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The Role of New Technology in Non-Opioid Chronic Pain Management for Reducing Falls in Community-Dwelling Seniors

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Abstract

Medical technology applications for the treatment of chronic pain are at the forefront of reducing dependence on opioid pain management pathways. Reduction of falls and the risk of falls in community dwelling seniors is also at the forefront of public health initiatives as well as state and federal legislation.[10, 11.] This paper explores the link between opioid management of chronic pain and risk of falls in the senior population and offers a medical pathway to reduce this risk.

Problem Statement

Chronic pain in the elderly has been linked to an increased fall risk and is further compounded by the use of opioids in the management of chronic pain. Not only have 3 million people over the age of 65 had injuries from an unintentional fall, but falls are also ranked first as their leading cause of death. New technology to treat and manage chronic pain plays an important role in reducing reliance on opioid narcotics and reducing the risk of falls in community-dwelling seniors in addition to reducing the associated mortality, morbidity and costs.

Background

The impact of chronic pain on falls

Chronic pain, defined as pain lasting three months or greater, is estimated to impact over 100 million US adults.[12] Neuropathic, musculoskeletal, inflammatory and mechanical pain characterize the common causes of chronic pain.

Chronic musculoskeletal pain has been shown to increase the risk of falls and correlates with pain severity and extent of anatomical regions afflicted by pain.[13] Between 30 and 40 percent of community-dwelling people over the age of 65 fall each year and the percentage of falls for those 80 years and older increases to 50 percent.[14] Falls are not necessarily an inevitable consequence of aging and with appropriate measures, many can be prevented.

Leveille et al. examined chronic pain as a risk for falls in adults aged 70 and older. Falls are reported to rank among the top ten leading causes of death in older adults in the US. The study defined a fall as unintentionally coming to rest on the ground or other lower level not as a result of a major intrinsic event (such as stroke, seizure or myocardial infarct) or significant external hazard.[15] The study concluded there is strong and consistent evidence that chronic musculoskeletal pain, regardless of the measure used, is associated with increased risk for falls in a general population of community-living older adults. The study also noted that chronic pain may impede cognitive function needed to prevent a fall and that patients with chronic pain show poorer executive function and attention compared to healthy controls.[16] A meta-analysis by Stubbs et al. also concluded that older adults with pain are at particularly increased risk of recurrent falls.[17] Additionally, pain that interferes with activities of daily living is also associated with increased risk of falls.[18]

A cross-sectional analysis of the 2011 National Health and Aging Trends Study of a sample of Medicare enrollees aged 65 and older (Patel et al.) concludes that fall-related outcomes were substantially more common in older adults with pain than in those without.[19] The study reports the prevalence of recurrent falls was 19.5% in participants with pain compared to 7.4% in those without. The prevalence of fear of falling that limits activity was reported to be 18.0% in those with pain compared to 4.4% in those without pain. Additionally, the prevalence of balance and fall outcomes increased with the number of pain sites: 11.6% for those with one pain site; 17.7% in those with two pain sites; 25.5% in those with three site and 41.4% in those with four or more sites.

Impact of opioids as a treatment option for chronic pain

Options for the treatment of chronic pain generally fall into six categories: pharmacologic, physical medicine, behavioral medicine, neuromodulation, interventional and surgical approaches, with pharmacologic approaches being the most widely used.[20] Opioids are considered as an approach for neuropathic, musculoskeletal as well as nociceptive pain. Use of opioids for the management of chronic pain entails a myriad of side effects as well as complications for many of the comorbidities present in the elderly population. In addition to the risks of overdose and opioid use disorder, use of opioids to manage chronic pain leads to balance dysregulation and enhanced fall risk.[21]

A recently published retrospective, observational, multicenter cohort study conducted on registry data in Canada of 67,929 patients between 2004 and 2014 identified that patients who had filled an opioid prescription within 2 weeks before injury were 2.4 times more likely to have a fall than any other type of injury.[22] While the study is not without limitations, including not being able to identify if filling a prescription for an opioid resulted in actual drug consumption and whether pain itself or the opioid contributed to the fall, the authors concluded that recent opioid use is associated with an increased risk of falls in older adults and an increased likelihood of death in those with fall-related injuries.[23]

Cognitive impairment, also associated with an increased fall risk, raises the issue of whether cognitively impaired seniors engage in risky activities and thereby increase their fall risk.[24] It has been reported that both acute and chronic use of opioids have an effect on cognitive performance. Neuropsychological data suggests that opioid use impacts attention, concentration, recall, visuospatial skills and psychomotor speed.[25] Therefore, use of opioids that may impact cognition in an already compromised elderly population may pose additional threats and risks of falling. Facilitating better medication management, particularly use of opioids to manage pain, in the elderly is one strategy to reduce risk and the prevention of falls.

Economic burden of falls

The Centers for Disease Control and Prevention report that more than one in four older people falls each year but less than 50% tell their health care provider[26] [27]. Importantly, a history of a prior fall doubles the chances for falling again.[28] In 2016, over 3 million people over age of 65 had a non-fatal injury caused by an unintentional fall.[29] Unintentional falls also rank first as the leading cause of death in the 65+ population with nearly 30,000 deaths reported in 2016.[30] The total medical cost for falls in 2015 was more than $50 billion.[31] The National Council on Aging estimates the financial toll for older adult falls is expected to increase as the population ages and may reach 67.7 billion by 2020.[32]

Fall related injuries pose financial implications well beyond the actual costs related to falls. Falling and the injuries associated with them typically impact mobility, often resulting in reduced ability to live independently or requires older adults to seek additional care for completing activities of daily living at home or even nursing home assistance. In 2013, Medicaid costs for institutional and home long-term care services totaled $123 billion.[33]

Many states have taken action to prevent and reduce falls through legislation that supports "aging in place" and initiatives to keep older adults in their homes and communities, thereby contributing to the reduced financial burden of falls. Washington SB 5557[34] specifically includes pharmacists in health insurance provider networks so that effective consult between provider, pharmacist and patient about medications can occur. This is one example of a policy that enables more effective medication management as pharmacists play a key role in identifying and modifying older adults' use of drugs leading to decreased fall risk.

Solution

Medical Technology --- redefining pain management and preventing opioid use

Generally accepted non-opioid treatments for pain such as steroid injections are widely used despite a dearth of evidenced based support. Epstein (2018) reports the risks and complications of both cervical and lumbar epidural injections. She concludes that they lack FDA approval and contribute to embolic infarcts, hematomas, abscesses, vertebral artery dissections and pain. Epstein also indicates these injections include side effects associated with the use of steroids and can trigger vasovagal reactions. [35] It has also been reported from a review of clinical trials that the duration of pain relief for intraarticular steroid injection is one to two weeks with a small number of trials demonstrating pain relief of up to three to four weeks.[36] Therefore, a critical challenge is to medically manage chronic pain in community-dwelling seniors via a non-pharmacologic pathway to address medication impact on the incidence and risk of falling and the inherent morbidity and mortality associated with falls.

New technology in the form of minimally invasive procedures and adjunctive therapies are at the forefront of meeting this challenge. The heightened focus to reduce exposure to opioid medication as a means of managing pain requires collaborative efforts of technology manufactures, health care providers, public policy makers and third party payers in order to create effective access pathways for technological advancements in the treatment of pain.

In 2012, nearly 260 million prescriptions were written for opioids—more than enough for every US adult to have a bottle of pills. [37] And in 2015 there were over 20,000 overdose deaths related to prescription pain relievers.[38] The US opioid crisis highlights the challenge of meeting patients' need for pain relief without the use of narcotics. Health care providers must be willing to explore new pain management treatment options and technologies, but government and health insurers must also be willing to support access to those treatments.

In May of 2018, the Food and Drug Administration's (FDA) Center for Devices and Radiological Health (CDRH) launched an *Innovation Challenge* to support the development of medical devices, including digital health technologies and diagnostic testing, to detect, treat and prevent opioid addiction as well as address and treat pain. Eight developing technologies intended to treat opioid use disorder, detect and treat overdose, dispense medication and treat pain were selected from among more than 250 applications from medical device developers who accepted the challenge. This is one example of the FDA's commitment to addressing the opioid crisis and supporting advanced treatment options to patients suffering from acute or chronic pain.

Advanced technology procedures to treat pain, particularly in the geriatric population, are a critical concern. Used in terminal cancer patients, neurolytic blocks have been shown to significantly reduce pain, reduce opioid-related side effects and increase quality of life. [39] Radiofrequency (RF) ablation has been effectively used to mitigate non-cancer spinal pain particularly stemming from facet joints. Studies have demonstrated long-lasting efficacy of RF.[40] Additional pain management technologies include: implantable intraspinal drug infusion pumps; pulsed electromagnetic field (PEMF) therapy; and nerve stimulation interventions such as deep transcranial magnetic stimulation (TMS) therapy; and spinal cord stimulation (SCS).

Pain stemming from peripheral nerves or ischemia are among the most common reason to address pain through nerve stimulation. The gate theory of pain suggests that the balance of sensation coursing through both large and small neural fibers determines the sensation of pain and that retrograde stimulation of the large fibers can

modulate pain. Nerve stimulation induced reductions in pain sensation and severity as well as reduction of analgesics required have been determined.[41]

Conclusion

The practice of prescribing opioid medication for the treatment of chronic pain requires particular attention to older community-dwelling patients who are at increased risk for falls. Alternative, non-pharmacological and non-invasive interventions for the treatment of chronic pain must be fully considered and supported to not only combat the opioid crisis but to reduce the risk of fall related injuries and death in the over 65 population. Increased longevity has led to the rapid growth of the older population which is projected to be about 1 billion or 12 percent of the projected world population by 2030[42] which demonstrates the potentially significant impact of this critical medical and economic health challenge. Fortunately, a federal initiative such as the CDRH's Innovation Challenge to support the development of medical devices to detect, treat and prevent opioid addiction as well as address and treat pain is available to meet these challenges.

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