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Older Adults' Response to Adverse Opioid Related Events: A Secondary Analysis

Sarah R. Coughlin
University of Connecticut - Storrs, sarah_coughlin@rocketmail.com

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Sarah Rose Coughlin

University of Connecticut, Department of Allied Health Sciences in the College of Agriculture, Health, and Natural Resources, 358 Mansfield Road, Storrs, CT 06269-1101

sarah.r.coughlin@uconn.edu

Thesis Advisor: Deborah Dillon McDonald, RN, PhD

University of Connecticut, School of Nursing, 231 Glenbrook Road, Storrs, CT 06269-4026

deborah.mcdonald@uconn.edu

Honors Advisor: Valerie Duffy, RD, PhD

University of Connecticut, Department of Allied Health Sciences in the College of Agriculture, Health, and Natural Resources, 358 Mansfield Road, Storrs, CT 06269-1101

valerie.duffy@uconn.edu

Abstract

Background: Many older adults suffer from chronic pain, a disease treated with opioids. Older adults are also highly susceptible to opioid ADEs. Research addressing older adults' self-management of opioid ADEs is lacking.

Objectives: This study compared the opioid ADE profile found by the present research to those previously reported in the literature for older adults. It also described how older adults respond to opioid ADEs and the resulting outcomes.

Method: The study utilized a secondary analysis design to examine 15 opioid ADE cases from a pilot study that described older adults' responses to analgesic ADEs.

Results: Neurological ADEs, including dizziness (34%) and headache (20%), and gastrointestinal ADEs, such as constipation (27%), upset stomach (27%), and nausea (20%), were common. Older adults identified opioid ADEs by failing to recognize the ADE (20%), another person identifying the ADE (20%), and recognizing the ADE within a few days of its occurrence (20%). Responses included contacting a physician (40%), stopping opioid use immediately (34%), taking another medication to treat constipation (20%), and continuing use despite the ADE (20%). Outcomes associated with responses included ADE resolution (54%), administration of another analgesic (20%), and ADE persistence (20%).

Conclusions: The opioid ADE profile in older adults is similar to that of adults, but certain ADEs may be more common in older adults, including dizziness, upset stomach, and fatigue. Older adults may struggle to appropriately react to ADEs, resulting in poor chronic pain management. Future research should develop interventions to ensure older adults' safety in long-term opioid therapy.

Keywords: adverse drug event, ADE, analgesic, chronic pain, older adult, opioid

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Introduction

Pain is the most frequent cause of prolonged disability and the strongest motivator of healthcare utilization in the United States (National Institute of Health, 2013). While acute pain is characterized by brevity, chronic pain is distinguished by longevity. Precise definitions of chronic pain vary based on the source, but this thesis designates it as continuous or intermittent pain that persists for six months or longer. Research estimates that over 116 million Americans suffer from chronic pain, which is nearly four times the quantity diagnosed with diabetes and more than tenfold the number afflicted with cancer (American Diabetes Association, 2016; Institute of Medicine, 2011; National Cancer Institute, 2016). Common manifestations of chronic pain include, but are not limited to, low back pain, osteoarthritis, neuropathy, psychogenic pain, and fibromyalgia (National Institute of Neurological Disorders and Stroke, 2016).

As chronic pain is one of the most prevalent diseases in the United States, it is essential to understand the severely reduced quality of life that affected individuals face. All variations of chronic pain are associated with fatigue, reduced appetite, insomnia, diminished mood, and decreased mobility that interfere with the capacity to complete activities of daily living (Chronic Pain, 2011). Reduced ability to carry out everyday tasks likely contributes to the high comorbidity between chronic pain and mental illness that is disseminated throughout the literature (Dersh, Polatin, & Gatchel, 2002; Hooten, 2016; McWilliams, Cox, & Enns, 2003; Murphy, Sacks, Brady, Hootman, & Chapman, 2012). Recent research has also shown a strong association between chronic pain and obesity (Okifuji & Hare, 2015). These empirical relationships exhibit that chronic pain lowers quality of life through continual discomfort and biopsychosocial degradation, and highlight that disease-related research is imperative.

Chronic pain impacts every age cohort, but disproportionately burdens older adults (Bourgeois, Shannon, Valim, & Mandl, 2011). This age group encompasses individuals who are or have exceeded the chronological age of 65 in an industrialized country (World Health Organization, 2016). Research estimates differentiate chronic pain prevalence among younger and older adults in the United States, with 30% of the general population affected compared to 50% of community-dwelling older adults and 83-93% of institutionalized older adults (Abdulla et al., 2013). In other words, older adults are 20-63% more vulnerable to this disease than younger populations. It is significant that this demographic is inequitably impacted because it comprises the fastest growing age group in the United States (U.S. Census Bureau, 2011). As of 2015, older adults constituted 15% of the total population and expanded at a rate that was 22% faster than all others during the previous decade (U.S. Department of Health and Human Services, 2015). In fact, current research predicts the older adult population to exceed one in four adults by 2060 (U.S. Department of Health and Human Services, 2015). Considering the recent projection that chronic pain costs the nation 635 billion dollars in medical costs and productivity losses annually, it is concerning that this number will continue to inflate as the susceptible population doubles over the next four decades (Daubresse et al., 2014).

As the prevalence of chronic pain and its associated costs increase, personal and economic devastation will follow suit. Therefore, studies identifying effective treatments that improve quality of life and reduce economic strain are urgent. Because a cure for chronic pain has not yet been discovered due to its elusive, complex nature, standard treatment involves pain reduction with analgesic medication. The three analgesic drug classifications include non-steroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and opioids. The American Geriatrics Society's Beers Criteria for Potentially Inappropriate Medication Use in Older Adults

recently advised against long-term NSAID use in older adults with chronic pain due to high risk of gastrointestinal bleeding or perforation, peptic ulcers, and renal complications that positively correlate with duration of use (American Geriatrics Society Beers Criteria Update Expert Panel, 2015). In order to avoid these potentially life-threatening complications from NSAIDs, older adults are now advised to utilize acetaminophen as first-line analgesic therapy (American Geriatrics Society Beers Criteria Update Expert Panel, 2015). Even though acetaminophen is recommended over other analgesics for this population, the drug still has potential to cause harm. In fact, acetaminophen is the primary cause of acute liver failure in the United States (Yoon et al., 2016). The American Geriatrics Society has also reported cases in which long-term acetaminophen use in older adults resulted in renal toxicity (American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons, 2009). However, it is notable that acetaminophen-associated dangers are negligible when used as directed (American Geriatrics Society Panel on the Pharmacological Management of Persistent Pain in Older Persons, 2009). This relatively consistent safety profile is what earned acetaminophen the title of the "first-line" analgesic in older adults. While acetaminophen may be the least damaging pain medication for this population, it is also the least potent and often fails to provide adequate analgesia, forcing older adults to progress to second-line therapy (Oteo-Álvaro et al., 2012).

The third class of analgesics, opioids, are recommended in older adults as a second-line alternative when more potent analgesia is required to achieve sufficient chronic pain management (American Geriatrics Society Beers Criteria Update Expert Panel, 2015). However, Beers criteria advocate against opioid therapy in older adults with a history of falls and fractures, as opioids are known to elevate risk for these events (Miller et al., 2011). The American Geriatrics Society's reservations regarding the safety of prescription opioid use in older adults is

warranted, considering that five percent of all adverse drug events (ADEs) in ambulatory care result from short or long-term opioid use (Gurwitz et al., 2003). The U.S. Department of Health and Human Services defines an ADE as "an injury resulting from medical intervention related to a drug…[including] medication errors, adverse drug reactions, allergic reactions, and overdoses" (Office of Disease Prevention and Health Promotion, 2017). Opioid ADEs range in severity from mild to life threatening and commonly include constipation, nausea, headache, dizziness, and respiratory depression in adults (Kane-Gill et al., 2014). A study by Gregorian and colleagues (2010) disclosed that 96% of adults taking opioids for chronic pain experienced at least one ADE and 79% experienced two or more, elucidating a startlingly high prevalence. Tremendous pervasiveness of opioid ADEs in adults suggests a similar, likely heightened, pattern among older adults.

As opioid use and attributed ADEs continue to increase, short-term clinical trials and long-term open label trials centralizing on opioid use for chronic pain management in adults have had an increasing presence in the literature. While most studies agree that opioids are generally efficacious and safe for adults, all report ADE incidence varying from 8% to 30%, depending on the study and the specific ADE (Avouac, Gossec, & Dougados, 2007; Buynak et al., 2015; Papaleontiou et al., 2010; Rauck et al., 2014; Wen, Sitar, et al., 2015; Wen, Taber et al., 2015). It is significant to emphasize that studies specifically focusing on opioid use in older adults are scant. While most research includes older adults in the sample, the proportion of participants is typically small. Additionally, statistical analysis using age as a covariate for opioid efficacy and safety is rare. Lastly, pharmaceutical companies that manufacture opioid medications fund an overwhelming majority of the studies, thereby publishing conclusions with questionable validity.

As a result, evidence that opioid therapy is appropriate for long-term chronic pain management in older adults is modest at best.

Caution should be exercised when extending opioid safety findings in adults to older adults because this subgroup has elevated ADE susceptibility compared to younger populations. Increased risk for ADEs among this cohort arises from many sources, namely the polypharmacy phenomenon, age-related pharmacological changes, and high rates of opioid utilization relative to other age groups. Because older adults are at enhanced risk for most chronic diseases, including diabetes, cancer, cardiovascular disease, dementia, and arthritis, many administer multiple medications at once, or engage in polypharmacy, to treat each comorbid condition (Centers for Disease Control and Prevention, 2013; Hajjar, Cafiero, & Hanlon, 2007). Qato and colleagues (2008) reported that over 50% of community dwelling older adults take five or more medications at once and the prevalence of this phenomenon steadily increases with age. Using multiple medications at once is dangerous because it increases the risk for drug-drug interactions to occur, which may manifest as ADEs. Older adults are also at elevated risk for ADEs because aging alters physiology, slowing down metabolism of medication (Kaye, Baluch, & Scott, 2010; Mangoni & Jackson, 2004). As metabolism decelerates, medication lingers in the body longer than in a younger patient, making a medication dose appropriate for an adult inappropriate for an older adult. If dosage is not personalized for age and metabolic rate, the older adult may overuse and develop an ADE. Most saliently, older adults are more likely to experience ADEs simply because chronic pain and consequential opioid therapy are more prevalent in this cohort relative to others (Abdulla et al., 2013).

While few studies have justified opioids as safe for older adults and this group is known to have increased ADE susceptibility compared to younger adults, the number of opioid

prescriptions for older adults continues to rise in the United States (Bicket & Mao, 2015). This is reflected by the four-fold upsurge in opioid prescriptions from 1999 to 2014 reported by the Centers for Disease Control and Prevention (Frenk, Porter, & Paulozzi, 2015). Prescriptions for opioids currently exceed 240 million per year, which is more than there are adults in the United States (U.S. Department of Health and Human Services, 2016). Considering that opioid ADEs in older adults increase alongside opioid prescriptions, it is concerning that little is known about ADE self-recognition and response in this population. As a result, the literature is unable to determine if reported rates of opioid ADEs among older adults are valid or if opioid ADEs are being resolved or left untreated. This research is needed to create a clear picture of opioid safety among older adults and provide rationale to develop interventions, if needed.

Although self-identification of ADEs and appropriate management (i.e., seeking advice from a healthcare practitioner) may seem commonsensical, this is not necessarily the case. Two prospective cohort studies that analyzed differences between patient and practitioner AE reporting suggested that adults are able to identify AEs, but failed to discuss how they self-identified and self-managed such events. It is also debatable whether or not these findings were generalizable to older adults or opioid therapy specifically (Weingart et al., 2005; Weissman et al., 2008). Another study reported that adults exposed to an educational intervention had greater AE self-efficacy than those who were treated with routine care, suggesting that AE self-management may be less self-evident and more complex than it seems (See et al., 2014). Only one study to date has described chronic pain patients' ability to self-identify and self-manage opioid ADEs. This study found that a mere 16% of patients reported an opioid ADE after identifying it, indicating that response, and potentially pain management outcome, may be inadequate among adults and older adults (Gregorian et al., 2010).

It is important to determine whether older adults self-identify and respond appropriately to opioid ADEs because failing to do so presents many dangers. Most evidently, making assumptions that older adults are able to self-manage ADEs and that opioids are safe for them without proof directly harms this population. If older adults are truly failing to recognize and appropriately manage ADEs, the cost of opioid utilization for chronic pain may outweigh the benefit, resulting in a treatment that does more harm than good. If research does not provide answers to these questions, ADEs may continue to go underreported and long-term opioid therapy in older adults will seem safer than it truly is. As the afflicted population increases, this misconception could harm millions of older adults worldwide. Studying older adults' response to opioid ADEs is also justified because 10% of hospitalized older adults visit the emergency room due to an opioid ADE, making opioids one of the "drug classes most often associated with causing harm in the hospital setting and occurring out of proportion with the frequency prescribed" (Bayoumi, Dolovich, Hutchison, & Holbrook, 2014, p. 217). If older adults knew how to self-identify and respond to ADEs appropriately when they first surfaced, the number of opioid-related emergency room visits could drastically decrease, along with the massive costs associated with these visits. Seemingly mild opioid ADEs are also significant due to the threat of secondary or worsening conditions that can develop from ADEs, which require further healthcare utilization and economic burden for both afflicted individuals and the U.S. economy. Treatment of secondary conditions likely contributes substantial health costs that could be avoided if older adults managed ADEs early on in an outpatient setting. As older adults comprise the age group that utilizes healthcare the most and is growing at the fastest rate, it is essential to prevent unnecessary harm and needless use of healthcare among this cohort if possible (U.S. Census Bureau, 2011).

Overall, research addressing how older adults self-identify and respond to opioid ADEs is vital to safeguard current older adults' health, prevent further health deterioration, and keep related medical costs at bay. It is alarming that research does not yet exist that investigates this capability, or lack thereof, in older adults. It is also concerning that the literature lacks adequate support for long-term opioid therapy in older adults and safety among this cohort remains questionable. Therefore, the purpose of this secondary data analysis was to describe the opioid ADEs that older adults are experiencing, older adults' ability to recognize opioid ADEs, how they respond to opioid ADEs once identified, and the outcomes that result from responses. Findings from this study afforded insight into whether current studies that conclude opioids are safe for all adult subgroups are accurate. This study also aided in determining whether clinical interventions are required to ensure that older adults are competent in opioid ADE recognition and proper response protocol.

Literature Review

The following review of literature investigates the most recent research regarding efficacy and safety of opioid medications in older adults and patient self-identification of adverse events (AEs). These subtopics are essential not only to demonstrate the current adequacy and safety profiles of opioids for treatment of chronic pain in older adults, but also to highlight the gaps in the literature regarding older adult identification of and response to opioid ADEs.

Opioid Medications for Chronic Pain Management in Older Adults

A recent announcement from the American Geriatrics Society that deemed NSAIDs as inappropriate chronic pain treatment in older adults encouraged the advent of research focusing on opioid medication as an alternative intervention (American Geriatrics Society Beers Criteria Update Expert Panel, 2015). The literature regarding the efficacy and safety of opioids for older

adults is incomplete, but so far generally consistent. A meta-analysis conducted by Avouac, Gossec, & Dougados (2007) analyzed 18 randomized clinical trials (RCTs) from 1966 to 2006 that studied the efficacy and tolerability of opioids versus placebo to treat osteoarthritis in adults. These trials in total assessed nearly 5000 subjects, and although the meta-analysis focused on adults in general, the average age of subjects was over 60, indicating older adult representation in the sample. The analysis found that opioids reduced pain intensity and improved physical functioning compared to placebo (Avouac, Gossec, & Dougados, 2007). The researchers also reported nausea (30%), constipation (23%), dizziness (20%), somnolence (18%), and vomiting (13%) as the most common ADEs. Additionally, about 25% of subjects randomized to opioid treatment discontinued participation due to ADEs, while the rate of attrition in placebo subjects was only seven percent (Avouac, Gossec, & Dougados, 2007). A notable strength of this study was its exclusive analysis of randomized clinical trials (RCTs). Studies with control groups, blinding, randomization, and placebo-control allow for causal-relationships to be made, and pooling data together from multiple RCTs further enhances validity. While this meta-analysis provided empirically strong data that suggest opioids may be an appropriate treatment for osteoarthritis in adults, it is also important to mention that the studies in this analysis were mostly short-term, failed to analyze subgroups based on covariates such as age, and were nearly unanimously funded by pharmaceutical companies. These weaknesses warrant questioning of validity and reliability, and limit practical implications to short-term opioid usage in adults only. Because chronic pain, by definition, does not cease, further inquiry is necessary to validate long-term opioid therapy in adults. Additionally, because this meta-analysis did not centralize on older adults or provide separate data regarding this subgroup, it is unknown if treatment is appropriate for this particular cohort.

Papaleontiou et al. (2010) published a meta-analysis that was very similar in purpose, method, and findings to Avouac, Gossec, & Dougados (2007). It compensated for a shortcoming of the aforementioned study by analyzing 18 RCTs that either specifically focused on older adults or separately reported a subset of data pertaining to older adults. Although the targeted population differed between the studies, many of the conclusions were the same. For example, both studies determined that opioids improved physical functioning and decreased pain intensity. ADE profiles and ADE-attrition rates were also analogous among opioid and placebo groups in both meta-analyses (Avouac, Gossec, & Dougados, 2007; Papaleontiou et al., 2010). These consistencies indicate that opioids provide effective analgesia in older adults and that the probability of attrition due to an ADE does not change with age. Therefore, it can be deduced that opioids likely provide comparable analgesia independent of age, which supports use of opioids among older adults.

Papaleontiou et al. (2010) also contributed findings that are distinct from those published by Avouac, Gossec, & Dougados (2007). The researchers observed that older adults taking opioids suffered a significant decline in mental health compared to placebo (Papaleontiou et al., 2010). This implies that opioids may be especially dangerous for older adults, a subgroup that is already known to suffer from mental illness at a high rate and has very restricted access to mental health services (Karel, Gatz, & Smyer, 2012). Also, when ADEs were specifically analyzed with age as an effect, it was found that some ADEs were more frequent among older adults, including constipation, fatigue, anorexia, somnolence, and vomiting (Papaleontiou et al., 2010). This suggests that older adults might be more vulnerable to certain opioid ADEs compared to younger groups. While specific studies that address this hypothesis exceed the realm of this discussion, it is important to note that the scientific community largely validates it

(Charlesworth et al., 2015; Frenk, Porter, & Paulozzi, 2015; Liukas et al., 2008). Lastly, Papaleontiou et al. consolidated the literature regarding older adult opioid abuse and observed that older adults may be less likely to suffer from opioid addiction compared with other age groups. This finding, if true, would discredit the argument that opioid use for chronic pain in older adults should be avoided due to legitimate risk of addiction. While this study provided strong evidence for opioid tolerability and effectiveness among older adults due to its meta-analytic nature, it had a few notable weaknesses that necessitate additional studies. A small percentage of the RCTs analyzed were originally centralized on older adults; many studies simply conducted a post hoc analysis to analyze if age had an effect on outcomes. Similar to Avouac, Gossec, & Dougados, the data in this study were collected over a short time span, which prohibited long-term implications from the findings. Lastly, akin to Avouac, Gossec, & Dougados, pharmaceutical companies funded a large percentage (78%) of the analyzed studies. The power these constraints hold over validity, reliability, and relevance of the data call for further development of the literature.

While Avouac, Gossec, & Dougados (2007) and Papaleontiou et al. (2010) contributed very useful findings regarding short-term efficacy and safety of opioids in younger and older adults, they left questions concerning long-term efficacy, specifically in older adults, to be answered. Buynak et al. (2015) and Wen, Taber, Lynch, He, & Ripa (2015) attempted to address the long-term efficacy issue by conducting yearlong open label studies that investigated the effectiveness and safety of orally administered opioids in the treatment of moderate to severe chronic pain in adults. While both studies lasted one year, Buynak et al. was an extension study and therefore some participants from this trial were medicated with opioids for up to two years. Buynak et al. and Wen, Taber, et al. had large sample sizes of 1154 and 922, respectively, and

14.5% to 17% were 65 years or older, indicating older adult representation. Both studies found that opioids consistently reduced pain severity compared with placebo and concluded that opioid medication was an effective long-term treatment for adults with moderate to severe chronic pain (Buynak et al., 2015; Wen, Taber, et al., 2015).

However, opioid efficacy in these open label trials was not without ADEs. Both studies reported similar ADE profiles that are typical of opioid medication but at differing rates. Buynak et al. (2015) reported headache, nausea, and constipation at 13%, 12%, and 11%, respectively. Conversely, Wen, Taber, et al. (2015) reported much higher rates of ADEs, including nausea, constipation, dizziness, vomiting, somnolence, headache, and fatigue at 24%, 21%, 12%, 11%, 11%, 9%, and 8%, respectively. Rates reported by Wen, Taber, et al. are comparable to those reported in the previously reviewed meta-analyses, whereas those reported by Buynak et al. are lower (Avouac, Gossec, & Dougados, 2007; Papaleontiou et al., 2010). However, these differences may be due to the fact that Buynak et al. was an extension trial, meaning that some participants had been medicated with opioids for nearly twice of long as participants from Wen, Taber, et al. This hypothesis is backed by the negative correlation between time on opioid and occurrence of ADEs that Buynak et al. reported. On another note, Buynak et al. and Wen, Taber, et al. were similar in that they reported occurrence of serious ADEs not mentioned in the meta-analyses: Seven to eight percent of subjects in both studies experienced ADEs leading to hospitalization, a medically significant diagnosis, or death, but it is unknown if these ADEs were related to the opioid regimen. These complications resulted in 13% attrition, which is lower than in the meta-analyses (Avouac, Gossec, & Dougados, 2007; Buynak et al., 2015; Papaleontiou et al., 2010; Wen, Taber, et al., 2015). The evidence for adequate pain relief and relatively low frequency of ADEs in both long-term studies supports long-term efficacy and moderate safety of

opioids among adults (Buynak et al., 2015; Wen, Taber, et al., 2015). Strengths of these studies included medium sample size, which eliminated sampling bias, and longitudinal design, which allowed measurement of long-term efficacy. Both of these studies were limited by open label nature in which they lacked experimental control, randomization, and blinding. This meant that causal relationships could not be concluded and that bias may have impacted results. One of the largest shortcomings of both studies was that they failed to specifically focus on older adults, which warrants questioning if findings are extendable to this age group. An additional drawback was that a pharmaceutical company funded both trials, akin to previously discussed studies.

The literature search failed to locate recent RCTs examining opioid efficacy and safety for chronic pain in older adults, but found two nearly identical studies that targeted adults generally. Rauck et al. (2014) and Wen, Sitar, Lynch, He, & Ripa (2015) both investigated the analgesic efficacy of hydrocodone, another oral opioid, in adults with chronic low back pain (CLBP) through twelve-week long, randomized, placebo-controlled, and double blind trials. The studies were composed of 510 and 439 adults with an average age of 49 and 47, respectively, indicating a lack of older adult participation. Half of the participants were randomly assigned to the experimental condition and the rest were given placebo. Efficacy of analgesia was evaluated based on the difference between pain intensity scores during titration and maintenance phases (Rauck et al., 2014; Wen, Sitar, et al., 2015). Control participants reported the largest changes in pain intensity during the maintenance phase of the studies, indicating that placebo was an inadequate pain reducer. The researchers in both studies concluded that hydrocodone was an effective treatment for CLBP (Rauck et al., 2014; Wen, Sitar, et al., 2015). These studies also reported similar ADE profiles at rates comparable to those of Buynak et al. (2015). Also notable is that two to six percent of the placebo group participants experienced withdrawal symptoms

after being weaned off of the opioid from the titration phase (Rauck et al., 2014; Wen, Sitar, et al., 2015). Unfortunately, the ages of participants that experienced withdrawal symptoms were not recorded and therefore further research is required to determine if a relationship exists between age and likelihood of opioid addiction. Both of these studies provided high quality evidence to suggest that opioids are safe and efficacious for short-term use in adults (Rauck et al., 2014; Wen, Sitar, et al., 2015). Strengths of these studies included medium sample size, which likely eliminated sampling bias, measures to ensure valid experimental conclusions, and literary currency. Limitations of these RCTs were that they were conducted over a short timeframe that was not long enough to establish long-term efficacy, similar to both meta-analyses cited earlier, and underrepresentation of older adults, similar to Avouac, Gossec, & Dougados (2007), Buynak et al., and Wen, Taber, et al. (2015). Lastly, like all studies outlined so far, both studies declared a conflict of interest that pharmaceutical companies provided funding.

The last study that will be discussed concerning opioid safety and efficacy is a post-hoc analysis by Broglio et al. (2017) that interpreted data specifically pertaining to older adults from Wen, Taber, et al. (2015), which was previously detailed in this review. Broglio et al. found that, similarly to the general adult population, long-term use of opioids was effective and generally safe in older adults aged 75 and older. However, seven out of the 24 older adults (29%) withdrew from the original study due to ADEs compared to a mere 13% of general participants (Broglio et al., 2017). This differential between younger and older adults suggested that older adults experience more serious ADEs, are more concerned about ADEs, are better at recognizing ADEs, or are more likely to stop taking a medication when it has adverse effects. This post-hoc analysis also found that 71% of the older adults in the study experienced ADEs compared to 84% of all participants from the original study (Broglio et al., 2017). This suggested that older adults

experience fewer ADEs than other age cohorts. This judgment may seem counterintuitive considering the large body of research mentioned earlier that discusses why older adults experience ADEs at higher incidence. However, the 16% greater attrition rate among older adults compared to other subgroups could have impacted the accuracy of reported ADE rates (Broglio et al., 2017). It is plausible that older adults who experienced ADEs initially dropped out of the study and the remaining older participants were less likely to experience an ADE. This phenomenon would have reduced the ADE rate among older adults when it was truly equal or higher than that of general adults. This hypothesis points out the limitations of this post-hoc analysis: the small sample size of older adults compromised generalizability to the entire population and likely interfered with the accuracy of the results due to sampling bias. Additionally, as the original study was an open label trial that lacked blinding, experimental control, and randomization, this analysis had questionable validity and reliability as well. Therefore, while observational patterns from this study are significant, they may not reflect actual incidence of ADEs in younger and older adults. Further original research specifically focused on older adults is required to gain a much more comprehensive grasp on the efficacy and safety of opioid medications for this group.

In summary, the literature regarding opioid efficacy and safety for the management of chronic pain in older adults is under-developed. While enough RCTs have been conducted to justify meta-analyses, most of the studies included in these analyses focused on adults generally rather than older adults specifically (Avouac, Gossec, & Dougados, 2007; Papaleontiou et al., 2010). The most recent trials studying opioid safety and efficacy were also focused generally on adults and either produced results with high experimental validity or long-term efficacy, but never both (Buynak et al., 2015; Rauck et al., 2014; Wen, Sitar, et al., 2015; Wen, Taber, et al.,

2015). Due to the lack of research that is focused on determining whether long term opioid use is safe for chronically pained older adults, this subset still must be monitored when prescribed opioids to ensure safety and adequate pain relief.

All studies detailed in this review found similar profiles of ADEs that are characteristic of opioids, but rates of ADEs varied. This inconsistency warrants further research to indicate which factors are mediating it, but it likely could involve sample size, study design, and time frame. Additionally, studies reported conflicting findings about whether older adults experience ADEs at higher or lower rates than other cohorts; Papaleontiou et al. (2010) found that older adults experience some ADEs at higher rates than younger cohorts and Broglio et al. (2017) observed that older adults experience less ADEs in comparison to the entire study sample. While Papaleontiou et al. is more reliable due to its greater sample of older adults (8690 to 24) and study design, this comparison still creates a discrepancy. Regardless, it is clear that older adults may experience ADEs differently than other demographics and there is a large possibility that they are at a higher risk for developing them. It is concerning that many older adults are currently taking opioids daily to treat chronic pain if research studying opioid safety in older adults is lacking. Therefore, it is significant that older adults understand the risks of taking opioids, how to identify an ADE when it occurs, and the correct protocol to follow to achieve a successful outcome. While there is currently little research that addresses self-identification of opioid ADEs, there are a few general studies that discuss how patients may self-identify AEs. These studies are discussed next.

Patient Self-Management of Adverse Events in Healthcare

The literature regarding patient self-management of healthcare-related AEs is extremely limited. An in-depth literature search only surfaced one study that described chronic pain

patients' self-management of opioid ADEs. This descriptive Internet-survey by Gregorian et al. (2010) investigated how analgesic efficacy and ADE frequency influence adult acute or chronic pain patients' and practitioners' preferences for various oral opioids. The researchers found that low ADE frequency was more important to patients than analgesic efficacy, which indicates that opioid ADEs noticeably interfere with quality of life (Gregorian et al., 2010). The study also reported that 19% of chronic pain participants failed to achieve adequate analgesia from opioids (Gregorian et al., 2010). This finding provides merit to question opioid efficacy in adults. The study also concluded that "physicians may not be fully aware of the side effects experienced by their patients," with 96% of chronic pain patients reporting at least one opioid ADE and healthcare practitioners estimating significantly lower ADE incidence (Gregorian et al., 2010, p.1103). Specifically, while 50% of participants reported nausea as an ADE, healthcare practitioners only estimated that 25-29% of opioid users would experience this (Gregorian et al., 2010). Discrepancy between patient and provider realities, in addition to the finding that only 16% of chronic pain patients sought healthcare after experiencing an opioid ADE, exposes that many ADEs are self-managed by patients and therefore go unreported (Gregorian et al., 2010). This opioid ADE reporting inaccuracy may contribute to medical professionals' assumption that opioid therapy is much safer than it actually is.

Gregorian and colleagues (2010) contributed many findings that are salient to the current study and provided good quality data due to its medium sample of over 600 participants. Nevertheless, there are some drawbacks worth mentioning. The survey was dichotomous in that pain patients were asked whether they contacted a physician or not, instead of generally asked how they identified the ADE and how they responded to it. Framing survey questions so that they require binary responses may cause important information regarding the ADE to be omitted.

Additionally, this study failed to ask follow-up questions regarding the outcomes that were associated with these actions, which was vital to understanding the entire ADE experience. Another disadvantage that this study presented was the Internet-survey design, which limited participation to those who had Internet-access. This likely impeded extensive older adult participation, considering that only 53% of older adults are estimated to have Internet-access (Zickuhr & Madden, 2012). The internal validity of the survey was also questionable because a survey design does not control for confounds that may impact results. Another shortcoming was that the mean age of the sample size was only 48 years old. While it was mentioned that chronic pain participants were significantly older than acute pain participants, and an inclusion criterion specified that participants must be age 18 or older, the mean age of the chronic pain patients was not identified specifically. Furthermore, age was not a statistical covariate and therefore findings specific to older adults were not presented or discussed. This exposes a substantial barrier in extending the findings of Gregorian et al. to the older adult population.

In addition to Gregorian et al. (2010), a few other recent studies contribute to the patient ADE self-management discussion, even though they do not specifically address ADEs. See et al. (2014) conducted a pretest-posttest experiment in which a group of 67 adult hospital patients, 16% of which were older adults, were randomized to either routine care or intervention. Routine care consisted of typical instructions from a healthcare provider regarding the steps a patient should take when feeling ill. Intervention involved education about awareness and early identification of AEs, recognition of AE exacerbation, and timely report to healthcare practitioners. The researchers found that, compared to baseline, patients in the intervention had significantly higher self-efficacy to self-identify and report worsening acute conditions than patients in the control group (See et al., 2014). Success of this intervention suggests that relevant

education boosts patients' confidence to recognize and report AEs. Because patients experience symptoms firsthand, they have the potential to be aware of AEs before practitioners. Therefore, improving patient self-identification would help to ensure early intervention and potentially better health outcomes. While this study did not focus on outpatient older adults or ADEs, it still addressed patient ability to self-recognize AEs and how confidence and motivation may be mediators of this ability. It also suggested that ADE self-recognition and appropriate response are not as simple as they seem. Through this finding, See et al. highlighted the importance of the current study: understanding how older adults recognize and respond to opioid ADEs may provide information that can enhance interventions and general health outcomes associated with opioid pain management.

Two prospective cohort studies that compared patient self-report of AEs to medical record report of AEs during hospital stays were also found during the literature search (Weingart et al., 2005; Weissman et al., 2008). The purpose of these studies was to determine if hospital patients are able to self-identify AEs and if AEs occur unbeknownst to healthcare providers. Both studies collected data on about 230 patients through direct patient interview during or after hospital stays and analysis of patient medical records. In Weingart et al., medical records were only able to verify 40% of all AEs reported by patients. Weissman et al. reported more concordance between medical records and patient self-report, with a 77% match. While the agreement between patient self-report and medical record history is largely different between these two studies, it is evident that many AEs are either self-identified by patients and unreported or undocumented by healthcare professionals. These studies both concluded that patients are likely able to identify AEs that occur during healthcare (Weingart et al., 2005; Weissman et al., 2008). Even though these studies did not specifically address ADEs, this research is still relevant

because patient ability to self-recognize AEs may generalize to ADEs too. These studies are further pertinent because the average age of participants in both studies was over 60, which indicates older adult representation and potential to extend findings to older adults. It is important to note, though, that this research may not be particularly salient because it was conducted in a hospital setting, in which AEs are likely more severe than those that might develop from an outpatient opioid regimen. As the severity of an AE increases, it likely becomes more apparent. Therefore, it may have been easier for subjects in these studies to identify AEs than it would be for older adults to recognize opioid ADEs in an outpatient setting.

To outline the findings regarding patient self-management of AEs in healthcare, only four relevant studies were found through the literature search. Gregorian et al. (2010) was most salient to the current study's purpose by specifically describing chronic pain patients' responses to opioid ADEs. It concluded that doctors are unaware of the high frequency at which ADEs occur in patients taking opioids for chronic pain. The study also disclosed that most chronic pain patients self-manage ADEs without healthcare intervention. Lastly, the study revealed that opioids do not provide adequate pain relief in a significant amount of adults, suggesting that efficacy, not only safety, is questionable (Gregorian et al., 2010). See et al. (2014) found that hospital patients, including older adults, have more self-efficacy to report AEs after an educational intervention compared to patients treated with routine care. The two prospective cohort studies mentioned found that patient self-reports and medical record reports of AEs are not very comparable (Weingart et al., 2005; Weissman et al., 2008). This incompatibility indicates that patients may be self-recognizing AEs and failing to report them or healthcare practitioners may be neglecting to document AEs that occurred. All four of these studies investigated patient ability to self-recognize and report AEs, but only one specifically studied

opioid ADEs. Additionally, while older adults were included in the sample populations, they were not focused on exclusively. These studies highlighted adults' ability to recognize and report AEs to healthcare practitioners and emphasized the complexity of patient self-identification of AEs. It is unknown if these findings can be extended to include older adults.

Summary and Predictions

Synthesis of the current scientific literature concerning long-term opioid therapy for chronically pained older adults and self-recognition of opioid ADEs among older adults discloses that relevant research is lacking. While many studies included the older adult demographic, this cohort was rarely exclusively studied. Research on opioid efficacy and safety is growing and there is modest evidence to suggest efficacy and tolerability among older populations. However, Papaleontiou et al. (2010) found that older adults are more susceptible to certain ADEs, and, as previously mentioned, this hypothesis is gaining empirical backing in the pharmacology and polypharmacy fields. The shortcomings of the current studies that address opioid efficacy and safety reviewed here call attention to the need to continue screening older adults for efficacy and tolerability of opioid medication, specifically occurrence of ADEs. Recent studies that concentrate on patient self-identification of AEs are very limited. Opioid ADEs were only centralized on in one study, and considering how pervasive they are, future studies should focus on this specific type of AE. While the reviewed studies made it clear that patients are likely to self-identify AEs, it is still unclear how patients do this. The literature also lacked empirical evidence regarding actions older adults take once they realize they are having an ADE and the outcomes that result from these actions. While these gaps in the literature exist for all populations, answers pertaining to older adults are particularly salient because this population is more vulnerable to experiencing ADEs, as discussed earlier.

Therefore, the purpose of this secondary data analysis was to describe the opioid ADEs that older adults experience, how and if older adults identify and respond to these, and the outcomes that result from the actions that older adults take. Based on the review of literature, this secondary analysis expected to find that most older adults experience the typical opioid ADE profile that has been previously reported in the literature for adults, including nausea (12-30%), constipation (11-23%), dizziness (12-20%), somnolence (11-18%), vomiting (11-13%), headache (9-13%), and fatigue (8%) (Avouac, Gossec, & Dougados, 2007; Buynak et al., 2015; Papaleontiou et al., 2010; Rauck et al., 2014; Wen, Sitar, et al., 2015; Wen Taber et al., 2015). As Papaleontiou et al. (2010) found that constipation, fatigue, somnolence, and vomiting were more common in the older adults and evidence suggests older adults experience ADEs at higher rates, these ADEs were anticipated to occur more frequently than others in the current study (Papaleontiou et al., 2010). The present study also expected older adults to successfully identify ADEs, but fail to respond to them in appropriate manner by seeking out healthcare (Gregorian et al., 2010; See et al., 2014; Weingart et al., 2005; Weissman et al., 2008). These poor ADE responses would presumably result in poor outcomes, in which many older adults' ADEs would endure unresolved and chronic pain management would remain inadequate (Gregorian et al., 2010).

Method

Design

The current study utilized a descriptive secondary analysis design. A pilot survey describing how older adults identify and respond to analgesic ADEs supplied the data. The current study specifically focused on opioid ADEs among older adults.

Sample

The sample included surveys from the original study that described 15 community dwelling older adults' experiences with opioid ADEs during chronic pain management. The present study detailed surveys from individuals who were age 65 or older, endured chronic pain for 6 months or longer presently or in the past, experienced an ADE to an opioid prescribed for chronic pain, and were able to comprehend written and spoken English adequately.

Procedure

Original Pilot Survey Procedure

The Institutional Review Board at the University of Connecticut approved the original pilot study. The recruitment process involved approaching seniors, explaining inclusion criteria, and inquiring about interest in participation. If a senior met inclusion criteria and expressed interest in an interview, the interviewer obtained informed consent and conducted the 20-minute interview in a private setting, or at a later date over the phone, to maintain privacy and dignity. The survey created for the original study was called the *Problem Pain Medication Survey (PPMS)* and it collected information on demographics, including age, sex, education level, marital status, race, and ethnicity, medical history, and the analgesic that caused the ADE. It additionally required subjects to respond to the following five open-ended questions regarding ADE experience:

> *Tell me everything that you can recall about how you first identified that you were having a negative response to the pain medication.*
>
> *Describe your negative response to the pain medication as completely as possible.*
>
> *Tell me the actions that you took in response to your negative pain medication response.*
>
> *Tell me what happened as a result of your actions.*

Is there anything else that might be helpful for us to understand about your negative experience with the pain medication?

Trained interviewers recorded responses on survey forms by hand or computer during the interviews to ensure maximal accuracy and clarity. After surveys were completed, raters independently coded the responses and disagreements were discussed to consensus. Subjects were not compensated for participation. Descriptive data on older adults' identification and response to analgesic ADEs were previously analyzed, but opioid ADE data was interpreted collectively with other analgesic classes rather than singularly.

Present Study Procedure

This secondary analysis isolated the 15 opioid ADE cases from the primary study to determine patterns confined within this specific subset of data. The Institutional Review Board at the University of Connecticut approved the research. The current study had a four-month timeline from January 2017 to May 2017. This included secondary data analysis of a subset of the original study's data, thesis completion, and submission for publication.

Analyses

The Statistical Package for the Social Sciences (SPSS, version 23) was used to perform data analyses in the original and present studies. Descriptive statistics were utilized to generate means and frequencies that portray age, sex, education level, marital status, medical history, number of comorbidities, medication allergies, current prescription medications, opioids that caused ADEs, ADEs experienced, mechanisms and timing of identification of ADEs, responses to ADEs, and outcomes that resulted from responses to ADEs.

Results

There were 15 viable opioid ADE cases from the primary study. Of these cases, the mean age was 77.1 with a standard deviation of 9.92. Of the 15 participants, three were male and 12 were female. Most participants, 80%, identified as Caucasian, and the other 20% identified as African American. Nine of the 15 cases indicated an ethnicity and all identified as non-Hispanic. Seven of the participants were married, five were widowed, two were divorced, and one was separated from a significant other. Seventy-three percent of participants were educated through high school, three received a baccalaureate degree, and one earned an associate's degree.

All individuals in the sample identified comorbidities and the mean number of diagnoses aside from chronic pain was greater than five. The majority of participants identified four to seven comorbidities and the range was one to nine. The most frequent comorbid diagnoses that participants reported included arthritis, hypertension, hearing loss, stomach-related diagnoses, cardiomyopathy, vision loss, and insomnia. Frequencies of all comorbidities are displayed in Table 1. All participants in the sample wore glasses, with 11 wearing them all the time and the other four only during reading. Seven individuals reported a medication allergy, with five people indicating an allergy to penicillin, one to codeine, and one to sulfa drugs. Of these participants, four reported a second medication allergy.

The opioid medications that caused the most frequent adverse responses included oxycodone, hydrocodone, and tramadol. Other opioid medications that caused ADEs can be viewed in Table 2. These percentages add up to greater than 100 percent because four of the 15 participants had ADEs to two or more opioid medications. In addition to ADEs to opioid medications, four of these individuals also had an ADE to a non-opioid analgesic (see Table 3).

The manner in which the ADE to the opioid analgesic was identified differed among participants. The most frequent ways in which ADEs were recognized were failing to identify the

ADE, another person identifying the ADE, and identifying the ADE within a few days of its occurrence. Ways of identifying ADEs are displayed in Table 4. The percentages indicated in the table add up to greater than 100 because one individual indicated two ways in which the adverse response was identified.

Participants reported at least one but up to seven ADEs to the opioid medications. The most frequent ADEs included dizziness, upset stomach, constipation, nausea, and headache. ADEs can be viewed in Table 5. Percentages add up to greater than 100 because eight individuals experienced two ADEs, seven individuals experienced three ADEs, three individuals experienced four ADEs, two individuals experienced five ADEs, and one individual experienced seven ADEs.

The actions that participants took in response to the ADEs that they experienced varied. The most frequent actions that individuals took included contacting a physician, stopping medication use immediately, taking a medication to treat constipation, and continuing medication use despite the ADE. Actions can be seen in Table 6. Percentages add up to greater than 100 because eight participants reported taking two actions, four participants reported taking three actions, and one participant reported taking four actions as a result of the ADE.

The outcomes that resulted from the actions that participants took in response to ADEs were diverse as well. The most frequent outcomes included resolution of ADE, administration of another analgesic, and continuation of the ADE. Outcomes can be viewed in Table 7. The percentages do not add up to 100 because six participants reported two outcomes and one participant reported three outcomes.

Discussion

As predicted, the current study concluded that older adults experience many of the same opioid ADEs that other research has commonly reported for adults. However, the most common opioid ADEs reported by prior studies for adults did not match up with the most frequent ADEs reported by the present study for older adults. Opioid ADEs that were most common among older adults in the current research included dizziness (34%), constipation (27%), upset stomach (27%), headaches (20%), nausea (20%) and fatigue (14%). The opioid ADEs that were most common in the literature for adults were nausea (12-30%), constipation (11-23%), dizziness (12-20%), somnolence (11-18%), vomiting (11-13%), headaches (9-13%), and fatigue (8%) (Avouac, Gossec, & Dougados, 2007; Buynak et al., 2015; Papaleontiou et al., 2010; Rauck et al., 2014; Wen, Sitar, et al., 2015; Wen, Taber, et al., 2015). While Papaleontiou et al. found that older adults are at increased risk for developing constipation, fatigue, vomiting, and somnolence from opioid therapy, the present study only supported increased frequency of constipation and fatigue and found contradictory evidence that supports decreased frequency of vomiting and insomnia. All of this evidence indicates that older adults may have a unique opioid ADE profile in which they are more vulnerable to some specific ADEs, such as dizziness, upset stomach, headaches, and fatigue, than other populations. Additionally, the present research described many severe opioid ADEs that were not mentioned in the literature, suggesting that more damaging ADEs may be frequent among older adults. These included internal bleeding, feeling faint, respiratory distress, decreased feelings of reality, feeling unlike self, depression, mental confusion, withdrawal, hallucinations, and cardiac dysrhythmia (Table 5). Although inconsistences in opioid ADE profile were only anticipated for constipation, fatigue, vomiting, and somnolence, these other discrepancies may reflect past studies' failure to exclusively study older adults (Papaleontiou et al., 2010). It is important to mention that this study exclusively

described older adults who had experienced ADEs, whereas other studies analyzed older adults who experienced ADEs and those who did not. This incongruity explains why general frequency rather than specific incidence was compared and presents a large drawback to the current study.

With regard to methods that older adults utilized to identify opioid ADEs, the present study found that at least 54% were inappropriate, meaning that ADE identification did not take place, another person identified the ADE, or ADE identification only occurred after a prolonged period (i.e., more than one week of experiencing it) (Table 4). This suggests that older adults struggle to recognize opioid ADEs, which is contrary to the predictions made by the present study. This finding also indicates that studies, such as Gregorian et al. (2010), that support adults' ability to identify and respond to ADEs might not be extendable to the older adult population. Practitioners that prescribe opioids need to ensure that older adults are aware of common opioid ADEs so that they are prepared to recognize them if they occur.

Due to past research that found few adults sought out healthcare after experiencing an opioid ADE, it was hypothesized that older adults' responses to ADEs would be poor (Gregorian et al., 2010). However, actions taken in response to opioid ADE discovery were mixed, with nearly 50% of responses considered appropriate and the other half considered inappropriate (Table 6). Appropriate responses included seeking healthcare in some way or stopping opioid medication use immediately after ADE identification. Both of these actions indicated awareness of the ADE and its potential dangers, as well as motivation to resolve it. Responses that were considered inappropriate involved self-management of the ADE, as these were viewed as dangerous to the older adult in some respect. Even though findings indicate that a substantial portion of older adults is able to respond appropriately to an ADE, the other portion of older

adults who is unable to do so cannot be overlooked. Therefore, practical implications involve ensuring that older adults understand the correct protocol to follow if an opioid ADE occurs.

Because the literature suggested that older adults would inadequately respond to ADEs, the current study predicted that outcomes associated with opioid ADEs would also be poor. Results that emerged from the actions that older adults took in response to ADEs were 27% more likely to be associated with inadequate chronic pain management compared to adequate chronic pain management (Table 7). If older adults do not recognize and manage ADEs in an appropriate manner, as this study has suggested, it is unsurprising, then, that outcomes concerning pain management and ADE resolution are generally dismal. At the same time, it is significant to highlight that not all opioid ADE outcomes were negative, which discloses that some older adults may safely and successfully self-manage ADEs without healthcare intervention. This finding has limitations, though. Deciding which ADEs are self-manageable and which require healthcare intervention, as well as which older adults have the competency to safely self-manage, may not be as obvious as it seems and likely should be determined by a healthcare practitioner to ensure a positive outcome.

To summarize the conclusions of this secondary data analysis, the opioid ADE profile observed in the present study was similar to the one described by previous research for adults, except older adults were more vulnerable to dizziness, upset stomach, headache, constipation, and fatigue, and less likely to develop nausea, vomiting, and somnolence. Mixed findings regarding older adults' abilities to self-recognize opioid ADEs and respond appropriately to them suggested that this population struggles to understand and successfully execute these concepts. The current study also concluded that outcomes associated with ADE management were, again, mixed, but mostly associated with poor chronic pain management. It is extremely likely that self-

identification capacity and response quality are mediators of prognosis, which means that enhancing older adults' ability to properly identify and respond to opioid ADEs would likely enhance associated outcomes. The present research also supported that some opioid ADEs might be safely self-manageable, but it was unclear what factors should determine whether healthcare should be utilized after an ADE. All of these findings together provide evidence that many older adults may have a fundamental misunderstanding of opioid ADEs. While further research is needed to determine the areas of confusion surrounding ADEs, evidence from the current study maintains that older adults may not understand which ADEs commonly result from opioid administration and the protocol to follow after an opioid ADE has been recognized.

The present study had many notable strengths. Unlike most research available in the current opioid and ADE literature, it focused exclusively on older adults to ensure that findings would be applicable to this population, which is most affected by chronic pain and therefore the largest consumer of opioid medication. Another asset of this secondary analysis is that the primary study that provided the data had very reputable methods. In particular, the PPMS survey, unlike the survey in Gregorian et al. (2010), asked older adults questions in open-ended format. This made responses less dichotomous and revealed the entire opioid ADE experience. At the same time, this research also had a few weaknesses. The sample of analyzed cases was only 15. Therefore, results were subject to sampling bias and generalizability to all older adults was only moderate. Additionally, the design of the primary study, which was a descriptive survey, was unable to control for confounds, which could have impacted the validity of the data that was utilized to perform this secondary data analysis.

Nevertheless, the observations made in this study disclose that long-term opioid therapy for older adults with chronic pain has potential to cause great harm as this demographic

continues to experience opioid ADEs at high incidence and inadequately identify and respond to them. Because the older adult population, and therefore the number of individuals afflicted with chronic pain, is increasing at a staggering rate, poor opioid ADE management will only become a larger issue in the future if further research developing and evaluating practical interventions is not conducted now. While some may question whether prolonged experience of seemingly mild opioid ADEs is a true health concern, they have the potential to deteriorate health or result in the development of secondary health issues. As an example, consider constipation, a common opioid ADE that was found to have an increased incidence in older adults in both the present study and the literature (Papaleontiou et al., 2010). While constipation may seem relatively harmless and easy to self-manage through over-the-counter laxatives, a long-term repercussion is increased risk of colorectal cancer, a life threatening condition for all ages (Guerin et al., 2014; Le Marchand et al., 1997). Additionally, chronic constipation has been shown to increase the risk of hemorrhoids, rectal prolapse, fecal incontinence, volvulus, and anal fissures, and decrease quality of life (Arora et al., 2012; Glia & Lindberg, 1997). These health conditions that develop from chronic constipation may further exacerbate pain as well. Even though some opioid ADEs seem to lack severity and urgency to resolve, studies examining the long-term consequences of ADEs enforce how vital early discovery and intervention are.

While other studies are required to conclusively determine how older adults identify and respond to opioid ADEs, this secondary data analysis is formative in providing the foundation for the conjecture that healthcare practitioners need to manage older adults' experiences with opioids more extensively. Because medical professionals exclusively prescribe opioid analgesics, they have full control over opioid use by older adults. This absolutism makes appropriate education extremely feasible. Older adult education regarding opioid ADEs, specifically which

ADEs to be cognizant of and the protocol to follow when an ADE surfaces, may be particularly beneficial in improving the ability of older adults to identify and respond appropriately. Additionally, educational sessions about opioid ADEs may help to intervene with the subset of older adults who are currently unable to identify them suitably. While studies that empirically validate the effectiveness of older adult opioid ADE education do not yet exist, a recent study discussed in the review of literature found that education increases adult hospital patients' self-efficacy to identify and disclose exacerbated acute care symptoms (See et al., 2014). This evidence would predict opioid ADE education by practitioners to increase older adults' ability to identify and respond proactively. Because the overwhelming majority of older adults are not demented, unless an older adult is confused from a preexisting condition or an opioid ADE, these findings would likely extend to older adults.

In conclusion, this secondary data analysis of a pilot study's findings has elucidated the discrepancies between the typical adult and older adult opioid ADE profiles, providing evidence for older adults' unique opioid therapy experience. The present research has also highlighted incongruences among proper opioid ADE management and the opioid ADE management that older adults are currently partaking in. In order to prevent further harm to the millions of older adults taking opioids for chronic pain and to the U.S. economy as opioid ADE health costs continue to rise, future research must focus on developing and evaluating ways to improve the safety of chronic pain management among older adults.

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Appendix

Table 1

Frequency of Comorbid Diagnoses in Addition to Chronic Pain (N=15)

Comorbidity	n	%
Arthritis	14	93.3
Hypertension	12	80.0
Hearing loss	7	46.7
Stomach related diagnosis	6	40.0
Cardiomyopathy	6	40.0
Vision loss	6	40.0
Insomnia	6	40.0
Diabetes mellitus	5	33.3
Thyroid disease	4	26.7
Depression	4	26.7
Cancer	3	20.0
Intestine-related diagnosis	3	20.0
Kidney failure	2	13.3
Integumentary related diagnosis	1	6.7
Vitamin D deficiency	1	6.7
Acute osteoporosis	1	6.7
Sleep apnea	1	6.7
Alzheimer's disease	1	6.7
Atrial fibrillation	1	6.7
Chronic Obstructive Pulmonary Disease	1	6.7
Liver failure	1	6.7

Table 2

Frequency of Adverse Drug Events by Type of Opioid Analgesic (N=15)

Opioid	n	%
Oxycodone	12	80.0
Hydrocodone	3	20.0
Tramadol	2	13.3
Nucynta	1	6.7
Fentanyl	1	6.7

Note: Other opioid medications were reported but were consolidated based on active opioid ingredient. For example, oxycontin and percocet contain oxycodone and therefore were accounted for under oxycodone.

Table 3

Frequency of Adverse Drug Events by Non-Opioid Analgesics (N=15)

Non-opioid	n	%
Ibuprofen	2	13.3
Aleve	1	6.7
Tylenol	1	6.7

Note: These individuals also had ADEs to opioid analgesics.

Table 4

Frequency of Methods for Self-Identifying Opioid Adverse Event(s) (N=15)

Response	n	%
No identification of ADE	3	20.0
Another person identified ADE	3	20.0
Delayed response within days	3	20.0
Immediate negative response	2	13.3
Negative response within hours	2	13.3
Increasing concern about addiction	1	6.7
Delayed response time	1	6.7
Prolonged negative effect prior to identification (>1 week)	1	6.7

Table 5

Frequency of Reported Opioid Adverse Events (N=15)

Opioid Adverse Event	n	%
Dizziness	5	33.3
Upset stomach	4	26.7
Constipation	4	26.7
Nausea	3	20.0
Headache	3	20.0
Fatigue	2	13.3
Internal bleeding	1	6.7
Cramps	1	6.7
Irritability	1	6.7
Insomnia	1	6.7
Shakiness	1	6.7
Feeling faint	1	6.7
Depression	1	6.7
Respiratory distress	1	6.7
Decreased feeling of reality	1	6.7
Feeling unlike self	1	6.7
Hyperactivity	1	6.7
Vomiting	1	6.7
Mental confusion	1	6.7
Withdrawal	1	6.7

Hallucinations	1	6.7
Cardiac dysrhythmia	1	6.7

Table 6

Frequency of Responses to Opioid Adverse Events (N=15)

Response to Opioid Adverse Event	n	%
Contacted physician	6	40.0
Stopped medication immediately	5	33.3
Took prophylaxis for constipation	3	20.0
Continued opioid	3	20.0
Went to emergency room	2	13.3
Took a different analgesic	2	13.3
Stayed home when symptoms occurred	1	6.7
Sought a pain clinic	1	6.7
Took a proton pump inhibitor	1	6.7
Stopped opioid after several months	1	6.7
Went to bed	1	6.7

Table 7

Frequency of Outcomes that Resulted from Actions to Opioid Adverse Events (N=15)

Outcome Resulting from Response	n	%
Adverse reaction subsided	8	53.3
Took a different analgesic	3	20.0
Adverse reaction remained	3	20.0
Pain continued	2	13.3
Prescribed a muscle relaxant	1	6.7
Surgery	1	6.7
Still waiting for appointment	1	6.7
Reduced frequency of opioid use	1	6.7
Blood transfusion	1	6.7
No outcome resulted	1	6.7