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Respiratory health of patients receiving agonist opioid treatment: Gender differences

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Summary

Background: The recommended treatment for opioid dependent people is agonist opioid treatment (AOT). The pharmacotherapies used are methadone and buprenorphine. The effects of methadone are similar to other opioids such as morphine and include sedation and respiratory depression. There is good evidence that polydrug use, particularly tobacco, cannabis and alcohol, is common among opioid dependent people on AOT programs. These drugs have also been linked to impaired lung function. The aims were to examine gender differences in (a) tobacco and cannabis consumption, and (b) respiratory symptoms and lung function of opioid dependent people receiving AOT. **Methods:** The sample (n=149) were recruited from two Western Australian drug and alcohol clinics from March 2009 to July 2012 from a pool of ~350 patients receiving AOT. Data were obtained on current and past smoking, passive smoking, cannabis use, AOT medications, asthma, and respiratory symptoms. Forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC) and the FEV1/FVC ratio were measured by spirometry. **Results:** Mean age ~40. Smoking prevalence (tobacco) was 89% males and 82% females, cannabis 47% males and 54% females. Over 60% were unemployed. The majority were treated with methadone. Breathlessness was associated with FEV1 (p=0.02) and FVC (p=0.02), asthma with FEV1 (p=0.04). COPD was detected in 27% of males and 24% of females. 51% reported shortness of breath when hurrying on level ground or walking up a slight hill and 30% gave a history of morning cough. As indicated by the FEV1/FVC ratio <0.70, 27.3% of men and 24% of women had COPD. **Conclusions:** The sample was relatively young but many men and women were exhibiting smoking related respiratory symptoms and ~25% had COPD. Declining lung function appears to be an important morbidity among patients on OST, particularly among women. Smoking cessation interventions should be included in AOT regimes.

Key Words: Lung health; Agonist Opioid Treatment; Chronic Obstructive Airways Disease; smoking; gender differences

1. Introduction

The recommended treatment for opioid dependent people is agonist opioid treatment (AOT). The pharmacotherapies used for AOT are methadone and buprenorphine [21]. Methadone is a synthetic opioid agonist with a relatively long plasma half life. The effects of methadone are similar to other opioids such as morphine and include sedation and respiratory depression. Buprenorphine is a partial opioid agonist which unlike methadone reaches a ceiling where high doses do not further increase respiratory depression

[21]. In Australia in 2013, 47,000 opioid dependent people were treated with AOT, almost double the 25,000 being treated in 1998 [5].

Smoking tobacco accounts for approximately 19,000 deaths per annum. In Australia, in 2003, it was estimated that tobacco was responsible for 8% of the burden of disease [6]. The majority of deaths attributable to smoking were from Chronic Obstructive Pulmonary Disease (COPD) (54,492), a largely irreversible progressive disease defined by a combination of related diseases including bronchitis and emphysema mainly characterized by difficulty in breathing,

ischaemic heart disease (31,435) and lung cancer (6,309) [6]. Most of the burden of disease occurs in those over 45 years of age. There is good evidence that polydrug use, particularly tobacco, cannabis and alcohol, is common amongst opiate dependent people on AOT programs. A population based study (n = 41,396) examined cancer mortality among persons who had received AOT in 1985 – 2005. Lung cancer was common and members of the cohort were 3.6 (95% CI 2.8 – 4.6) times more likely to die from lung cancer than matched persons in the general population [27].

A high prevalence of COPD among people aged 50 years and over receiving AOT (methadone) has recently been observed in a Canadian case control study utilizing prescription claims data [8]. People receiving methadone maintenance treatment (n = 199) were randomly selected and compared to a matched group not on methadone. The methadone group were significantly more likely to receive medication for COPD (OR = 32.65, p < 0.001) and depression (OR = 4.07, p < 0.001) than the control group.

Cannabis is the most widely used illicit drug in Australia. It can be eaten or smoked in a water pipe but in Australia is commonly smoked in a 'joint'. A systematic review of 34 publications from 1996 to 2005 on the effect of cannabis smoking on pulmonary function and respiratory complications reported that short-term exposure to cannabis was associated with bronchodilation and long-term smoking was associated with increased respiratory symptoms suggestive of COPD [28]. Cannabis smoking has been linked to emphysema and secondary pneumothorax in young adults (age 24 – 27 years).

The aim of this study was to examine gender differences in tobacco and cannabis consumption, respiratory symptoms and lung function in people receiving AOT. This population may be particularly prone to lung disease from their exposure to tobacco and cannabis smoke and opioid drugs. Despite this the published literature relating to gender differences in respiratory morbidity of this population is scant.

2. Methods

This cross sectional study was approved by the South Metro Area Health Services Human Research Ethics Committee (Approval #08/517). Participants (n=149) were recruited from a pool of approximately 350 patients at two well established public Western Australian drug and alcohol clinics in Fremantle (n=78) and Rockingham (n=71) from March 2009 to

July 2012. Informed consent was obtained from all participants before enrollment. Both methadone and buprenorphine (Suboxone) doses were prescribed on a flexible, individualized basis according to recommended guidelines [21]. All patients 18 years and over were eligible to be included. Participants completed a questionnaire and underwent spirometry testing.

A modified version of the British Medical Research Council questionnaire [25] was used to collect data on age, gender, current and past smoking, passive smoking, cannabis use, AOT medications, asthma and respiratory symptoms. Tobacco smoking and cannabis use was categorized by age of initiation of use and number of cigarettes/joints/bongs per day. Duration of episode of AOT from commencement of treatment to time of enrollment in the study was calculated.

Spirometry was used to measure the forced expiratory volume in one second (FEV1), forced vital capacity (FVC) and the FEV1/FVC ratio. A Vitalograph air bellows spirometer was used at Fremantle and an Easy One electronic spirometer at Rockingham. FEV1 and FVC were recorded in accordance with the American Thoracic Society Guidelines [1]. A minimum of three spirometric tests were conducted for each participant and the highest recorded FEV1 and FVC was used in the analysis.

Spirometric end points recommended by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) [16] and used in a recent Australian study of respiratory symptoms and illness in older Australians (BOLD) [29] was adopted. A FEV1/FVC ratio of < 0.70 was taken as being indicative of COPD. Two spirometers and training for all staff involved were provided by the Department of Respiratory Medicine, Sir Charles Gairdner Hospital, Perth. Patients were given a summary of their spirometry results which they could take to their General Practitioner if abnormal together with smoking cessation literature and advice.

Initially we attempted to recruit patients by providing appointments specifically for the study. However few attended and therefore recruitment was done at routine clinic appointments.

Univariate analysis was used to estimate the frequencies, mean and median for respiratory symptoms and diseases, smoking (tobacco and cannabis), demographic characteristics and lung function for all subjects. In addition, the standard deviation (SD) of the mean, quartiles and range of the median were estimated to assess the variation in the distribution of various variables. Linear regression modeling was used

Table 1: Socio-demographics and AOT characteristics

Variables	Males	Females	p- value
Mean age in year (SD)	39.34 (9.02)	39.82 (8.75)	0.75
Mean height in cm (SD)	176.3 (8.4)	164.7 (6.9)	<0.001
Mean weight in kg (SD)	84.0 (16.7)	74.3 (20.2)	<0.01
Mean time on current buprenorphine treatment (months)*	7.2 (5.3)	6.0 (5.6)	0.21
Mean time on current methadone treatment (months)*	6.7 (6)	9.0 (7.2)	0.06
No. of Sex (%)	99 (66.4)	50.0 (33.6)	-
No. aged greater than 30 years (%)	81 (81.8)	42.0 (84.0)	0.92
No. of Unemployed (%)	62(62.6)	32.0 (64)	0.99
No. on methadone (%)	71 (71.7)	33.0 (66)	0.6
Median methadone dose in mg (IQR)	69 (2-120)	70.0 (8.0-120.0)	0.51
Median buprenorphine dose in mg (IQR)	16 (6-60)	16.0 (2.0-30.0)	0.21

*Reflects the length of the current episode of AOT treatment from commencement to time of recruitment. SD=Standard deviation

to examine the relationship between lung function measurements and other factors including the respiratory symptoms and diseases, smoking behaviours (both tobacco and cannabis use), AOT drugs and demographics characteristics. Data were analysed with Epicalc R version 2.16.10.

3. Results

Two thirds of the sample were men. The average age of men and women was similar ~40 years and the majority were unemployed. Over 80% were over 30 years of age. Women were smaller and weighed less than men. Over two thirds of men and women were treated with methadone. The median dose of methadone was 69mg for men, 70mg for women. The median dose of buprenorphine for men and women was similar (16mg) (Table 1). The mean duration of methadone at time of recruitment to the study was 6.7 months for men; 9 months for women: for buprenorphine it was 7 months for men and 6 months for women.

Over 80% of men and women were current tobacco smokers. Over half the women and almost

half the men were current cannabis smokers (Table 2). The average age of commencing tobacco smoking for men and women was approximately 15 years: for cannabis 15.2 years for men and 17.1 years for women. Men smoked an average of 18 cigarettes per day, women 13. Over 40% of men and 34% of women were smoking cannabis on a daily basis. The average number of cones/joints/bongs smoked per day for men and women was similar (5.9). There were no significant differences between men and women in regard to tobacco and cannabis use.

The prevalence of respiratory symptoms and disease are shown in Table 3. A greater percentage of women than men reported being breathless when hurrying, walking on level ground and walking at own pace. A greater percentage of men than women were short of breath at rest. The proportion of men and women who reported usually coughing in the morning was similar (30%). A greater percentage of women than men (50%, 43.4%) reported coughing day or night. Slightly more women than men coughed most days for three months in a year and brought up phlegm, consistent with a diagnosis of chronic bronchitis. A greater percentage of women than men

Table 2: Tobacco and cannabis use

Variables	All	Males	Females	p- value
Mean cigarettes smoked/day (SD)	17.52 (11.3)	18 (12.2)	13.1 (8.5)	0.14
Mean age of initiation tobacco in years (SD)	15.80 (4.1)	15.6 (4.2)	14.8 (3.6)	0.91
Mean Age of initiation cannabis (SD)	15.62 (4.4)	15.2 (3.3)	17.1 (5.2)	0.09
Mean Cones/joints/bongs smoked per day (SD)	6.40 (8.0)	5.8 (8.1)	5.9 (7.3)	0.90
No. of Current tobacco smoker (%)	129 (86.6)	88 (89.0)	41 (82.0)	0.36
No. of current cannabis user (%)	63 (42.3)	47 (47.5)	27 (54.0)	0.15
Daily use cannabis (%)	58 (38.9)	41 (41.4)	17 (34.0)	0.38
Use cannabis 2-3 times/week (%)	26 (17.4)	17 (17.2)	9 (18.0)	0.78
Use cannabis less than weekly (%)	18 (12.1)	13 (13.1)	5 (10.0)	0.58

SD= Standard deviation

Table 3: Respiratory symptoms and diagnoses

Variables	All N (%)	Males N (%)	Females N (%)
Breathless			
When hurrying on level ground/walking up a slight hill (GR 1)	68 (45.6)	35 (35.2)	33 (66.0)
When walking with people your age on level ground (GR 2)	32 (21.5)	15 (15.2)	17 (34.0)
When walking on level ground at own pace (GR 3)	17 (11.4)	7 (7.1)	10 (20.0)
Short of breath when at rest (GR 4)	18 (12.1)	13 (13.1)	5 (10.0)
Cough			
Usually in morning	44 (29.5)	29 (29.3)	15 (30.0)
Usually day or night	68 (45.6)	43 (43.4)	25 (50.0)
Most days for three months in past year	48 (32.2)	31 (31.3)	17 (34.0)
Bring up phlegm most days for three months in past year	52 (34.9)	34 (34.3)	18 (36.0)
Disease diagnosed by doctor			
Asthma	55 (36.9)	30 (30.3)	25 (50.0)
Bronchitis	54 (36.2)	34 (34.3)	20 (40.0)
Other chest problems	36 (24.2)	21 (21.2)	15 (30.0)
Pleurisy	17 (11.4)	10 (10.1)	7 (14.0)

reported being diagnosed by a doctor with asthma, bronchitis, other chest problems and pleurisy.

Spirometry results are presented in Table 4. In comparison with men, women had lower FEV1 and FVC spirometry scores ($p < 0.001$). Based on GOLD criteria 27.3% of men and 24% of women were categorized as having COPD (FEV1/FVC ratio of < 0.70). Breathlessness was significantly associated with FEV1 ($p = 0.02$) and FVC ($p = 0.02$). Asthma was significantly associated with FEV1 ($p = 0.04$) but not FVC. Current cannabis use was associated with FVC ($p = 0.04$). The modeling did not show any evidence of significant interactions between the other variables examined (Table 5).

4. Discussion

This study was conducted to examine gender differences in tobacco and cannabis consumption,

respiratory symptoms and lung function among people receiving AOT. The characteristics of the participants in the study were similar to those reported nationally [5]. That is the majority were over 30 years of age, almost two thirds were male, and over 64% were treated with methadone. Over 80% were current tobacco smokers. This is far higher than the 11.5% of Western Australian aged 16 years and over who reported smoking tobacco in the past year in the WA Surveillance System 2010 [10]. This high prevalence of smoking tobacco among people on AOT is similar to that reported elsewhere [2,12].

Over a third also smoked cannabis on a daily basis, a considerably higher proportion than the 13.4% aged 14 years and older reported in the recent national survey [4]. Both men and women commenced smoking tobacco and cannabis around 15 years of age, though some started as early as 11 years indicating an average exposure to tobacco and cannabis of

Table 4: Average Spirometry measurement

Variables	Males (N=99)	Females (N=50)	p- value
Mean FEV1 (SD)	3.8 (0.85)	2.7 (0.67)	< 0.001
Mean FVC (SD)	5.0 (0.96)	3.6 (0.66)	< 0.001
Mean FEV1/FVC (SD)	0.8 (0.08)	0.8 (0.10)	0.07
Mean FEV1 % predicted (SD)	90.7 (14.6)	88.8 (19.1)	0.50
Mean FVC % predicted (SD)	97.9 (14.1)	95.1 (15.9)	0.28
No. of FEV1/FVC < 0.70 =COPD (%)	27 (27.3)	12.0 (24.0)	0.82

SD=Standard deviation

Table 5: Factors predicting FEV1 and FVC adjusted for age* and sex.

Variable	FEV1		FVC	
	Co-efficient (Se)	p-value	Co-efficient (Se)	p-value
Tobacco Smoking				
Never	1		1	
Past	2.63 (7.58)	0.72	5.88 (7.01)	0.40
Current	-1.97 (6.42)	0.76	3.24 (5.94)	0.59
Pack/week	-0.04 (0.04)	0.35	-0.03 (0.04)	0.36
Disease				
Asthma	-6.35 (2.99)	0.04 *	-4.80 (2.90)	0.10
Bronchitis	-3.79 (2.99)	0.21	-1.24 (2.86)	0.66
Pleurisy	-7.37 (4.22)	0.08	-3.86 (4.04)	0.34
Pneumonia	1.32 (0.30)	0.66	0.09 (2.86)	0.98
Treatment				
Buprenorphine	1			
Methadone	2.61 (2.87)	0.36	2.43 (2.64)	0.36
Cannabis Smoking				
Never	1		1	
Past	4.87 (5.33)	0.36	4.78 (4.68)	0.08
Current	6.12 (5.21)	0.20	8.18 (4.58)	0.05
Joint/bong	-0.11 (0.19)	0.55	-0.05 (0.17)	0.75
Symptoms				
Phlegm	-2.60 (1.98)	0.19	-1.79 (1.86)	0.34
Cough	-0.83 (2.04)	0.68	-0.27 (1.91)	0.89
Breathlessness	-2.12 (0.92)	0.02*	-2.13 (0.87)	0.02*

*p<0.05

around 25 years.

No statistical significant interactions were observed between smoking (tobacco and cannabis) and AOT drugs (methadone, buprenorphine). Among the respiratory symptoms breathlessness was significantly associated with FEV1 and FVC and asthma with FEV1. Current cannabis use was associated with FVC. The lack of significance detected with the other variables examined is likely due to the small sample size of the study.

Overall 37% had been diagnosed with asthma. This far exceeds the 19% of asthma reported among adults in Western Australia aged 18-79 years in 2005-07 [3]. As noted above, we classified COPD in accordance with the GOLD recommendations. Our estimates are not directly comparable to those of the BOLD study because spirometry was measured before and after bronchodilation with salbutamol which was not done in our study. Also the BOLD study reported on participants aged 40 years and over and age groupings of 40-54 years, 55-74 years and 75 years and over. Nonetheless it is of interest to note that patients in the present study had a higher "prevalence" of COPD than those in the BOLD 40 plus age group and a much higher proportion of Gold Stage 1 than

the Bold 75 plus group (not tabled).

Maximal function of the respiratory system is reached at approximately 20 years for females and 25 for males after which lung function slowly decreases with age especially in smokers and asthmatics [15,19]. Physiological changes associated with aging include decreases in the elastic recoil of the lung and the surface area of the alveoli available for gas exchange decrease in compliance of the chest wall and strength of respiratory muscles. The age-related decline in lung function (FEV1) has been observed in a recent Busselton Health Study which found that smoking tobacco and asthma have an additive effect, with increased rate of lung decline in adult life [18].

As assessed by questionnaire and spirometry, many participants were already manifesting respiratory symptoms and disease associated with smoking behaviour, the prevalence of which detected in our study appears high for a population with an average age of 40 years [14]. Spirometry testing is not generally available in Australian drug and alcohol clinics or general practice. Increasing availability in these locations would entail an investment in resources such as equipment and training of relevant health professionals in procedures and interpretation of test results and

referral pathways to specialist respiratory services when necessary. Spirometric testing may not currently be an option for many treatment facilities.

Tobacco smoking is the main modifiable environmental risk factor for COPD. In Australia the proportion of people aged 14 years and over who smoke tobacco has declined from 29% in 1992 to 18% in 2012 [14]. This is largely due to public health campaigns and legislation which has had limited effect on people on AOT. It has been reported that for this population smoking cessation improves quality of life [11, 22] and is not associated with increased drug use [11, 20, 23]. Few AOT treatment facilities in Canada [13], Australia [9, 30] or USA [24, 26] routinely offer smoking cessation programs. Recommendations have been made for inclusion in treatment programs [7, 9, 30].

Limitations

Our study has several limitations, the main one being the lack of follow-up and an age/gender matched control group. It is cross sectional hence does not capture the full history of exposure to methadone or buprenorphine via possible involvement in multiple AOT treatment episodes. In addition approximately a third (n=149) of the available patients were recruited suggesting that selection bias may affect the findings. The study is based on a relatively small sample of patients who consented to participate and may under or overestimate the extent of lung function deficits identified. The possibility that the more 'chaotic' patients failed to participate cannot be discounted.

Also patient acceptability of spirometry testing needs to be taken into account. It takes time to explain, administer and discuss the test results. While we encountered few direct refusals, procrastination was common with many saying they were too busy on the day, had other commitments or would consider being tested at their next appointment with the clinic.

Quantifying cannabis use is problematic. The concept of a 'standard joint' i.e. that one joint be considered equivalent to 10 puffs, five bonges or 0.5g of cannabis has been proposed [31]. Variations in concentrations of tetrahydrocannabinol have been reported [17] and anecdotally it is not uncommon for smokers to mix cannabis with tobacco confounding accurate estimations of cannabis exposure. In this study we have used quantity and frequency measures based on joints per day/week plus age of initiation to use, all of which are subject to recall bias and do not take into account possible periods of abstinence.

5. Conclusions

Smoking tobacco/cannabis was common among both males and females. Women were more likely than males to have respiratory symptoms, asthma, bronchitis and other chest problems. Declining lung function, relative to age, is potentially an important morbidity among people on AOT, particularly women. Interventions to optimize client outcomes and avoid potential progression of lung disease by early diagnosis and reducing/ceasing smoking behaviour are indicated. While treatment of opioid addiction is the primary function of AOT, there is a need to include other behaviours such as smoking tobacco and cannabis which patients may not see as a current problem or health risk.

References

1. American Thoracic Society (1995). Standardization of spirometry, 1994 update. *Am J Respir Crit Care Med.* 152: 1107-1136.
2. Anderson BJ, Niaura R, Stein MD (2007). Smoking cessation patterns in methadone-maintained smokers. *Nicotine Tob Res.* 9:421-8.
3. Australian Centre for Asthma Monitoring (2011). Asthma in Australia. AIHW Asthma Series No. 4. Cat. No. ACM 22. Canberra: AIHW.
4. Australian Institute of Health and Welfare. (2011): 2010 National Drug Strategy Household Survey report. Drug Statistics Series no. 25. Cat. No. PHE 145. Canberra: AIHW.
5. Australian Institute of Health and Welfare (2014). National Opioid Pharmacotherapy Statistics: 2013. Drug treatment series 23. Cat. No. HSE 147. Canberra: AIHW.
6. Begg S, Vos T, Barker B, Stevenson C, Stanley I, Lopez AD. (2007): The burden of disease and injury in Australia 2003. AIHW Cat. No. PHE 82. Canberra AIHW.
7. Bell J, Butler B. (2008): Health care utilization associated with methadone and buprenorphine. *Heroin Addict Relat Clin Probl.* 10 (2): 21-26.
8. Borycki E, Macdonald S, Maruyama A, Zhao J. (2013): Hypertension, chronic obstructive pulmonary disease, diabetes and depression among older methadone maintenance patients in British Columbia. *Drug Alcohol Rev.* 32 (4): 412-418.
9. Bowman J, Wiggers J, Colyvas K, Wye P, Walsh RA, Bartlem K. (2011): Smoking cessation among Australian methadone clients: Prevalence, characteristics and a need for action. *Drug Alcohol Rev.* 31: 507-513.
10. Christou A, Hood R, Miller J. (2012): National Drug Strategy Household Survey 2010. Western Australian supplementary tables. DAO Surveillance Report No. 6. Drug and Alcohol Office, Perth.

11. Chizimuso T, Khara M, Procyshyn RM, Johnson JI, Barr AM, Greaves L. (2010): Smoking cessation interventions among individuals in methadone maintenance: A brief review. *J Subst Abuse Treat.* 38 (2): 191-199.
12. Clemmey P, Brooner R, Chutuape MA, Kidorf M, Stitzer M. (1997) : Smoking habits and attitudes in a methadone maintenance treatment population. *Drug Alcohol Depend.* 44:123-32.
13. Currie SR, Nesbitt K, Wood C, Lawson A. (2003): Survey of smoking cessation in Canadian addiction programs. *J Subst Abuse Treat.* 24, 59-65.
14. Department of Health, Western Australia. (2008): Chronic Obstructive Pulmonary Disease Model of Care. Perth: Health Networks Branch, Department of Health, Western Australia.
15. Fletcher C, Peto R, Tinker C, Speizer F. (1976): The natural history of chronic bronchitis and emphysema: an eight-year study of early chronic obstructive lung disease in working men in London. Oxford University Press. Oxford.
16. Global Initiative for Chronic Obstructive Lung Disease. (2011): Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease. Updated 2010. Global Initiative for Chronic Obstructive Lung Disease Inc.
17. Hall W, Lemon J, Solowij N. (1994): The health and psychological consequences of cannabis use. National Drug Strategy Monograph Series no. 25. Canberra: Australian Government Publishing Service.
18. James AL, Palmer LJ, Kicic E, Maxwell P, Lagan S, Ryan G, Musk A. (2005) : Decline in lung function in the Busselton health study. *Am J of Resp Crit Care Med.* 171:109-114.
19. Janssens JP, Stein MD, Pache JC Stein MD. (1999): Physiological changes in respiratory function associated with aging *Eur Respir J.* 13: 197-205.
20. Lemon SC, Friedman PD, Stein MD. (2003): The impact of smoking cessation on drug abuse treatment outcome. *Addict Behav.* 28, 1323-31.
21. Lintzeris N, Clark N, Winstock A, Dunlop A, Muhleisen P, Gowing L, Ali R *et al.* (2006): Clinical guidelines and procedures for the use of methadone in the maintenance treatment of opioid dependence. National Drug Strategy. Commonwealth of Australia, Canberra.
22. McCarthy WJ, Collins C, Hser YI. (2002): Does cigarette smoking effect drug treatment? *J Drug Issues.* 2, 61-80.
23. McCarthy WJ, Zhou Y, Hser YI, Collins C. (2002): To smoke or not to smoke: impact on disability, quality of life, and illicit drug use in baseline polydrug users. *J Addict Dis.* 21, 35-54.
24. McCool RM, Richter KP, Choi WS. (2005): Benefits and barriers to providing smoking treatment in methadone clinics: findings from a national study. *Am J Addict.* 14, 358-66.
25. Medical Research Council on the aetiology of chronic bronchitis. (1960): Standardised questionnaire on respiratory symptom. *Br Med J.* 2:1965.
26. Olsen Y, Alford DP, Horton JJ, Saitz R. (2005): Addressing smoking cessation in methadone programs. *J Addict Dis.* 24, 33-48.
27. Randall D, Deganhardt AL, Vadjic CL, Hall W, Law M, Butler T. (2011): Increasing cancer mortality among opioid dependent persons in Australia: a new public health challenge for a disadvantaged population. *Aust NZ J Pub Health.* 35 (3):220-225.
28. Tetrault JM, Crothers K, Moore BA, Mehra R, Concato J, Feillin D. (2007): Effects of marijuana smoking on pulmonary functions and respiratory complications: a systematic review. *Arch Intern Med* 167: 221-228.
29. Toelle BG, Xuan W, Bird TE, Abramson MJ, Atkinson DN, Burton DL, James AL, et al. (2013) : Respiratory symptoms and illness in older Australians: the Burden of Obstructive Lung Disease (BOLD) study. *Med J Aust* 198 (3): 144-148.
30. Walsh RA, Bowman JA, Tzelepis F, Lecathelinais C. (2005) : Smoking cessation interventions in Australian drug treatment agencies: a national survey of attitudes and practices. *Drug Alcohol Rev.* 24: 235-244.
31. Zeisser C, Thompson k, Stockwell T, Duff C, Chow C, Vallance K, Ivsins M, Michelow W, Marsh D, Lucas P. (2012): A 'standard joint'? The role of quantity in predicting cannabis-related problems. *Addict Res Theory.* 20 (1): 82-92.

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Conflict of interest

Professor Musk receives funding from the wine industry for unrelated research. The other authors have no relevant personal or funding interests.

Ethics

Authors confirm that the submitted study was conducted according to the WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects. This cross sectional study was approved by the South Metro Area Health Services Human Research Ethics Committee (Approval #08/517).

Note

It is the policy of this Journal to provide a free revision of English for Authors who are not native English speakers.