

Review

Treatment for opioid use and outcomes in older adults: a systematic literature review

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ABSTRACT

Background: Historically, issues relating to problem substance use among older people have received little attention, and have only recently been recognised.

Methods: A literature review of relevant material was conducted in November 2015 to assess current outcome research among older adults treated for opioid dependence. Multiple electronic databases were searched and results were supplemented by grey literature, library and online searches, and relevant references within selected articles. Retrieved articles were assessed for relevance against the inclusion and exclusion criteria. Results were reviewed to identify major findings and recommendations.

Results: A total of 76 titles were included in the review. Most research conducted on older adults involves alcohol and prescription medications. Older drug users are growing in number and have a unique profile, with many presenting for treatment for the first time aged 50–70 years. Findings reveal (1) opioid treatment numbers are decreasing, however the average age of treatment admissions is increasing, (2) there is no consensus on what old is (3) two distinct types of older opioid substance users exist (early/late onset), (4) older clients achieve better treatment outcomes than younger counterparts, and (5) older women achieve better treatment outcomes than men.

Conclusions: Findings suggest that little is known about treatment outcomes among older people. Problematic drug use (of which opioids make up the largest proportion) had been incorrectly assumed to end as patients age. Defining an age limit for 'older' is important. Addiction and healthcare services must anticipate and prepare for increased demand by this group.

1. Introduction

Although generally associated with young people, drug use and problematic drug use have no age limits and are neglected subjects among older people (Beynon et al., 2007; Crome et al., 2011b; Institute of Medicine, 2012). The assumption that drug users 'mature out' of drug use has proved incorrect. In reality, the number of older drug users has been increasing internationally for the last 40 years and older drug users have a unique profile, different from their younger counterparts (Rosen et al., 2011; Taylor and Grossberg, 2012). Historically, issues relating to problematic substance use among older people have received little attention and these issues have only recently been recognised. Research on older adults is predominately from the United States and involves alcohol and prescription medications (Crome et al., 2015; Taylor and Grossberg, 2012). The literature calls for more attention to be given to this topic (Beynon, 2009; Beynon et al., 2010; Crome et al., 2011b; European Monitoring Centre for Drugs and Drug Addiction, 2010; Fahmy et al., 2012; Gossop, 2008; Institute of

Medicine, 2012), and notes insufficient addiction treatment research relating to older people (Bhatia et al., 2015; Crome et al., 2015).

The burden of disease due to drug use is highest for heroin and other opiates compared to any other illicit drugs (Darke, 2011; Degenhardt and Hall, 2015), and the use of heroin has emerged as an international public health concern within the past decade (Teesson et al., 2015). Long term heroin users have the highest risk of mortality with the average age of death in the early thirties (Darke et al., 2006a) and heroin overdose deaths have been reported among older people in their 50's and 60's (Darke et al., 2006b). Yet, heroin use among the older population has not been comprehensively investigated (Doukas, 2011; Morral et al., 1997; Rosen et al., 2011), and little is known about the characteristics of the ageing opioid treatment population (Han et al., 2015). Little research has been undertaken on the epidemiology of older dependent opioid users, or on the discussion of appropriate treatment services for this group (Han et al., 2015).

The proportion of older adults in the population is increasing, as is the proportion of ageing drug users. Ageing drug users are likely to

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experience an accelerated aging process and have complex needs due to accumulated health effects of their drug use. International trends demonstrate large numbers of opioid users are living longer. This is likely due to a number of factors: (1) demographic changes and increased life expectancy in the general population, (2) ageing baby-boom and post-baby-boom cohorts (50 years-and-older age group) who experienced increasing levels drug availability over time along with higher rates of illicit drug use during their youth, (3) developments in and improved access to healthcare, harm reduction and drug treatment services leading to increased longevity among drug users (Australian Injecting Illicit Drug Users League, 2011; Beynon, 2009; Burns et al., 2009; Colliver et al., 2006; Crome et al., 2015; European Monitoring Centre for Drugs and Drug Addiction, 2010; Gfroerer et al., 2003; Han et al., 2009; Hartnoll et al., 2010; Hartnoll, 1986; Institute of Medicine, 2012; Johnson and Sung, 2009; Pirona et al., 2015; Simoni-Wastila and Yang, 2006; Substance Abuse and Mental Health Services Administration, 1998, 2007, 2015; Vincent and Velkoff, 2011). There is an ageing cohort of heroin users in treatment (United Nations Office on Drugs and Crime, 2015). Trends in the methadone treatment population show this group is growing in number and are also ageing (Rosen, 2004), with many presenting for the first time aged 50–70 years (Doukas, 2011, 2014). European trend analysis shows increasing mean ages of first heroin use and first treatment in Western European countries (Barrio et al., 2013). Given the increasing prevalence of drug use by older people (Colliver et al., 2006; Gfroerer et al., 2003; Simoni-Wastila and Yang, 2006; Vincent and Velkoff, 2011) and the need to develop health care responses, epidemiological research is required (Bhatia et al., 2015).

In light of the dearth of evidence available for treating older adults, the aim of this study was to conduct a review of opioid dependence and associated treatment outcomes among ageing opioid users. The study objectives were (1) to identify and distil key literature on ageing among people treated for opioid use, and (2) to investigate outcomes of their treatment(s) (e.g., immediate treatment outcomes, such as retention, and post-treatment outcomes, such as abstinence).

2. Methods

ASSIA, CINAHL, MEDLINE, PsycINFO, Pubmed, and Cochrane Library databases were searched up to the end of October 2015 using subject headings and keywords (and their variants) under the following concepts: addiction (substance-related disorders; addict; drug use; drug dependent; problematic use; etc.); opioid drugs (e.g.; opiate alkaloids; opioid; heroin; methadone; etc.); intervention (e.g.; treatment; therapy; intervention; rehabilitation; etc.); treatment outcomes (e.g.; immediate treatment outcomes such as retention and post-treatment outcomes; such as abstinence); study type (cohort studies; longitudinal; follow up; prospective; evaluation etc.). Targeted searches were supplemented with manual searches. Grey literature databases, library databases and general online searches (e.g.; websites of the university library; government organisations and Google) were searched for books and grey literature; including policy documents; reports and conference documentation. References included in relevant articles retrieved were screened for additional references to supplement the review.

2.1. Inclusion and exclusion criteria

The search was restricted by subject type (humans) and English language publications. No restrictions were applied to publication dates to ensure all relevant research was captured.

The search included:

- any opioid use disorder, including disorders related to prescription medications, and illicit drugs;
- any intervention, including psychosocial interventions and/or pharmacological interventions.

The search and selection criteria excluded:

- disorders related to alcohol, nicotine, prescription medications, and illicit drugs other than opioids;
- substance abuse disorder/s comorbid with other mental disorder/s where mental disorder/s were the primary focus
- interventions not administered to the person with substance abuse disorder
- studies not reporting primary research data, with the exception of relevant systematic reviews.

2.2. Study selection

Papers explicitly involving individuals who received addiction treatment for their opioid use were candidates for inclusion. As studies of a longitudinal nature follow people over time during which people grow older, no age restrictions were made to the search criteria to avoid inadvertently excluding appropriate studies. Results were filtered to include studies examining age or proxies for age such as length of drug career. Search results were managed in EndNote software. Abstracts were assessed against inclusion/exclusion criteria and following this process, full papers were retrieved for review. A systematic review of relevant primary material was conducted using the PRISMA approach and the PRISMA flow chart (Fig. 1) outlines the process by which literature was selected for inclusion (Moher et al., 2010).

3. Results

The search resulted in the identification of 15,509 titles. After excluding duplicates, 7,519 records were eligible for title/abstract screening and a further 6,561 were excluded as they did not fulfil the eligibility criteria. Full texts of the remaining 958 records were examined and 882 were excluded as the study design and/or disorder were not relevant. Seventy-six papers were included in the review (see Fig. 1).

Papers were reviewed to identify major findings and recommendations. Information was extracted and thematically compiled for synthesis. Table 1 outlines opioid treatment studies among older people. Results were organised into two themes based on the study objectives (1) ageing among people who use opioids, and (2) treatment outcomes and ageing.

3.1. Defining ageing based on current literature

Traditionally, opioid misuse has been perceived as a problem largely among those aged 40 years and younger. As people who use opioids are surviving longer than 40 years, the cut-off point of 40 years has been used to define the 'older' population (Crome et al., 2009). There is no consensus in the literature on what 'old' is; it ranges from 37 to 55, 40+, 45+, 50+, 60+, 65+, 49 to 61, 50 to 59, and 50 to 74 (Beynon et al., 2010; Beynon et al., 2007; Boeri et al., 2011; Crome et al., 2011b; Doukas, 2011; European Monitoring Centre for Drugs and Drug Addiction, 2010; Han et al., 2009; Han et al., 2015; Institute of Medicine, 2012; Lofwall et al., 2008; Outlaw et al., 2012; Raffoul et al., 1981; Roe et al., 2010; Rosen et al., 2011; Schonfeld et al., 2000; Wu and Blazer, 2011).

3.2. Ageing among older people who use opioids

Epidemiological surveys and admissions to addiction services in developed countries indicate a growing proportion of older opioid users along with decreased numbers of younger users, and this trend is likely to continue for the next two decades (Australian Injecting Illicit Drug Users League, 2011; Beynon et al., 2007; Crome et al., 2011a; Crome et al., 2011b; Frances, 2011; Gossop, 2008; Han et al., 2009; Han et al., 2015; Wu and Blazer, 2011). Reasons for the growing trend of older

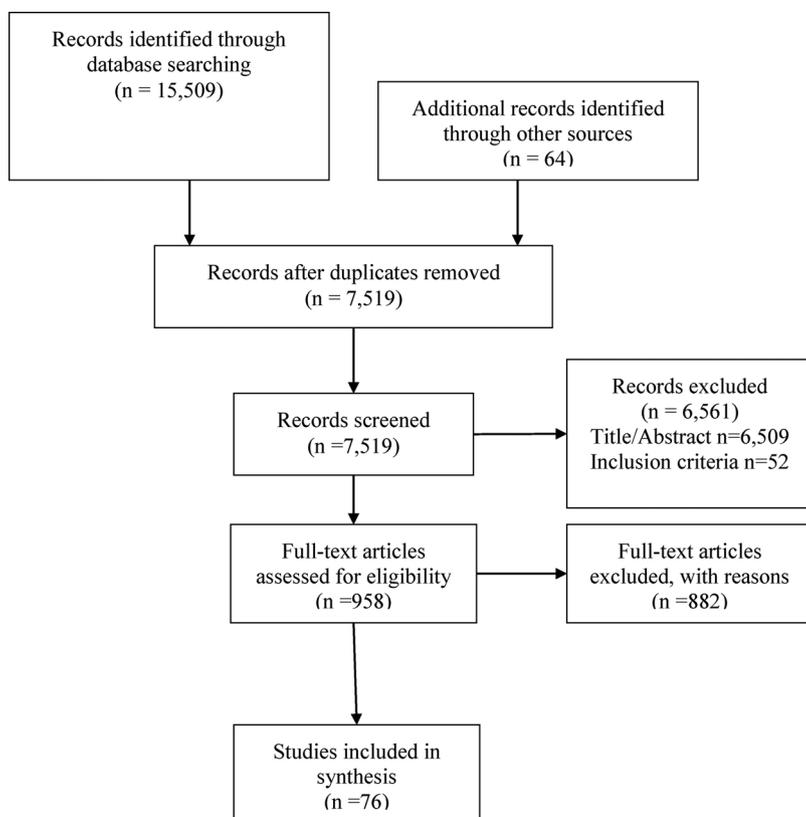


Fig. 1. PRISMA study selection flowchart.

drug users include demographic changes, drug availability, increased life expectancy, improved treatment access and the development of harm reduction services (Australian Injecting Illicit Drug Users League, 2011; Beynon, 2009; Burns et al., 2009; Colliver et al., 2006; Crome et al., 2015; European Monitoring Centre for Drugs and Drug Addiction, 2010; Gfroerer et al., 2003; Han et al., 2009; Hartnoll et al., 2010; Hartnoll, 1986; Institute of Medicine, 2012; Johnson and Sung, 2009; Pirona et al., 2015; Simoni-Wastila and Yang, 2006; Substance Abuse and Mental Health Services Administration, 1998, 2007, 2015; Vincent and Velkoff, 2011).

The “baby boomer” generation in the United States (people born between 1946 and 1964) are the largest generation alive (78 million people) (Crome et al., 2015). The prevalence of drug use among those aged 50 years and older is increasing and is expected to continue growing as baby boomers age (Gfroerer et al., 2003). One-in-four older people have used medications with potential to abuse, a figure likely to increase as the baby boomer generation ages (Simoni-Wastila and Yang, 2006). Projections indicate a doubling of older illicit substance misusers between 2006 and 2020 (Han et al., 2009) with an estimated 5 million older people having substance problems by 2020 (Gfroerer et al., 2003). However, the true number is likely to be much higher due to the fact that, by 2020, only half of the baby boomers will have reached 65 years of age (Johnson and Sung, 2009). An estimated 21.6 million people required treatment for substance abuse in 2011, while 3.8 million received treatment (Substance Abuse and Mental Health Services Administration, 2012). The Treatment Episode Data Set (TEDs) shows increased admissions involving drugs among those aged 50 years and older between 1992 and 2005 (Lofwall et al., 2008). Treatment admissions for opioid use among those aged 65 years and older increased by 3.9% between 1995 and 2005 (6.6% in 1995, 10.5% in 2005) (Substance Abuse and Mental Health Services Administration, 2007). There are increased proportions of older people (aged 45 years +) using heroin (11.4% in 1992, 17.5% in 2012), methadone (0.3% in 1992, 0.6% in 2012) and other opiates (1.6% in 1992, 8.4% in 2012) (Substance Abuse and Mental Health Services Administration, 2015).

Although much of what is known about the ageing opioid treatment population comes from TEDs, it is limited by its definition of older, which is confined to greater than age 50 or 55 (Lofwall et al., 2005) and is therefore limited in its analysis of age trends (Han et al., 2015).

As a continent, Europe has the oldest population with one-in-five aged 60 years and older, a figure expected to increase to one-in-four by 2050 (European Monitoring Centre for Drugs and Drug Addiction, 2010). Historically, the largest group to receive specialised drug treatment in Europe are problem opiate users, mainly heroin users and injectors. Almost 700,000 Europeans receive opioid substitution treatment (OST), making up a substantial proportion of the European treatment population (Pirona et al., 2015). The Amsterdam Cohort Study was the first to highlight ageing and its findings challenged the view that the majority of drug users ‘mature out’ and become drug free (Institute of Medicine, 2012). The Treatment Demand Indicator (European Monitoring Centre for Drugs and Drug Addiction, 2012) has identified an ageing cohort of opioid users soon to become the largest drug treatment population in Europe (Pirona et al., 2015). Almost all European countries reported increasing proportions of older clients entering drug treatment (European Monitoring Centre for Drugs and Drug Addiction, 2010). Between 2002 and 2005, the proportion aged 40 years and older in treatment for opioid problems more than doubled (Gossop, 2008). In 2008, opiates (mainly heroin) was the primary drug among 65% of people aged 40 years and older entering treatment (European Monitoring Centre for Drugs and Drug Addiction, 2010). Recent European trends (2006–2013) show a 21% decrease in the numbers of opiate users entering treatment, while the average age of entries increased from 33 to 36 years and the median age increased by 5 years. The proportion of opiate cases aged 40 years or older increased from 1-in-5 to 1-in-3 (Pirona et al., 2015). These findings have raised concern at a European level regarding the readiness of treatment systems to meet the needs of this ageing cohort of opiate users with increasing and complex drug, health and social needs (Pirona et al., 2015).

Changing age profiles for opioid users in treatment have also been

Table 1
Opioid treatment studies among older people.

Study	Study period and location	Design/Method	Population and sample size	Clear logic for age cut-off to define older	Major findings relating to ageing	Major findings relating to opioids	Recommendations for opioid treatment and/or outcomes in older adults
Bhatia et al. (2015)	Period: Publications from January 2007– October 2014. Location: Not applicable.	Systematic review of the treatment of substance use disorders in the elderly. Secondary analysis.	- Adults over 50 years of age - Any substance disorder receiving an intervention	Not applicable	- 13 relevant studies - Encouraging treatment responses among older adults	- No studies found on treatments for illicit drug use amongst older adults - Dearth of evidence available for treating older adults with substance use	- The gap in the literature on treatments for illicit drug use. A need for epidemiological research, given the growing prevalence rate of illicit drug use among older adults. A need to further develop health services - More research is needed to fully understand the specific characteristics and needs of older adults with opioid dependence - New models of care are needed to address increasing levels of morbidity as this population ages
Han et al. (2015)	Period:1996–2012. Location: All New York State licensed drug treatment programmes.	Review of administrative data from the Client Data System of the New York State Department of Health. Secondary analysis (pre-existing data).	- Adults in opioid treatment programs, defined as buprenorphine treatment, and/or psychosocial treatment for opioid dependence	No	- A pronounced age trend observed 1996–2012, with adults aged 50 and older becoming the majority - The proportion of females increased among older adults (aged 50 +), while the proportion of females among the younger group (< 50 years) decreased - There were notable shifts in race and ethnicity	- Heroin was the predominant primary substance - Small increases reported use of alcohol and marijuana - The majority reported use of a secondary drug (mainly cocaine)	- More research is needed to fully understand the specific characteristics and needs of older adults with opioid dependence - New models of care are needed to address increasing levels of morbidity as this population ages
Grella and Lovinger (2011)	Period:1978–2009. Location: Central and Southern California, United States.	Primary longitudinal research (interviews and pre-existing data)	- Follow up of 914 patients who originally participated in studies of publically funded methadone maintenance programmes between 1978 and 1981 - Followed up 2005–2009	Not applicable		- 4 heroin trajectory groups identified - Gender differences, with women more likely to enter remission quickly - Rapid decreases in heroin use is associated with increased use of other drugs - Gradual decreases in heroin use was associated with a gradual decreases in the use of other drugs - Problems in school, age first arrested and younger onset of heroin use are associated with more persistent heroin use	- About two-fifths ceased heroin use within 10–20 years of initiation. - More than half used consistently over the 30 years - High rates of persistent drug use over 30 years follow-up suggest that ageing heroin users are in need of treatment
Moy et al. (2011)	Period: Publications up to January 2007. Location: Not applicable.	Systematic review of substance treatment for older substance misusers. Secondary analysis (systematic and narrative).	- Adults over 50 years of age - Any substance disorder receiving an intervention	No	- 13 relevant studies - Little research conducted into the treatment of substance dependence in older patients - Evidence that older people do not achieve worse outcomes than younger counterparts	- 1 study on opiate dependence (see (Firooz and Carlson (2004))	- Majority of research originates in United States; research in different settings and countries would be valuable - Increased awareness of prevalence and importance of substance abuse in older people among the medical profession and general population - Consider designated treatment programmes to include older people
			- Adults over 50 years of age	No	- 9 relevant studies		

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Table 1 (continued)

Study	Study period and location	Design/Method	Population and sample size	Clear logic for age cut-off to define older	Major findings relating to ageing	Major findings relating to opioids	Recommendations for opioid treatment and/or outcomes in older adults
Rosen et al. (2011)	Period: Publications from 1990 to 2009, Location: United States.	Literature review of older heroin users. Secondary analysis.	- Using heroin and/or in methadone treatment		- Large scale longitudinal studies have not included an exclusive or significant sample of older adults	- Research on heroin use and methadone treatment for this group is scant and quantitative findings were not consistent	- Highlighted need for additional research with larger samples as all of the research was conducted using small sample sizes - A coordinated effort from funders, researchers and practitioners is needed to adequately prepare for the significant needs of the population - Certain lifestyle risk factors and comorbid medical conditions are potential targets for intervention that may improve health outcomes for older patients with opioid dependence
Fareed et al. (2009)	Period:2002–2007. Location: Atlanta Veterans Affairs Medical Centre, United States.	Retrospective chart review of patients in methadone maintenance treatment. Secondary research (pre-existing data).	- N = 91 - Patients aged 40 years and older only	No	- Older adults were more likely to have had longer periods of treatment and were more likely to have a history of comorbid alcohol misuse - Older adults were less likely to report current heroin use and overall drug use	- Those remaining in treatment had a significant reduction in drug use, psychiatric, medical and legal problems compared with those who dropped out of treatment	
Rajaratnam et al. (2009)	Period: Not given. Location: 4 of 18 methadone maintenance treatment clinics associated with Beth Israel Medical Centre in New York City, United States.	Random selection using modified stratified sampling of current patients. Primary research (interviews, surveys and clinical chart review).	- N = 156 patients attending a methadone treatment programme - Older defined as aged 55 years and older	No	- Older adults were more likely to have longer periods of treatment, a history of problem alcohol use and were less likely to report current heroin use and overall drug use	- Only a small proportion of methadone maintenance patients have regular contact with a primary care physician despite having many medical and psychiatric conditions. The rate of contact does not increase with age - Quality of life does not increase with age and length of time in methadone maintenance treatment	- Methadone maintenance treatment services should be better prepared to help patients age more successfully.
Rosen et al. (2008)	Period: Not given. Location: A methadone clinic in a medium-size Midwestern industrial city in the United States.	Primary research (patient interviews and pre-existing results of monthly drug screenings)	- Older patients (aged 50 years and older) in methadone maintenance treatment - N = 140	No	- 76.4% screened positive for illegal drug use across 24 months, of which: - 80.4% screened positive more than once - 21% reported binge drinking at least once in the previous year	- The physical health burden of the ageing population will require mental health and treatment providers to place an increased emphasis on physical health services - Appropriate training of providers in the screening, assessment, and treatment of age-related disorders is necessary for adequate care - Early intervention to curb heroin addiction is critical to sustaining stable long-term recovery - Strategies for achieving and maintaining stable recovery should include stress coping strategies, identifying personal	(continued on next page)
Hser (2007)	Period:1974–1997. Location: California Civil Addict Programme, United States.	Primary longitudinal study (interviews, urinalysis and pre-existing criminal justice data)	- N = 242 of the original 581 male participants heroin addicts admitted between 1962 and 1964 - Followed up at 3 time points 10 years apart (1974–1975, 1985–1986 and 1996–1997)	Not applicable	- The recovered group initiated abstinence and maintained the stable recovery in their late 30s - 53% continued to use heroin into their late 50s and 60s	- Certain interventions are likely to enhance long-term stable recovery - Stable recovery (at 10 years) was predicted by ethnicity, self-efficacy and psychological distress	

Table 1 (continued)

Study	Study period and location	Design/Method	Population and sample size	Clear logic for age cut-off to define older	Major findings relating to ageing	Major findings relating to opioids	Recommendations for opioid treatment and/or outcomes in older adults
Hser et al. (2007)	Period: 1974–1997. Location: California Civil Addict Programme, United States.	Primary longitudinal research (interviews, urinalysis and pre-existing criminal justice data)	- N = 471 of the original 581 male participants heroin addicts admitted between 1962 and 1964 - Followed up at 3 time points 10 years apart (1974–1975, 1985–1986 and 1996–1997)	Not applicable	- Maturing out does not apply to heroin addicts due to the high prevalence of continued heroin use in the ageing sample and the lack of association of older age with recovery	- Identified three groups with distinct heroin use trajectories - Only a small group stopped heroin use early on and maintained a relatively stable recovery - Adverse consequences of chronic heroin addiction The older group had fewer positive urine screenings for opiates (3.7% versus 6.9% positive)	- Mechanisms for early cessation of heroin use are unknown and need in-depth investigation - Addiction is mostly a chronic condition, requiring long-term care and management strategies
Loftwall et al. (2005)	Period: Not given. Location: Addiction Treatment Services outpatient programme of the Johns Hopkins Bayview Medical Centre, United States.	Primary research consisting of a cross sectional surveys examining physical and mental health characteristics along with urine toxicology samples	- N = 67 (41 older and 26 younger) opioid maintenance patients. Age ranges: older = 50–66 years, younger = 25–34 years	Yes, people diagnosed with drug dependence die on average 22.5 years earlier	- The older group were in treatment longer, had fewer positive urine results, were older at drug use initiation (except alcohol), had poorer physical health and took more prescribed medications than patients aged 25–34 years	- There is a strong rationale to develop and test potentially more effective health care service delivery strategies	
Firoz and Carlson (2004)	Period: 1995–2000. Location: Midwestern methadone maintenance treatment programme, United States.	Primary research (programme and patient surveys, patient clinical status review and use of pre-existing chart and database information, treatment outcomes at 9 months post-admission)	- N = 759 (54 older and 705 younger) methadone maintenance patients - Older defined as adults aged 55 years+, younger < 55	No	- At nine months the older group had improved outcomes on drug use measures. - Groups did not differ in medical, psychiatric problems or employment. - Older methadone patients did significantly better in treatment	- Methadone programmes treating older patients should not assume that this group are similar to other older populations in terms of prevalence of medical and psychiatric problems	
Hser et al. (2004)	Period: 1974–1997. Location: California Civil Addict Programme, United States.	Prospective cohort study. Interview and medical examination	- N = 108 of the 242 surviving male heroin addicts admitted between 1962 and 1964. - Followed up in 1996–1997	Not applicable	- Poor health conditions and high mortality - 23.2% still using heroin	- Clinicians need to screen patients for infectious diseases regardless of their current illicit drug-using status. - Treatment programmes should focus on incremental improvements rather than lifelong abstinence. - Treatment programmes should consider the social and physical health needs of older adults.	
Hser et al. (2001)	Period: 1974–1997. Location: California Civil Addict Programme, United States.	Primary longitudinal research (interviews, urinalysis and pre-existing criminal justice data)	- N = 581 male heroin addicts admitted between 1962 and 1964. - Followed up at 3 time points (1974–1975, 1985–1986 and 1996–1997)	Not applicable	- By age 50–60 years approximately half of the 242 interviewed subjects tested negative for heroin - A fifth of heroin users were still active users, now aged in their late 50s.	- Steady increases in deaths and stable heroin use - Long term heroin abstinence is associated with less criminality, morbidity, psychological distress and higher employment - Five years heroin abstinence considerably reduced the likelihood of future relapse	

reported in Australia. Similar to the U.S. and Europe, there is evidence of an ageing cohort receiving OST, along with decreasing numbers of new entrants (Burns et al., 2009). Between 1986 and 2006, the proportion of new entrants aged 40 years and older increased significantly and the median age of those retained in treatment increased from 29 to 37 years. An estimated 30,000 regular opioid users are aged 40 years or older (Australian Injecting Illicit Drug Users League, 2011). A literature review comments that studies from the U.S and Europe “establish little beyond the existence of a fast-growing cohort of older drug users and the expectation that this cohort will continue to grow over the coming decades” (Australian Injecting Illicit Drug Users League, 2011).

3.3. Types of older opioid users

The literature points to two distinct types of problem substance users among older people; “early-onset” and “late-onset” users. “Early-onset” refers to those who have a long history of substance abuse, who continue to abuse as they age, while “late-onset” includes individuals who develop a new habit as elders (Roe et al., 2010). Current research lacks data exploring these groups (Taylor and Grossberg, 2012).

3.4. Treatment interventions and ageing

Currently there are two known systematic reviews of drug treatments among older people (Bhatia et al., 2015; Moy et al., 2011). Having reviewed problem substance use treatments in older people, Bhatia et al. did not find any evidence on treatments for illicit drug use, a point previously made by Moy et al. (Bhatia et al., 2015; Moy et al., 2011). Bhatia et al. called for epidemiological research in this area and the need to develop health care responses. Moy et al. reviewed studies on substance treatment among older people published between 1984 and 2005, and found 11 studies on alcohol, three on nicotine, one on prescription medications and one on opiate dependence (Moy et al., 2011). Rosen et al. reviewed the characteristics and consequences of heroin use among older adults in the U.S. Having found just 9 eligible studies, the review concluded that research on heroin use and methadone treatment was scant, quantitative findings were inconsistent, and called for additional research with larger samples, as all of the research was conducted using small sample sizes (Rosen et al., 2011). The literature notes that research mostly originates in the United States, and, therefore, it is difficult to generalise findings given societal differences and differences in the organisation of and accessibility to health care systems internationally (Bhatia et al., 2015; Crome et al., 2015). The need for European countries to develop epidemiological databases, services and research has been highlighted (Crome et al., 2015). A U.K. report on older substance misusers states that the “examination of trends in the extent, nature and predictors of substance use problems among older people is required” (Crome et al., 2011b).

3.5. Treatment outcome studies and ageing

This review focuses on immediate outcomes following a treatment intervention for ageing opioid users and includes outcomes such as retention and abstinence. Three studies examined treatment profiles over time, of which just one study specifically investigated ageing. Han et al. examined age trends and characteristics of older adults in opioid treatment programmes in New York City between 1996 and 2012. In 1996 the majority (56.2%) were less than 40 years old. By 2012, 35.9% were aged 50–59 years, with large increases in numbers aged 60 and older (1.7% in 2006, 13.1% in 2012). Multiple drug use was high (particularly cocaine, > 30%) and there was a small, but consistent change in the type of primary opioid used, with more frequent use of non-heroin and prescription opioids (Han et al., 2015).

Five longitudinal studies included proxies for age (i.e., length of drug career), but none specifically investigate age or ageing. These

studies examined treatment outcomes over 30 or more years in two Californian based treatment groups. Grella and Lovinger investigated 30-year trajectories of heroin use among people participating in publicly funded methadone maintenance programmes between 1978 and 1981. The study identified four heroin trajectory groups: (1) women were more likely to enter remission quickly, (2) rapid decreases in heroin use are associated with increased use of other drugs, (3) gradual decreases in heroin use were associated with gradual decreases in the use of other drugs, and (4) problems in school, age first arrested and younger onset of heroin use are associated with persistent use of heroin. The authors concluded that high rates of persistent drug use over 30 years follow-up suggest that ageing heroin users are in need of treatment (Grella and Lovinger, 2011). Hser and colleagues published four articles based on a 33-year longitudinal study (1974–1997), examining outcomes among men attending compulsory treatment for heroin dependent, criminal offenders. They found: a steady increase in deaths and stable heroin use (Hser et al., 2001), poor health conditions and high mortality (Hser et al., 2004), adverse consequences of chronic heroin addiction (Hser et al., 2007), and interventions likely to enhance long-term stable recovery (Hser, 2007).

3.6. Treatment outcomes differ by age group

Three studies (Firoz and Carlson, 2004; Lofwall et al., 2005; Rajaratnam et al., 2009) compared treatment outcomes among younger and older groups and found that older clients achieved better outcomes than their younger counterparts. Although the age cut-offs were not identical, differences were found in treatment retention and drug use. Firoz and Carlson found that older methadone patients did significantly better in treatment. At nine months post-treatment admission, the older group (age 55 years and older) had improved outcomes for drug use measures compared to the younger group (61% of older and 35% of younger patients had no positive urine-drug-screens) (Firoz and Carlson, 2004). Rajaratnam et al. found that older adults (aged 55 years and older) were more likely to have longer treatment durations ($p < 0.01$), a history of problem alcohol use ($p < 0.01$), and were less likely to report current heroin ($p < 0.05$) and overall drug use ($p < 0.05$) than younger counterparts (Rajaratnam et al., 2009). Lofwall et al. found several age differences when comparing groups (age 50–66 years, age 25–34 years). The older group was in treatment longer (averaged 4.2 years versus 1.3 years), had fewer positive urine results (3.7% versus 6.9% opiate positive), was older at drug use initiation (except alcohol) (marijuana: 20.6 versus 14.2 years, heroin: 24.2 versus 19.3 years, cocaine 29.4 versus 20.2 years), had poorer physical health and took more prescribed medications daily (43.9% versus 3.8% with three or more daily medications) (Lofwall et al., 2005).

Two additional studies by Fareed et al. and Rosen et al. investigated outcomes among older treatment cohorts, but neither made comparisons to younger counterparts. Fareed et al. found improved outcomes for older patients retained in treatment, whereby those aged 40 years and older had significant reductions in drug use ($p < 0.0001$ for opiates and cocaine), psychiatric ($p < 0.016$) and legal problems ($p < 0.02$) compared with treatment drop-outs (Fareed et al., 2009). Rosen et al. compared drug and alcohol use one year preceding and following interview, but did not find differences in urine test results (Rosen et al., 2008).

3.7. Treatment outcomes differ by gender

Two studies investigating treatment outcomes and gender found that women achieved better outcomes. Rosen et al. examined the prevalence of mental and physical health disorders in 140 older methadone maintenance patients (aged 50 years and older). Physical health appeared better among older women who had significantly lower rates of hypertension and diabetes (Rosen et al., 2008). Grella and Lovinger

investigated 30-year trajectories of heroin use and found one trajectory where women were more likely than men to enter remission quickly (Grella and Lovinger, 2011).

4. Discussion

The literature has identified a neglected ageing population who use opioids and a dearth of available research and evidence for treating this group. Historically issues relating to problem substance use among older people have received little attention, and are only recently being recognised. Larger scale longitudinal studies tracking treatment and health outcomes have not included a significant sample of older people (Hubbard et al., 2003; Korper and Council, 2002; Ross et al., 2005). Most of the existing literature involving older adults treats them as a homogenous group and/or compares them to their younger counterparts, however there is some evidence of different subgroups within the ageing opioid population (Roe et al., 2010; Taylor and Grossberg, 2012), gender differences (Grella and Lovinger, 2011; Rosen et al., 2008; Satre et al., 2007; Satre et al., 2004), and drug use trajectories (Aharonovich et al., 2005; Bhatia et al., 2015; Colliver et al., 2006; Gfroerer et al., 2003; Grella and Lovinger, 2011; Lofwall et al., 2005; Vincent and Velkoff, 2011). These and other factors may have important implications for treatment services (Gfroerer et al., 2003; Vincent and Velkoff, 2011). For example, late-onset users may be easier to treat.

The articles reviewed indicate significant future needs, yet currently there is insufficient research and evidence for interventions that treat older people. Addiction and other healthcare services are insufficiently aware of the needs of ageing drug users and must anticipate and prepare for increased demand from this group. Age related information is important epidemiologically to understand the dynamics of epidemics (Barrio et al., 2013). Research lacks large quantitative studies explicitly examining the area. Large samples are also required to accurately assess the needs of the population and monitor ageing trends. Existing treatment monitoring systems are not being utilised to this end. Empirical research is required to adequately describe the problem and to develop appropriate treatment programmes and interventions for older opioid users.

The small number of studies meeting the review criteria were all based in high income countries, therefore generalisability to other settings may be potentially impacted. Almost all studies reviewed involved convenience samples taken from methadone treatment centres in large urban areas. Many studies were excluded due to their sampling criteria. For example, many papers from the Australian Treatment Outcome Study included individuals attending needle exchange services who were not treated for their opiate problem (Darke, 2011; Darke et al., 2011; Darke et al., 2009; Teesson et al., 2015; Teesson et al., 2007). There is substantial variation in what the term “older” or “ageing” encompasses and, therefore, the body of evidence for the target population is small, and the majority of studies do not give their reasoning for their choice of age cut-offs. Due to the narrow focus of the review objectives, important issues related to the care of older patients with substance use problems (including medical, psychiatric, multimorbidity, cognitive decline, social isolation, medication drug interactions, and burden of medications among other things) have not been discussed. Outcome measures such as employment and involvement in criminality may be less appropriate for the older population, particularly in the case of the late-onset group who are at a later stage of life and financial security.

The literature discusses treatment outcomes for the ageing opioid population in general terms and the area is yet to be extensively studied. In a recent review, Crome et al. found four studies reporting outcomes among older adults in treatment for problem substance use (Lofwall et al., 2005; Rosen et al., 2008; Satre et al., 2007; Satre et al., 2004) and concluded that treatment outcome research shows that older adults do better in treatment than their younger counterparts (Crome

et al., 2015). The two studies by Satre et al. are outside the scope of this review as they do not specifically investigate opioid drugs (Satre et al., 2007; Satre et al., 2004). Findings from these studies are important nonetheless, as they found important associations between age, gender and treatment outcomes. An examination of 5-year alcohol and drug treatment outcomes (comparing groups aged 55–77, 40–54 and < 40 years) found correlations between abstinence among women, treatment retention and having no close family/friends who encouraged use. Abstinence was greatest among women aged 55–77 years (81% for women aged 55–77, 43% for men aged 55–77, 57% for women aged 40–54, 44% for men aged < 40 years). Women aged 55–77 years remained in treatment longer than men in the same age group (20.7 weeks versus 9.5 weeks) (Satre et al., 2004). The second study by Satre et al. examined 7-year alcohol and drug treatment outcomes in outpatients aged 55 years and older. This study found (1) women were more likely to report abstinence in the 30 days prior to follow up than men (76.0% versus 54.2%), (2) a positive relationship between 30-day abstinence and length of stay in treatment, (3) abstinence at 7 years was correlated with attendance at 12-step meetings, and (4) men were more likely than women to continue drinking and to drink heavily (Satre et al., 2007). There are a number of possible reasons why older groups may do better, some examples include a lesser severity of dependence, a greater willingness to change, better adherence to treatment, longer treatment durations, more supportive social networks, and perhaps age itself (Moy et al., 2011). Survival may also be a factor with healthier older adults more likely to be in treatment (Firoz and Carlson, 2004). It is likely that differences exist for early and late onset groups. Although not widely studied, differences may exist due to economic status. Late-onset group may be at a later stage of life and financial security. Early exposure is consistent with poor general health (Lofwall et al., 2005).

The study findings have several implications for practice and policy. The ageing opioid population present many challenges for policymakers and healthcare providers who are typically accustomed to working with younger drug users. Much work is required to effectively prepare for and respond to the needs of older people, such as: developing effective prevention and treatment responses (service availability, treatment models, workforce awareness and training), developing tools to measure substance use and abuse among older adults, and providing adequate data to measure emerging problems and predicting future trends (Gfroerer et al., 2003; Han et al., 2009; Institute of Medicine, 2012). Treatment systems must prepare for the growing population of ageing adults. Age specific services have been raised as an area for development (European Monitoring Centre for Drugs and Drug Addiction, 2010). Currently, specialised treatment programmes for older drug users are rare, and concerns have been voiced regarding the readiness of current treatment systems to meet the needs of this ageing cohort of opioid users with increasing and complex drug, health and social needs (Colliver et al., 2006; Pirona et al., 2015).

Collaboration and integrated approaches between healthcare and social care providers may be useful, particularly as many older people may already be in regular contact with services due to health issues, and these providers are well placed to identify substance problems among this population. A recent review of service responses for older, high risk drug users found few effective service model responses, limited awareness of older drug users among service professionals and practitioners, and a need for further evidence to fully understand factors (demographic, social and drug use onset) related to the needs of older drug users and their engagement with services (Atkinson, 2016). Addiction and other healthcare services would benefit from training programmes that raise awareness of this growing population. Education programmes in screening, assessing and diagnosing problem substance use in ageing populations would be valuable for health and social care providers. Evidence-based information is important so that policymakers, practitioners, and researchers understand the unique circumstances of the growing population of ageing opioid users. Older adults are largely treated as a homogeneous group in the literature despite

evidence to the contrary. Treatment outcome research is important due to the small number of existing studies including older adults. Further research is required to investigate gender and early/late onset differences.

5. Conclusions

The rationale for conducting this research was to determine what is known about opioid dependence and treatment outcomes among ageing opioid users. There is no consensus in the literature on what old is, however the opioid treatment population, within which subgroups exist, is ageing. The definition of old varies by study and country. Clear rationale for the choice of age cut-offs in defining the older population is important and should be determined by large national datasets. It is important to understand the specific needs of this ageing population in order to deliver appropriate care. Further research using large samples is required to investigate subgroups of older adults in more detail and to determine whether there are in differences in their treatment outcomes. Currently, addiction and healthcare services are unaware of the extent of the needs of older users. They must anticipate and prepare for predicted increases in demand by this group.

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Contributors

Author Carew conducted the systematic search, prepared the first draft and submitted the article. Author Comiskey devised the review topic and systematic approach, reviewed the search terms with author Carew for relevance and completeness and edited successive drafts prior to submission. All authors read and approved final submission.

Conflict of interest

The authors declare that they have no conflict of interest concerning this article.

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