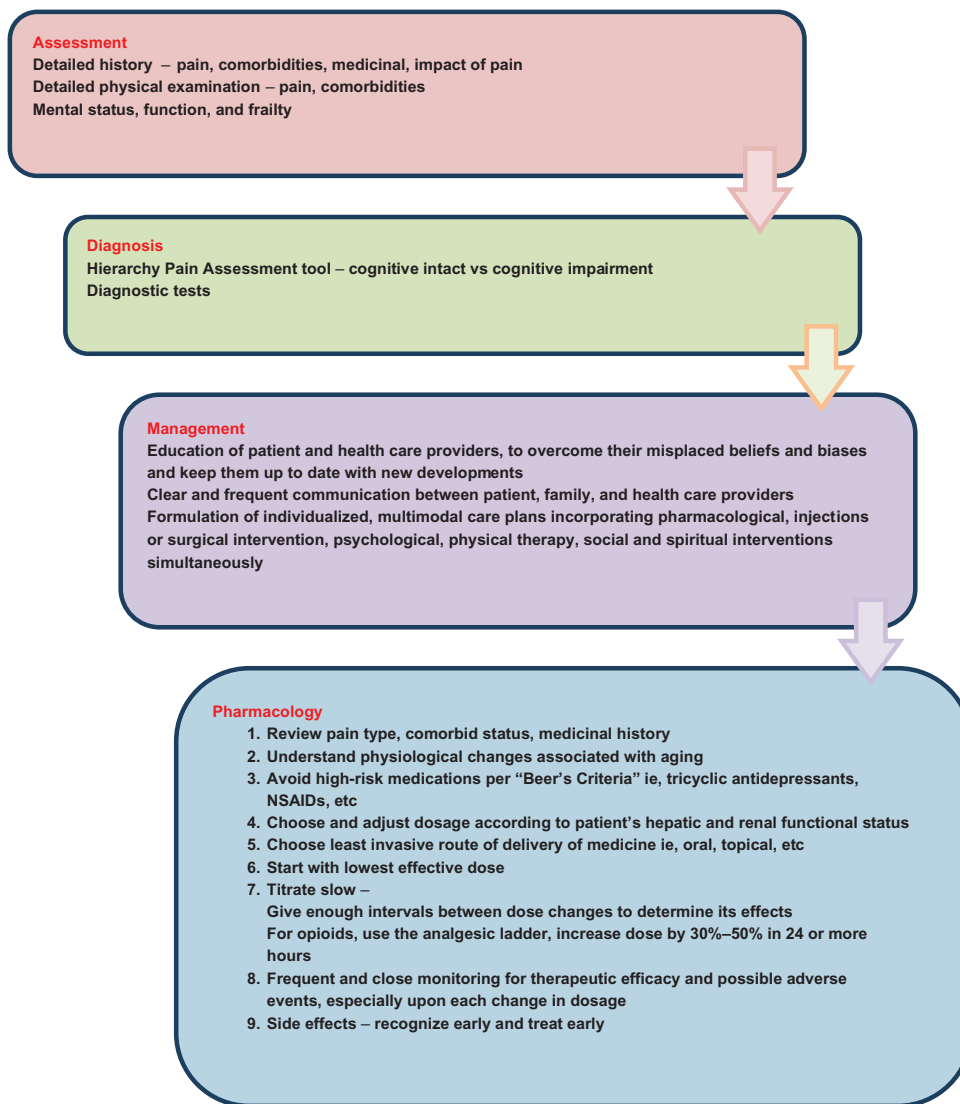
Analgesia can also be achieved by delivering medications peripherally around the nerves or by continuous delivery of

Table 2 Opioid equianalgesic conversion table

	Elimination (t½) in hours	IV equivalent to IV morphine 10 mg (single dose)	PO equivalent to IV morphine 10 mg (single dose)
Morphine	2–4	10 mg	20–60 mg
Fentanyl	4	100 mcg	N/A
Hydrocodone	4	N/A	30–40 mg
Oxymorphone	2–3	1	10
Hydromorphone	3	2 mg	10 mg
Methadone*	20–120	10 mg	10–20 mg
Oxycodone	3	N/A	20–30 mg

Notes: *Very long elimination time causes methadone to accumulate over many days.
Abbreviations: IV, intravenous; PO, oral; N/A, not applicable.

Assessment
Detailed history – pain, comorbidities, medicinal, impact of pain
Detailed physical examination – pain, comorbidities
Mental status, function, and frailty

Diagnosis
Hierarchy Pain Assessment tool – cognitive intact vs cognitive impairment
Diagnostic tests

Management
Education of patient and health care providers, to overcome their misplaced beliefs and biases and keep them up to date with new developments
Clear and frequent communication between patient, family, and health care providers
Formulation of individualized, multimodal care plans incorporating pharmacological, injections or surgical intervention, psychological, physical therapy, social and spiritual interventions simultaneously

Pharmacology
1. Review pain type, comorbid status, medicinal history
2. Understand physiological changes associated with aging
3. Avoid high-risk medications per "Beer's Criteria" ie, tricyclic antidepressants, NSAIDs, etc
4. Choose and adjust dosage according to patient's hepatic and renal functional status
5. Choose least invasive route of delivery of medicine ie, oral, topical, etc
6. Start with lowest effective dose
7. Titrate slow –
   Give enough intervals between dose changes to determine its effects
   For opioids, use the analgesic ladder, increase dose by 30%–50% in 24 or more hours
8. Frequent and close monitoring for therapeutic efficacy and possible adverse events, especially upon each change in dosage
9. Side effects – recognize early and treat early

Figure 1 Management of pain in frail older adults.
Abbreviation: NSAID, nonsteroidal anti inflammatory drug.

medication neuraxially via an implantable pump. The pain signal can also be affected by neuromodulation, as with use of a spinal cord stimulator for pain relief.

Summary

Pain is an extremely common symptom of aging and its management is a challenging task for any physician, secondary to unique individual physiological states, multiple barriers, and associated comorbidities.

Despite the presence of significant limitations, effective and safe pain management is the patient's right. Education among health professionals, age-targeted clinical trials, frequent and detailed pain assessment, utilization of multiple modalities concomitantly, and the development of common guidelines can facilitate the effective delivery of pain control.

An exponential increase in the number of older adults in the total population with chronic degenerative pathologies presents a significant burden on the current health care system. More elderly-focused, age-specific, clinical, socioeconomic, and epidemiological studies are needed to promote healthy aging, as well as early, safe, and effective management of health problems, including pain.

In summary we recommend the following steps in pain management for frail older adults (Figure 1):[29]

- Provide a rational, individualized plan of care
- Provide comprehensive pain assessment, as this is essential in developing an individualized management plan
- Use physical therapy and occupational therapy to keep older patients active and mobile

- Avoid high-risk medication (ie, tricyclic antidepressants, nonsteroidal anti-inflammatory drugs, etc), as recommended by the BEERS criteria[20]
- Avoid polypharmacy, if possible
- Use the least invasive drug-delivery route
- Use the lowest effective dose by starting at low dose and titrating slowly to the desired level
- Allow for adequate time to evaluate the dose response
- Adjust doses in patients with renal/hepatic impairment or other comorbidities
- Adjust one medication at a time
- Use multimodality treatment to get the most effective results with least side effects
- Reevaluate after each change in plan, and monitor side effects, drug–drug interactions, and drug efficacy.

Disclosure

The authors report no conflicts of interest in this work.

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