

# The impact of a smoke-free psychiatric hospitalization on patient smoking outcomes: a systematic review

*Australian & New Zealand Journal of Psychiatry*  
2014, Vol. 48(7) 617–633  
DOI: 10.1177/0004867414533835

© The Royal Australian and  
New Zealand College of Psychiatrists 2014  
Reprints and permissions:  
sagepub.co.uk/journalsPermissions.nav  
anp.sagepub.com



Emily A Stockings<sup>1</sup>, Jenny A Bowman<sup>1</sup>, Judith J Prochaska<sup>2</sup>,  
Amanda L Baker<sup>3,4</sup>, Richard Clancy<sup>1,4</sup>, Jenny Knight<sup>5</sup>,  
Paula M Wye<sup>1,5</sup>, Margaret Terry<sup>5</sup> and John H Wiggers<sup>3,5</sup>

## Abstract

**Objective:** Smoke-free policies have been introduced in inpatient psychiatric facilities in most developed nations. Such a period of supported abstinence during hospitalization may impact smoking behaviours post discharge, yet little quantitative evidence exists. The aim of this review was to provide the first synthesis of the research evidence examining the impact of a smoke-free psychiatric hospitalization on patients' smoking-related behaviours, motivation, and beliefs.

**Methods:** We conducted a systematic review of electronic databases PubMed, MEDLINE, PsycINFO, and EMBASE from inception to June 2013. Studies were included if they were conducted in an inpatient psychiatric facility with a smoke-free policy and if they examined any change in patients' smoking-related behaviours, motivation, or beliefs either during admission, post discharge, or both. Risk of bias was assessed using the Cochrane Collaboration Risk of Bias Tool.

**Results:** Fourteen studies were included in the review. Of the four studies that assessed change in smoking from admission to post discharge, two indicated a significant decline in cigarette consumption up to 3 months post discharge. Positive changes in motivation to quit and beliefs about quitting ability were identified in two studies. One study reported an increase in the rate of quit attempts and one reported a decline in nicotine dependence levels.

**Conclusions:** A smoke-free psychiatric hospitalization may have a positive impact on patients' smoking-related behaviours, motivation, and beliefs, both during admission and up to 3 months post discharge. Further controlled studies with more rigorous designs are required to confirm this potential.

## Keywords

Hospital, psychiatric department, smoke-free policy, smoking, tobacco

## Introduction

Smoking remains the leading preventable cause of death and disease in Western nations (US Department of Health and Human Services, 2004). People with a mental disorder smoke at higher rates (Lawrence et al., 2009; Morgan et al., 2012), are more dependent on nicotine (Australian Institute of Health and Welfare, 2007), and are less likely to quit than the general population of smokers (Diaz et al., 2006; Hagman et al., 2008). As a result, persons with a mental disorder are more likely to suffer smoking-related diseases, and consequently die 12–15 years earlier than persons without such disorders (Lawrence et al., 2013). Some of the highest levels of smoking have been observed among patients hospitalized for psychiatric treatment (Benowitz et al., 2009; Lineberry et al., 2009).

<sup>1</sup>School of Psychology, University of Newcastle, Callaghan, Australia

<sup>2</sup>Stanford Prevention Research Center, Department of Medicine, Stanford University, Stanford, USA

<sup>3</sup>School of Medicine and Public Health, University of Newcastle, Callaghan, Australia

<sup>4</sup>Centre for Translational Neuroscience and Mental Health (CTNMH), Waratah, Australia

<sup>5</sup>Hunter New England Population Health (HNEPH), Wallsend, Australia

### Corresponding author:

Emily A Stockings, National Drug and Alcohol Research Centre, 22–32 King Street, Randwick, NSW 2031, Australia.  
Email: e.stockings@unsw.edu.au

Smoking bans have been introduced in general hospital settings in a number of countries (House of Commons Health Committee, 2005). Such bans seek to protect patients, staff, and visitors from the harmful effects of second hand smoke exposure (Tobacco Advisory Group, 2005) and have been found to be associated with reductions in staff smoking (Callinan et al., 2010; Fathallah et al., 2012). In addition, clinical practice guidelines recommend the provision of behavioural and pharmacological nicotine dependence treatment in order to manage the impacts of smoking bans for patients and to aid the likelihood of their successful smoking cessation (Fiore et al., 2008). Evidence from general hospital settings suggests that a period of such supported abstinence during a smoke-free hospitalization may be beneficial in increasing motivation to quit (Williams and Jones, 2012) and the likelihood of remaining abstinent for up to 12 months post discharge (Duffy et al., 2010; Rigotti et al., 2000; Williams and Jones, 2012). Recent systematic review evidence further suggests that the provision of nicotine replacement therapy (NRT) and smoking cessation counselling during a smoke-free hospitalization can increase patient cessation rates by 54% at 12 months post discharge (Rigotti et al., 2012).

Clinical practice guidelines similarly recommend the introduction of smoke-free policies incorporating complete smoking bans and the provision of nicotine dependence treatment within psychiatric facilities (American Psychiatric Association, 1996; Tobacco Advisory Group, 2005). While the introduction of smoking bans in these settings has often been delayed and/or reported to be difficult (Campion et al., 2008; Ratschen et al., 2009), evidence suggests that when staff leadership is cohesive, enforcement of the ban is consistent, and appropriate nicotine dependence treatment is systematically provided to patients, smoking bans have not led to increased patient aggression or discharge against medical advice (Lawn and Campion, 2010; Lawn and Pols, 2005; Moss et al., 2010).

Although a smoke-free psychiatric hospitalization may positively impact on patients' smoking behaviours, as evidenced among smokers in general hospital settings (Duffy et al., 2010; Rigotti et al., 2000; Williams and Jones, 2012), few studies have examined the impact of a smoke-free psychiatric hospitalization on patients' smoking outcomes. The aim of this systematic review was to provide the first synthesis of the evidence examining the impact of smoke-free policies on patient smoking behaviours, motivation, and beliefs both during and post discharge from an inpatient psychiatric facility.

## Methods

A systematic review was conducted in June 2013 in line with the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) statement (Moher et al., 2009). A PRISMA checklist for the review is included in

Supplementary Table A1 (Appendix 1, available online). The electronic databases PubMed, MEDLINE, PsycINFO, and EMBASE were searched from inception to June 2013 using the following terms: "smoking" AND "psychiatric department, hospital" AND "patient discharge", "tobacco" AND "mental health" AND "admission" OR "discharge", "psychiatric" AND "smoke-free policy" OR "smoking ban" AND "inpatient", "smoking" AND "mental health" AND "hospitalized", "smoking" AND "psychiatric" AND "restricted", "tobacco dependence treatment" AND "psychiatric" AND "hospital", and "smoking cessation treatment" AND "psychiatric" AND "hospital". Individual searches of each database were conducted and the results combined. Results were restricted to studies with humans and those written in English. Articles were excluded if they did not report original data (e.g. review articles). The reference lists of prior reviews and key articles were searched for papers relevant to the study aims.

This review is registered on the National Institute for Health Research international prospective register of systematic reviews (PROSPERO; registration number CRD42012002770; available at [www.crd.york.ac.uk/PROSPERO/](http://www.crd.york.ac.uk/PROSPERO/)).

Included papers were required to examine changes in patients' reported smoking-related behaviours (including abstinence from cigarettes, quit attempts, cigarette consumption, nicotine dependence, and use of smoking cessation supports), motivation, or beliefs during or following an admission to an adult inpatient psychiatric facility with a policy incorporating restrictions on smoking. Papers were excluded if they surveyed clinical staff only. Study findings were examined with regard to risk of bias (Higgins and Green, 2011) and with respect to a number of aspects of smoke-free policies, including: the nature of the smoking restrictions ("complete – all buildings and grounds", "incomplete with smoking permitted outdoors", "incomplete with smoking permitted indoors", or "incomplete with smoking permitted in designated rooms or at designated times"); adherence to such restrictions ("adherence evident", "non-adherence evident", or "not reported"); and provision of nicotine dependence treatment ("psychological only", "pharmacological only", "combined", or "not reported").

A data extraction form was developed based on guidance literature (Popay et al., 2006) with data being extracted independently by the first and second authors (EAS and JAB) and analysed by systematic narrative synthesis.

## Assessment of risk of bias

Risk of bias in the included studies was examined using the Cochrane Collaboration tool for assessing risk of bias (Higgins and Green, 2011). The tool comprises five domains of bias: selection, performance, detection, attrition, and reporting, with a sixth domain for "other biases". Reviewers are required to make a judgement of risk of bias

with supporting statements for each domain (“low risk”, “high risk”, or “risk unable to be determined”). Given this review was not limited to randomized controlled trials, the tool was modified by the study authors for the purpose of assessing nonrandomized and noncomparative studies. For assessing selection bias, the categories “random sequence generation” and “allocation concealment” were replaced with “comparability of groups” (in the case of studies with multiple groups) and “sample representativeness”, respectively. Comparability of groups included an examination of whether the authors provided adequate detail that the groups were comparable on relevant prognostic factors at baseline (e.g. age, gender, length of admission, level of smoking, psychological distress). Sample representativeness included an examination of whether the authors provided adequate detail that the included sample was representative of the target population. Given that participants in the included studies would most likely be aware of the hospital’s smoke-free policy (i.e. not blinded to the intervention), the domains for performance and detection bias were combined into a single domain named “blinding”, which assessed blinding of outcome assessors. For the other domains, criteria for determining risk of bias were retained as per the original tool (Higgins and Green, 2011). Risk of bias was assessed independently by the first author (EAS) and by a research assistant, and discrepancies were resolved via consensus with the second author (JAB). Assessors were not blinded to study authors, institution, or journal as they were familiar with the literature. No studies in the review were excluded from the narrative synthesis on the basis of risk of bias.

## Results

Figure 1 describes the results of the search and paper selection process. The search identified a total of 334 papers, of which 156 were unique, and 178 were duplicates. By reviewing the title, abstracts and reference lists of the 156 papers, 86 were identified as potentially relevant and 70 were excluded as they were not relevant to the search topic. The first author reviewed the 86 articles and their reference lists, resulting in 71 being excluded (25 did not examine patients’ smoking-related behaviours, 21 in inpatient psychiatric facilities without a smoke-free policy, 21 no original data, four surveyed clinical staff only). The remaining 15 publications (based on 14 studies) were included in this review (Table 1). As the publication by Shmueli et al. (2008) reported on the same sample as Prochaska et al. (2006), both papers were considered as one study and have been cited as the earlier study.

### Study characteristics

A description of the 14 included studies is provided in Table 1 regarding: study location, design, setting, and sample; the

nature of the smoke-free policy (including the type of smoking restriction, adherence with the policy, and provision of nicotine dependence treatment); the smoking-related outcomes assessed and measures used, and the study findings.

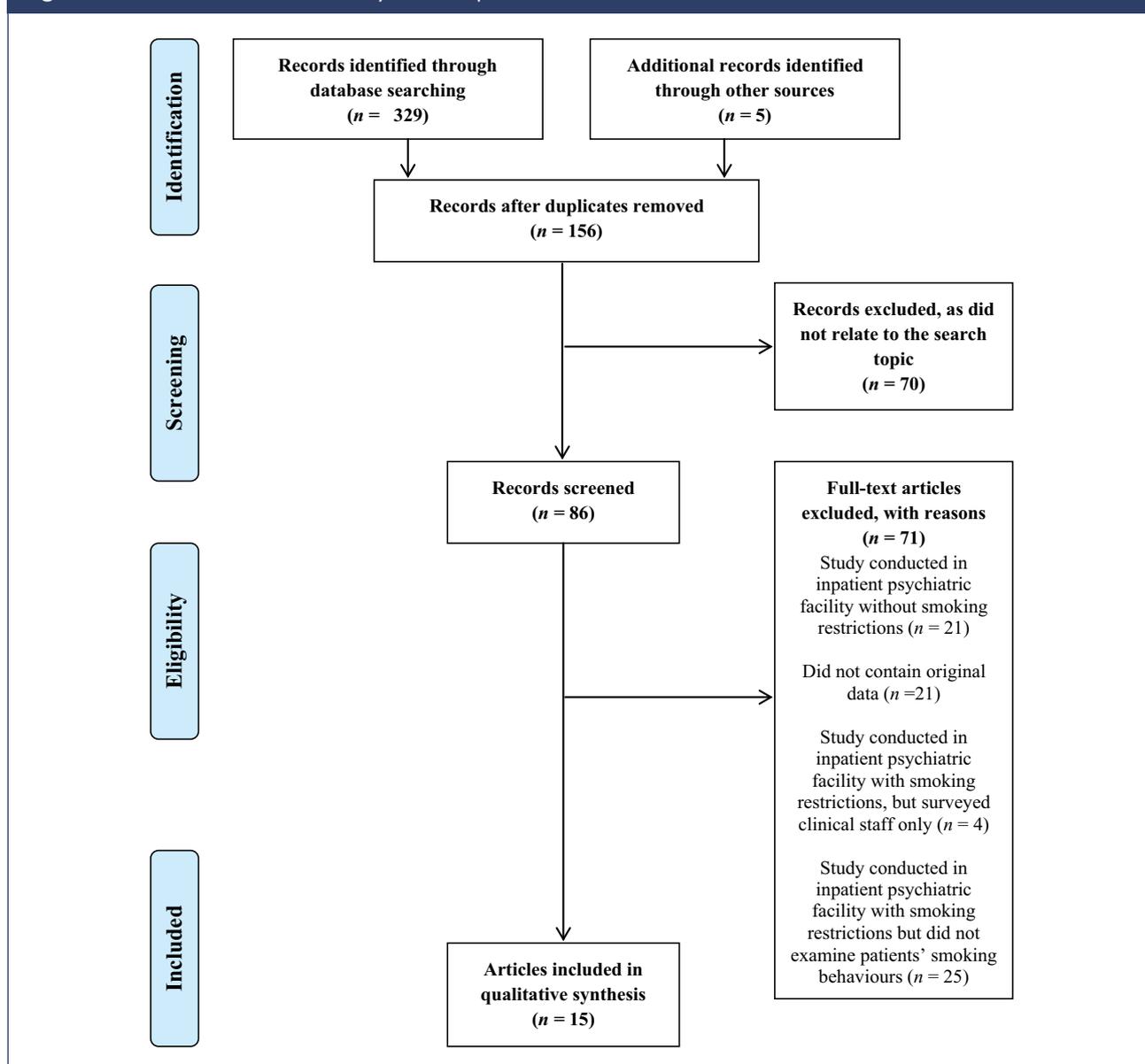
Seven studies were conducted in the USA (Downey et al., 1998; Jones et al., 2004; Patten et al., 1995; Prochaska et al., 2006; Resnick and Bosworth, 1989; Smith and Grant, 1989; Smith et al., 2012), three in Switzerland (Etter et al., 2008; Keizer and Eytan, 2005; Keizer et al., 2009), two in the UK (Ratschen et al., 2010; Smith and O’Callaghan, 2008), and two in Australia (Hehir et al., 2012; Siru et al., 2010). None of the studies involved randomized controlled trials. Six studies were conducted as cross-sectional surveys at a single time point (Hehir et al., 2012; Keizer and Eytan, 2005; Ratschen et al., 2010; Smith and Grant, 1989; Smith and O’Callaghan, 2008; Smith et al., 2012) and four as cross-sectional surveys at multiple time points in the same facility and at various stages of smoke-free policy implementation (Etter et al., 2008; Keizer et al., 2009; Patten et al., 1995; Resnick and Bosworth, 1989). Four studies used repeated-measures designs, two of which examined changes in smoking-related behaviours over time in a single group (Jonas and Eagle, 1991; Prochaska et al., 2006) and two examined changes in smoking-related behaviours over time in two groups (Downey et al., 1998; Siru et al., 2010), one of which used general hospital patients as a comparison group (Siru et al., 2010). The number of patients included in the studies ranged from 15–467. Where reported, length of admission ranged from 1–990 days.

### Level of smoking restriction in place and adherence

Six studies were conducted in facilities with complete smoking bans (Hehir et al., 2012; Jonas and Eagle, 1991; Prochaska et al., 2006; Ratschen et al., 2010; Siru et al., 2010; Smith et al., 2012), and eight in facilities with incomplete bans, four of which banned smoking indoors only (Etter et al., 2008; Patten et al., 1995; Resnick and Bosworth, 1989; Smith and Grant, 1989), three restricted smoking to designated smoking rooms (Keizer and Eytan, 2005; Keizer et al., 2009; Smith and O’Callaghan, 2008), and one restricted smoking to five predetermined intervals per day (Downey et al., 1998). Five studies were conducted in facilities which introduced or had a change in a smoke-free policy during the study period from none/minimal to more thorough restrictions on smoking (Downey et al., 1998; Etter et al., 2008; Keizer and Eytan, 2005; Keizer et al., 2009; Patten et al., 1995; Resnick and Bosworth, 1989).

Of the six studies conducted in facilities with complete bans, one indicated that all participants abstained from smoking during admission (Jonas and Eagle, 1991) and two indicated some level of nonadherence (Ratschen et al.,

Figure 1. PRISMA flowchart of the study selection process.



2010; Smith et al., 2012). Of the eight studies conducted in facilities with incomplete bans, five indicated some level of nonadherence (Etter et al., 2008; Patten et al., 1995; Resnick and Bosworth, 1989; Smith and Grant, 1989; Smith and O'Callaghan, 2008). Six studies did not provide comment on policy adherence (Downey et al., 1998; Hehir et al., 2012; Keizer and Eytan, 2005; Keizer et al., 2009; Prochaska et al., 2006; Siru et al., 2010). Evidence of non-adherence typically comprised patient self-report that they themselves had smoked in prohibited areas of the facility (Ratschen et al., 2010; Smith and Grant, 1989; Smith and O'Callaghan, 2008), were aware of family or friends smuggling cigarettes onto the ward (Resnick and Bosworth, 1989), were exposed to continued smoking by other patients

(Smith et al., 2012), or were aware of sharing of cigarettes between patients or between patients and staff (Etter et al., 2008). One study used medical records to identify that several patients had smoked in a prohibited area during their admission (Patten et al., 1995).

#### *Provision of nicotine dependence treatment*

In ten of the 14 studies, facilities were reported as providing nicotine dependence treatment to patients as part of routine care, including NRT and brief advice to quit (Etter et al., 2008; Hehir et al., 2012; Jonas and Eagle, 1991; Patten et al., 1995; Prochaska et al., 2006; Ratschen et al., 2010; Resnick and Bosworth, 1989; Siru et al., 2010; Smith

**Table 1.** Characteristics and findings of studies included in the review.

Study, location, design, setting, and sample	Nature of the smoke-free policy	Smoking-related outcomes and measures	Findings
<b>Resnick and Bosworth (1989), USA</b>			
<b>Design:</b> Cross-sectional surveys of patients conducted at two time-points: 1 month pre-ban, 1 month post ban	<b>Type:</b> Incomplete ban (smoking banned indoors)	<b>Outcomes:</b> Smoking-related beliefs only	During the pre-ban period, 29% reported the restricted policy would lead them to quit, 30% reported it would lead them to try and reduce, and 38% reported it would not affect their smoking
<b>Setting:</b> 12-bed, acute, locked psychiatric unit of a university hospital	<b>Detail:</b> In the pre-ban period, smoking was permitted in a designated day room from 8 am to 11 pm; post ban, smoking was banned indoors only	<b>Measures:</b> Nonstandardized items regarding patients' perceived impact of the smoking ban on future smoking behaviours, and smoking group attendance	The percentage reporting wanting to attend a smoking cessation group was higher when smoking was permitted in a designated room (60%) than when smoking was banned indoors (32%); no significance test conducted
<b>Sample:</b> n=165 (116 pre-ban, 49 post ban)	<b>Adherence:</b> Nonadherence evident		Doses of PRN NRT were lower in the 1-month period when smoking was permitted in a designated room (7) than when smoking was banned indoors (176); no significance test conducted
<b>Smokers:</b> 71%	<b>Nicotine dependence treatment:</b> Pharmacological only (nicotine gum)		Occasionally, cigarettes were smoked on the ward, or smuggled in by visitors
<b>Smith and Grant (1989), USA</b>			
<b>Design:</b> Cross-sectional survey of patients discharged from the third to fifth weeks following smoke-free policy implementation	<b>Type:</b> Incomplete ban (smoking banned indoors)	<b>Outcomes:</b> Smoking-related behaviours and beliefs	Two patients reported refraining from, or reducing their smoking during admission and 54% indicated they expected to reduce their smoking post discharge
<b>Setting:</b> 42-bed, 3-unit (2 general units, 1 intensive care unit), private psychiatric facility	<b>Detail:</b> Smoking banned indoors only	<b>Measures:</b> Nonstandardized items regarding change in smoking behaviour during admission, and beliefs regarding future smoking behaviours post discharge	Only 14 (43.8%) patients indicated they had been informed of the smoking ban by staff prior to admission
<b>Sample:</b> n=32	<b>Adherence:</b> Nonadherence evident		The majority (12/13) of the smokers reported smoking during their hospital stay; several patients acknowledged violating the ban and smoked in a prohibited area during their admission
<b>Smokers:</b> 40.6%	<b>Nicotine dependence treatment:</b> Pharmacological only (nicotine gum)		
<b>Jonas and Eagle (1991), USA</b>			
<b>Design:</b> Repeated-measures design, comprising surveys of a single group of patients during admission and 6–18 months post discharge	<b>Type:</b> Complete ban	<b>Outcomes:</b> Smoking-related behaviours only	All participants abstained from smoking during admission and were observed using nicotine gum at least twice, by a staff member

(Continued)

Table 1. (Continued)

Study, location, design, setting, and sample	Nature of the smoke-free policy	Smoking-related outcomes and measures	Findings
<p><b>Setting:</b> Short-term psychiatric unit of a general hospital</p> <p><b>Sample:</b> n=39</p> <p><b>Age:</b> mean 32.5 years</p> <p><b>Gender:</b> 76.9% female</p> <p><b>Admission length:</b> mean 14.1 days</p>	<p><b>Detail:</b> Smoking prohibited for all patients</p> <p><b>Adherence:</b> Evident</p> <p><b>Nicotine dependence treatment:</b> Combined: NRT (nicotine gum) and education in its use</p>	<p><b>Measures:</b> Daily cigarette consumption, abstinence from cigarettes</p>	<p>80% resumed smoking immediately after discharge, and 89.7% (35/39) resumed smoking within 8-week post discharge</p> <p>10.3% were abstinent at 8-week post discharge, and were lighter smokers on admission</p> <p>No difference in the number of cigarettes smoked from admission to discharge</p> <p>Resumption of smoking post discharge was not associated with any demographic factors</p>
<p><b>Patten et al. (1995), USA</b></p> <p>Design: Cross-sectional survey of patients at two time points: 3 months prior and 3 months post smoke-free policy implementation, with a follow-up interview conducted at 16–18-month post discharge for patients in the post-implementation period</p> <p><b>Setting:</b> 28-bed, locked psychiatric unit</p> <p><b>Sample:</b> n=362 (184 pre-ban, 178 post ban, 19 of which completed the follow-up interview)</p> <p><b>Age:</b> 11–82 years (mean 39.3)</p> <p><b>Gender:</b> 59.2% female</p> <p><b>Admission length:</b> 1–53 days (mean 12.5)</p> <p><b>Smokers:</b> 43.3%</p>	<p><b>Type:</b> Incomplete ban (smoking banned indoors)</p> <p><b>Detail:</b> In the pre-ban period, smoking was permitted in a designated room; in the post-ban period, smoking was banned indoors only</p> <p><b>Adherence:</b> Nonadherence evident</p> <p><b>Nicotine dependence treatment:</b> Combined: NRT (nicotine gum), weekly nicotine dependence support group, and self-help materials</p>	<p><b>Outcomes:</b> Smoking-related behaviours only</p> <p><b>Measures:</b> Smoking status, daily cigarette consumption, use of smoking cessation supports, self-reported abstinence from cigarettes</p>	<p>No difference in smoking status or daily cigarette consumption from the pre- to post-ban periods</p> <p>A small number (0.8%) of medical records indicated a patient smoked in prohibited area of the hospital during their hospital stay</p> <p>Of the 19 patients who were followed up by telephone 16–18 months post discharge in the post-ban period, five (26%) reported using nicotine gum in hospital, 21% reported participating in a smoking cessation program post discharge, and three patients (15.8%) used NRT post discharge (all used gum)</p> <p>All 19 smokers reported returning to smoking immediately after discharge, and 18 of the 19 (95%) reported current smoking; two patients (10.5%) reported not smoking at 6 and 12 months post discharge</p>

(Continued)

Table 1. (Continued)

Study, location, design, setting, and sample	Nature of the smoke-free policy	Smoking-related outcomes and measures	Findings
<p><b>Inclusion criteria:</b> All smokers admitted to the facility during the study period</p> <p><b>Participation rate:</b> 100%</p>			
<p><b>Downey et al. (1998), USA</b></p>			
<p><b>Design:</b> Two-group repeated-measures design, with surveys conducted upon admission and discharge for patients in the “ad lib” and “restricted” smoking periods</p> <p><b>Setting:</b> University psychiatry unit</p> <p><b>Sample:</b> n=42 (20 in the “ad lib” period, 22 in the “restricted” period)</p> <p><b>Age:</b> mean 34.6 years</p> <p><b>Gender:</b> 57% female</p> <p><b>Admission length:</b> mean 9.9 days</p> <p><b>Inclusion criteria:</b> All smokers admitted to the facility during the study period</p> <p><b>Participation rate:</b> 100%</p>	<p><b>Type:</b> Incomplete ban (smoking permitted at designated times)</p> <p><b>Detail:</b> In the “ad lib” period, patients were permitted to smoke unrestricted. During the “restricted” period, smoking was restricted to five predetermined intervals per day</p> <p><b>Adherence:</b> Not reported</p> <p><b>Nicotine dependence treatment:</b> Not reported</p>	<p><b>Outcomes:</b> Smoking-related motivation only</p> <p><b>Measures:</b> Stage of Change visual analogue scale (Rustin and Tate, 1993)</p>	<p>“Restricted” smokers showed a statistically significant decrease on the “action” stage of change scale from admission to discharge, while “ad lib” smokers showed a significant increase (<math>p&lt;0.05</math>)</p>
<p><b>Keizer and Eytan (2005), Switzerland</b></p>			
<p><b>Design:</b> Cross-sectional survey of patients admitted over a 3-week period</p> <p><b>Setting:</b> Nine 15–20 bed units (half acute, half long-term) of a general university psychiatric hospital</p> <p><b>Sample:</b> n=91</p> <p><b>Age:</b> 37.6 years</p>	<p><b>Type:</b> Partial ban (smoking permitted in designated rooms)</p> <p><b>Detail:</b> Smoking only permitted in designated areas</p> <p><b>Adherence:</b> Not reported</p> <p><b>Nicotine dependence treatment:</b> Not reported</p>	<p><b>Outcomes:</b> Smoking-related behaviours only</p> <p><b>Measures:</b> Smoking status, daily cigarette consumption, nicotine dependence (two items from the HSI)</p>	<p>70.5% of stable smokers on admission reported varying their smoking behaviour during admission</p> <p>Relative to pre-admission, 43.2% increased and 27.3% decreased daily cigarette consumption during admission</p> <p>Mean daily cigarette consumption was reported to be higher during admission (26.2) than the week pre-admission (23.7) but was not statistically significant (<math>p=0.09</math>)</p> <p>Patients with lower baseline HSI scores had the greatest reported increase in smoking from pre-admission to admission (<math>p=0.005</math>), and this effect was stronger for males than females (<math>p=0.035</math>)</p>

(Continued)

Table 1. (Continued)

Study, location, design, setting, and sample	Nature of the smoke-free policy	Smoking-related outcomes and measures	Findings
<p><b>Gender:</b> 47.3% female</p> <p><b>Smokers:</b> 72%</p> <p><b>Inclusion criteria:</b> All patients admitted to the facility during the study period</p> <p><b>Participation rate:</b> 79%</p>			<p>Heavy smokers (47%) were more significantly more likely to decrease their cigarette consumption during admission than light smokers (10%), and light smokers (80%) were more likely to increase than heavy smokers (17%; <math>p=0.001</math>)</p>
<b>Prochaska et al. (2006) (includes Shmueli et al., 2008), USA</b>			
<p><b>Design:</b> Repeated-measures design comprising surveys of a single group of patients during admission, and at 1-week, 1-month, and 3-month post discharge</p>	<p><b>Type:</b> Complete ban</p>	<p><b>Outcomes:</b> Smoking-related behaviours, motivation, and beliefs</p>	<p>70% used NRT during hospitalization (60% patches, 21% gum and 19% combination), and 2% received advice to quit; daily NRT dose was 12.6 mg, and median NRT replacement level was 70%; only 4% were prescribed NRT on discharge; nicotine dose predicted increased feelings of success with quitting during hospitalization</p>
<p><b>Setting:</b> University-based inpatient psychiatry unit</p>	<p><b>Detail:</b> Smoking prohibited for all patients on buildings and grounds</p>	<p><b>Measures:</b> Smoking history questionnaire (years of smoking, daily cigarette consumption, previous quit attempts), nicotine dependence (FTND), TAQ, NWC, use of post-discharge cessation supports, quit attempts, abstinence from cigarettes (validated with expired breath CO)</p>	<p>Compared to admission, upon discharge participants expected to be significantly more successful in their quit attempt (<math>p&lt;0.05</math>), and perceived significantly less difficulty in staying smoke-free following a quit attempt (<math>p&lt;0.01</math>); there was also a statistically significant decrease in the number of patients having no abstinence goal, and significant increases in patients reporting both intermediate goals, and goals to quit for good (<math>p&lt;0.001</math>)</p>
<p><b>Sample:</b> <math>n=100</math></p>	<p><b>Adherence:</b> Not reported</p>		<p>All patients returned to smoking within the 3-month study period, with 76% resuming smoking on the day of discharge; patients who were heavier smokers on admission (<math>p=0.047</math>), had higher FTND scores (<math>p=0.043</math>), greater cravings to smoke during hospitalization (<math>p=0.014</math>), fewer lifetime quit attempts (<math>p=0.034</math>), and less desire to quit (<math>p=0.002</math>) were significantly more likely to return to smoking on the day of discharge</p>
<p><b>Age:</b> mean 38.7 years</p>	<p><b>Nicotine dependence treatment:</b> Combined: NRT (patch, gum), advice to quit, and tobacco treatment provision entered on discharge plan</p>		<p>There was a statistically significant decline in number of cigarettes smoked from pre-admission to 3 months post discharge (<math>p&lt;0.001</math>)</p>

(Continued)

Table 1. (Continued)

Study, location, design, setting, and sample	Nature of the smoke-free policy	Smoking-related outcomes and measures	Findings
<p><b>Gender:</b> 39% female</p> <p><b>Admission length:</b> 1–37 days (mean 6.4)</p> <p><b>Smokers:</b> 35%</p> <p><b>Inclusion criteria:</b> &gt; 18 years, current smoker</p> <p><b>Participation rate:</b> 87%</p>			<p>Nearly half (48%) reported a quit attempt post discharge, and 4% were biochemically confirmed abstinent at 3 months; use of NRT post hospitalization was associated with making a quit attempt post hospitalization (OR 6.9, <math>p &lt; 0.001</math>)</p>
<p><b>Etter et al., 2008, Switzerland</b></p> <p><b>Design:</b> Four cross-sectional surveys of patients: pre-partial smoking ban (2003), 2 months post implementation of the partial smoking ban (2004), 20 months post implementation of the partial smoking ban (2005), and 3–5 months post implementation of the total smoking ban (2006)</p> <p><b>Setting:</b> 2 units (1 short stay unit, 1 medium stay unit each comprising 16 beds) of a 10 unit 166-bed university hospital psychiatry department</p> <p><b>Sample:</b> n=467 (106, 2003; 108, 2004; 119, 2005; 134, 2006)</p> <p><b>Age:</b> mean 39.9 years</p>	<p><b>Type:</b> Incomplete ban (smoking banned indoors)</p> <p><b>Detail:</b> In the no ban period (2003), patients could smoke anywhere, unrestricted. During the partial ban (2004–2005), smoking was permitted inside a designated smoking room; during the total ban (2006), smoking was banned indoors only</p> <p><b>Adherence:</b> Nonadherence evident</p> <p><b>Nicotine dependence treatment:</b> Combined: NRT (patch, gum) and advice to quit</p>	<p><b>Outcomes:</b> Smoking-related behaviours only</p> <p><b>Measures:</b> Smoking status, daily cigarette consumption, quit attempts</p>	<p>No change in smoking status or cigarette consumption across the four time points</p> <p>The proportion of smokers who attempted to quit during their hospital stay was higher (18.4%) during the total ban (2006) than during the partial ban (2005; 2.2%; <math>p = 0.01</math>)</p> <p>Patients' reported receipt of NRT was higher in the total ban period (2006; 52.2%) than the no ban period (2003; 5.1%, <math>p &lt; 0.002</math>); receipt of advice to quit was also higher during the total ban period (2006; 42.6%) than the no ban period (2003; 15.4%; <math>p = 0.006</math>)</p> <p>In the total ban period (2006), 22.1% of patients reported the restricted smoking rules in the hospital were not respected, and 11.5% reported they were exposed to smoke in bedrooms, 26.9% in dining rooms, and 34.6% in corridors, all areas where smoking was prohibited</p>

(Continued)

Table 1. (Continued)

Study, location, design, setting, and sample	Nature of the smoke-free policy	Smoking-related outcomes and measures	Findings
<p><b>Gender:</b> 40.8% female</p> <p><b>Smokers:</b> 79.6%</p> <p><b>Inclusion criteria:</b> All patients admitted to the facility during the study period</p> <p><b>Participation rate:</b> 86%</p>			<p>In the total ban period (2006), over half (52.2%) the patients reported that other patients provided them with cigarettes, 14.6% of patients reported that staff provided them with cigarettes, and 22.4% reported that hospital staff forbade them to smoke</p>
<b>Smith and O'Callaghan (2008), UK</b>			
<p><b>Design:</b> Cross-sectional survey of patients over a 1-month period</p> <p><b>Setting:</b> 13 wards (10 general, three functional old age wards) of a public mental health trust</p> <p><b>Sample:</b> n=135</p> <p><b>Age:</b> 18–86 (mean 49.7 years)</p> <p><b>Gender:</b> 47.4% female</p> <p><b>Smokers:</b> 54.1%</p> <p><b>Participation rate:</b> 55.6%</p>	<p><b>Type:</b> Incomplete ban (smoking permitted in designated rooms)</p> <p><b>Detail:</b> Smoking permitted in two designated smoking rooms per ward, smoking banned in all other indoor areas</p> <p><b>Adherence:</b> Nonadherence evident</p> <p><b>Nicotine dependence treatment:</b> Not reported</p>	<p><b>Outcomes:</b> Smoking-related behaviours only</p> <p><b>Measures:</b> Smoking status, nonstandardized items regarding change in smoking behaviour during admission</p>	<p>Overall reported rate of smoking remained constant between pre-admission and the time of interviewing</p> <p>From pre-admission to the time of interviewing, 14% reported an increase in smoking, and 23% reported a decrease</p> <p>Two patients reported resuming smoking, two reported smoking uptake, and two reported both increasing and decreasing smoking during admission relative to pre-admission</p> <p>Policy noncompliance was reported by 22.2% of the total sample</p>
<b>Keizer et al. (2009), Switzerland</b>			
<p><b>Design:</b> Cross-sectional surveys of patients pre (2001) and post smoking-ban implementation (2005)</p> <p><b>Setting:</b> Nine, 15–20 bed units (half acute, half long-term) of a general university psychiatric hospital</p> <p><b>Sample:</b> n=224 (91 pre-ban, 2001; 134 post ban, 2005)</p>	<p><b>Type:</b> Incomplete ban (smoking permitted in designated rooms)</p> <p><b>Detail:</b> In the pre-ban period (2001) there were no compulsory smoking rules. Post ban (2005), smoking was restricted to one designated ventilated room per unit</p> <p><b>Adherence:</b> Not reported</p>	<p><b>Outcomes:</b> Smoking-related behaviours and motivation</p> <p><b>Measures:</b> Daily cigarette consumption, nicotine dependence (HSI), SCS, nonstandardized items regarding reasons for changing smoking behaviour during admission</p>	<p>Relative to pre-admission, average number of cigarettes smoked per day during admission increased by 3.2 in the pre-ban period (2001) and decreased by 6.2 post ban (2005); however, not statistically significant</p> <p>In the post-ban period relative to pre-admission, 25.5% of smokers increased and 37.3% decreased cigarette consumption during admission</p> <p>In the post-ban period (2005), reductions in daily cigarette consumption from pre-admission to during admission were significantly only for heavy smokers (<math>p=0.001</math>)</p>

(Continued)

Table 1. (Continued)

Study, location, design, setting, and sample	Nature of the smoke- free policy	Smoking-related outcomes and measures	Findings
<p><b>Gender:</b> 47.3% female</p> <p><b>Smokers:</b> 72.1%</p> <p><b>Inclusion criteria:</b> All patients admitted to the facility during the study period</p> <p><b>Participation rate:</b> 79%</p>	<p><b>Nicotine dependence treatment:</b> Not reported</p>		<p>Significantly larger proportions of participants the “contemplation” and “preparation/decision” stages of change for quitting when smoking was restricted to designated rooms (2005; 18.5%) than when smoking was unrestricted (2001; 4.9%; <math>p=0.02</math>), and significantly larger proportions of patients who “would like to stop smoking” when smoking was restricted to designated rooms (2005; 43.5%) than when smoking was unrestricted (2001; 24.5%; <math>p=0.02</math>)</p> <p>The most frequently cited reason to reduce smoking in hospital was the smoking restrictions</p> <p>50.5% viewed hospitalization as clearly stimulating smoking, and this did not change from pre to post ban (<math>p=0.53</math>)</p> <p>44.9% reported perceiving “very much” or “an enormous quantity” of smoke on the ward</p>
<p><b>Ratschen et al. (2010), UK</b></p> <p><b>Design:</b> Cross-sectional survey of patients over a 6-week period</p> <p><b>Setting:</b> Two acute mental health wards (32 beds) and one intensive care unit (10 beds)</p> <p><b>Sample:</b> n=15</p> <p><b>Age:</b> 27–61 (mean 42.3 years)</p> <p><b>Gender:</b> 40% female</p> <p><b>Admission length:</b> 2–990 days (mean 151)</p> <p><b>Inclusion criteria:</b> Current smoker</p> <p><b>Participation rate:</b> 53.6%</p>	<p><b>Type:</b> Complete ban</p> <p><b>Detail:</b> Smoking prohibited for all patients on buildings and grounds</p> <p><b>Adherence:</b> Nonadherence evident</p> <p><b>Nicotine dependence treatment:</b> Combined: NRT (patch) and advice to quit</p>	<p><b>Outcomes:</b> Smoking-related behaviours and beliefs</p> <p><b>Measures:</b> Nonstandardized items regarding change in smoking behaviour during admission and beliefs about future use of smoking cessation supports, nicotine dependence (HSI)</p>	<p>Compared to pre-admission, seven patients reported smoking less, six reported smoking more, and two equally as much while in hospital</p> <p>Patients’ self-reported mean nicotine dependence levels were lower during hospitalization (mean±SD HSI 0.71±1.86) than prior to admission (HSI=2.0±1.5); no significance test conducted</p> <p>The majority reported they would take up offers of smoking cessation support on the ward, despite no patients using the NRT provided on the ward, or receiving advice to quit</p> <p>Participants generally stated they had been informed of the policy</p> <p>Two patients (13.3%) reported covert smoking in a prohibited area</p>

(Continued)

Table 1. (Continued)

Study, location, design, setting, and sample	Nature of the smoke-free policy	Smoking-related outcomes and measures	Findings
<b>Siru et al. (2010), Australia</b>			
<b>Design:</b> Repeated-measures design comprising surveys of patients upon admission, and at 5-day, 14-day, and 6-month post discharge, with general hospital patients as a comparison group	<b>Type:</b> Complete ban	<b>Outcomes:</b> Smoking-related behaviours and beliefs	59.4% used any type of NRT (50% used patches, 23.4% used inhalers) and 20.3% received advice to cut down; one person was prescribed NRT on discharge
<b>Setting:</b> Departments of psychiatry, orthopaedics, and plastic surgery of a teaching hospital	<b>Detail:</b> Smoking prohibited for all patients on buildings and grounds	<b>Measures:</b> Daily cigarette consumption, abstinence from cigarettes, nonstandardized items regarding beliefs about future smoking behaviours, use of cessation supports post discharge	70.3% reported they were somewhat to very likely to stay off cigarettes following discharge, which did not differ from the comparison group (65.1%; $p=0.37$ )
<b>Sample:</b> $n=64$ (mental health sample), 43 (nonmental health sample)	<b>Adherence:</b> Not reported		68.8% reported intent to cut down or continue not smoking post discharge, which did not differ from the comparison group (67.5%; $p=0.93$ )
<b>Age:</b> mean 37.3 years	<b>Nicotine dependence treatment:</b> Combined: NRT (patch, inhaler), non-NRT interventions, and advice to quit		89.6% returned to smoking within 5 days of discharge, which did not differ from the comparison group (92.1%; $p=1.0$ )
<b>Gender:</b> 46.9% female			Post-discharge NRT use was 20.8% at 5 days, 15.2% at 14 days, and 18.5% at 6 months
<b>Admission length:</b> median 11 days			A significant reduction in cigarette consumption was found between baseline and 14 days post discharge ( $p=0.015$ ) and did not differ from the comparison group
<b>Inclusion criteria:</b> All smokers admitted to the facility during the study period			Abstinence rates were 7.8% at 5 days, 4.7% at 14 days and 6.3% at 6 months and did not differ from the comparison group (7.0%, 0%, and 2.3% respectively)
<b>Hehir et al. (2012), Australia</b>			
<b>Design:</b> Four focus groups, one cross-sectional survey of patients during admission, and one cross-sectional survey of patients discharged to medium secure mental health facilities	<b>Type:</b> Complete ban	<b>Outcomes:</b> Smoking-related behaviours and beliefs	A large number of smokers in the focus group reported a sense of achievement at having stopped smoking during admission, and many indicated intent to quit post discharge
<b>Setting:</b> Long-term, 106-bed forensic mental health inpatient facility	<b>Detail:</b> Smoking prohibited for all patients on buildings and grounds	<b>Measures:</b> Smoking status, use of cessation supports, nonstandardized items regarding beliefs about current and future smoking behaviour	In the patient survey, the majority (92%) of smokers were informed of the smoke-free policy on admission, 88% were offered, and 73% used NRT

(Continued)

Table 1. (Continued)

Study, location, design, setting, and sample	Nature of the smoke-free policy	Smoking-related outcomes and measures	Findings
<p><b>Sample:</b> n=81 (focus group=21, patient survey during admission=45, patient survey post discharge=15)</p> <p><b>Age:</b> 78% between 30–49 years</p> <p><b>Gender:</b> 6.7% female</p> <p><b>Smokers:</b> 84%</p> <p><b>Admission length:</b> 68.9% admitted for 1 year or more</p> <p><b>Inclusion criteria:</b> All clinically stabilized patients who spoke English</p>	<p><b>Adherence:</b> Not reported</p> <p><b>Nicotine dependence treatment:</b> Combined: nicotine dependence assessment, NRT (patch, lozenge, inhaler), and information about smoking cessation</p>		<p>81% of smokers agreed admission to a smoke-free facility was a good opportunity to quit; however, 36% reported they planned to continue smoking upon discharge</p> <p>In the post-discharge sample, 67% reported intent to quit upon discharge, and 58% (n=12) remained nonsmokers</p>
<p><b>Smith et al. (2012), USA</b></p> <p><b>Design:</b> Cross-sectional survey of patients</p> <p><b>Setting:</b> Intermediate-to long-term psychiatric facility</p> <p><b>Sample:</b> n=100</p> <p><b>Smokers:</b> 60%</p> <p><b>Admission length:</b> mean 4 years, median 1.47 years</p>	<p><b>Type:</b> Complete ban</p> <p><b>Detail:</b> Smoking prohibited for all patients on buildings and grounds</p> <p><b>Adherence:</b> Nonadherence evident</p> <p><b>Nicotine dependence treatment:</b> Combined: NRT and counselling</p>	<p><b>Outcomes:</b> Smoking-related behaviours only</p> <p><b>Measures:</b> Smoking status, daily cigarette consumption, use of cessation supports during admission</p>	<p>Of the 63% classified as smokers pre-admission, 67% (n=42) reported current smoking, and 33.3% (n=21) quit on admission</p> <p>Self-reported number of cigarettes smoked during admission (mean 12.1) were significantly lower than pre-admission (mean 31.0; <math>p&lt;0.05</math>)</p> <p>Of those who quit upon admission (n=21), 29% (n=6) used NRT and 29% (n=6) received counselling</p> <p>Patients reported that smoking continued to occur inside buildings (59%) and on grounds (49%)</p>

FTND, Fagerstrom Test for Nicotine Dependence (Fagerstrom et al., 1996); HSI, Heaviness of Smoking Index (Kozlowski et al., 1994); NRT, Nicotine Replacement Therapy; NWC, Nicotine Withdrawal Checklist (Shiffman et al., 2002); PRN, Pro re nata (as needed); SCS, Stages of Change scale (DiClemente et al., 1991); TAQ, Thoughts about Abstinence Questionnaire (Hall et al., 1990).

and Grant, 1989; Smith et al., 2012). In six of these, complete smoking bans were implemented (Hehir et al., 2012; Jonas and Eagle, 1991; Prochaska et al., 2006; Ratschen et al., 2010; Siru et al., 2010; Smith et al., 2012) and smoking was banned indoors only for the remaining four facilities (Etter et al., 2008; Patten et al., 1995; Resnick and Bosworth, 1989; Smith and Grant, 1989). None of the four studies that were conducted in facilities which permitted smoking in designated rooms or at designated times reported the provision of routine nicotine dependence treatment (Downey et al., 1998; Keizer and Eytan, 2005; Keizer

et al., 2009; Smith and O'Callaghan, 2008). Rates of receipt of nicotine dependence treatment are provided in Table 1 and, overall, indicate suboptimal treatment.

### Risk of bias in included studies

Supplementary Figure A1 and Supplementary Table A2 (Appendix 1) describe the assessed risk of bias for each included study. Most studies were small, and incomplete in their reporting of outcomes. Consequently, risk of bias was mostly unable to be determined, or determined to be high.

Only studies large enough to report statistical comparisons are considered in depth below (in addition to information already provided in Table 1).

#### *Changes in smoking behaviour during admission*

**Facilities with complete smoking bans.** Two studies with complete smoking bans assessed smoking behaviour during admission (Ratschen et al., 2010; Smith et al., 2012), with one of these (Smith et al., 2012) large enough to conduct statistical comparisons. The study conducted by Smith et al. (2012) indicated that patients' cigarette consumption was significantly lower during admission than pre-admission ( $p < 0.05$ ). Although combined nicotine dependence treatment was available, usage was not reported (Smith et al., 2012).

**Facilities with incomplete smoking bans.** Of the three studies with indoor smoking bans that examined changes in smoking behaviour during admission (Etter et al., 2008; Patten et al., 1995; Smith and Grant, 1989), only one conducted a statistical analysis of the results. Etter et al. (2008) reported a significantly larger proportion of participants making a quit attempt, from 2.2% when smoking was permitted in designated rooms to 18.4% when smoking was banned indoors ( $p = 0.01$ ; Table 1; Etter et al., 2008). Although the increased proportion of participants making a quit attempt in this study was accompanied by an increase in patients receiving NRT and advice to quit (both  $p < 0.001$ ), nonadherence to the policy was reported (Etter et al., 2008).

Three studies with designated smoking rooms examined changes in smoking behaviour during admission (Keizer and Eytan, 2005; Keizer et al., 2009; Smith and O'Callaghan, 2008). Of these, two reported statistical analyses. Keizer and Eytan (2005) reported that relative to pre-admission, 43.2% of patients increased and 27.3% decreased their daily cigarette consumption during admission (Keizer and Eytan, 2005). These rates were 25.5% and 37.3%, respectively, in the 2009 follow-up study (Keizer et al., 2009), with changes reaching significance for heavy smokers ( $p = 0.001$ ; Table 1; Keizer et al., 2009).

#### *Changes in smoking behaviour post discharge*

**Facilities with complete smoking bans.** Four studies with complete smoking bans examined changes in smoking behaviours post discharge (Hehir et al., 2012; Jonas and Eagle, 1991; Prochaska et al., 2006; Siru et al., 2010). All three studies that used repeated-measures designs to examine smoking from admission to discharge reported that the majority (89.6%, Siru et al., 2010; 80%, Jonas and Eagle, 1991; 76%, Prochaska et al., 2006) of participants resumed smoking within 5 days post discharge (Table 1). However, both the more recent and larger studies reported significant reductions in daily cigarette consumption at 14 days (Siru et al., 2010) and 3 months (Prochaska et al., 2006)

post discharge relative to pre-admission levels. Both were conducted in facilities that provided combined nicotine dependence treatment, with the majority of participants in both studies having used NRT during admission (60%, Siru et al., 2010; 70%, Prochaska et al., 2006); however, receipt of advice to quit was low (2%, Prochaska et al., 2006; 20%, Siru et al., 2010) and neither study provided details of smoke-free policy adherence. Jonas and Eagle (1991) reported no change in cigarette consumption from the time of admission to 6–18 months post hospitalization. Of these three studies, only one study biochemically validated self-reported abstinence, reporting that 4% of participants were abstinent at 3 months post discharge (Prochaska et al., 2006), and self-reported abstinence was 10.3% at 8 weeks in one study (Jonas and Eagle, 1991), and 6.3% at 6 months post discharge in the other (Siru et al., 2010). The remaining study reported that 58% of patients ( $n = 12$ ) were abstinent post discharge; however, this study was of cross-sectional design, had a small sample size, and patients were discharged to the care of facilities that imposed smoking restrictions and provided combined nicotine dependence treatment and thus were effectively still in institutional care (Hehir et al., 2012).

**Facilities with incomplete smoking bans.** Patten et al. (1995) reported that all participants ( $n = 15$ ) resumed smoking immediately after discharge; however, 5.3% self-reported abstinence at 16–18 months. This study reported provision of combined nicotine dependence treatment, with 26% of participants reporting using NRT during admission; however, nonadherence with the smoke-free policy was evident.

#### *Changes in smoking-related motivations or beliefs during admission*

**Facilities with complete smoking bans.** Four studies with complete smoking bans examined smoking-related motivations or beliefs during admission (Hehir et al., 2012; Prochaska et al., 2006; Ratschen et al., 2010; Siru et al., 2010). Of these, the only study to examine such changes using a repeated-measures design and statistical analyses reported that participants expected to be significantly more successful ( $p < 0.05$ ), and perceived significantly less difficulty in staying quit following a quit attempt at discharge compared to on admission ( $p < 0.01$ ; Prochaska et al., 2006). In this study, the majority of participants (70%) used NRT during hospitalization, and nicotine doses predicted these increased expectations of success with quitting ( $p < 0.05$ ; Table 1; Prochaska et al., 2006).

**Facilities with incomplete smoking bans.** Four studies with incomplete smoking bans examined smoking-related motivations or beliefs during admission (Downey et al., 1998; Keizer et al., 2009; Resnick and Bosworth, 1989; Smith and Grant, 1989). In the largest and most recent

study, Keizer et al. (2009) found a significantly larger proportion of participants in the contemplation and preparation/decision stages of change when smoking was unrestricted (4.9%) as compared to when smoking was permitted only in designated rooms (18.5%;  $p=0.02$ ), indicating an increase in motivation to quit. However, authors did not report provision of nicotine dependence treatment, or adherence to the smoking ban. In the earlier study of Downey et al. (1998) which permitted smoking at designated times, participants admitted to the facility during the “restricted” period when smoking was limited to five intervals per day reported a significant decline on the “action” stage of change scale from admission to discharge, suggesting a decline in motivation to quit. However, participants admitted during the unrestricted “ad lib” period reported a significant increase in motivation to quit ( $p<0.05$ ). In the two older and smaller cross-sectional studies with indoor bans, the majority of patients reported that the smoke-free policy would lead them to reduce their smoking or to try to quit post discharge (Resnick and Bosworth, 1989; Smith and Grant, 1989). In both studies, nicotine gum was made available to patients; however, rates of receipt were not reported and nonadherence to the smoke-free policy was evident (Resnick and Bosworth, 1989; Smith and Grant, 1989).

## Discussion

The findings of this review suggest that a smoke-free psychiatric hospitalization may have the potential to impact positively on patients’ smoking behaviours and on smoking-related motivation and beliefs. Positive changes in smoking-related outcomes identified included declines in daily cigarette consumption post discharge (Prochaska et al., 2006; Siru et al., 2010), increases in patients’ motivation to quit (Keizer et al., 2009; Prochaska et al., 2006), and an increase quit attempts (Etter et al., 2008); however, one older study indicated a decline in motivation to quit (Downey et al., 1998). Of the 14 included studies, many were small and incomplete in their reporting of outcomes, thus limiting the ability to draw firm conclusions regarding the impact of smoking bans on patients smoking behaviour.

Recently conducted, larger studies appeared more likely to have been undertaken in facilities with comprehensive restrictions on smoking and which provided combined pharmacological and behavioural nicotine dependence treatment. These studies also appeared to be associated with more positive smoking outcomes; however, limitations in the data available precluded any quantitative assessment of this trend. Studies conducted in the 1980s and 1990s being undertaken at a time where smoking restrictions were still being introduced in general medical settings and rare in inpatient psychiatric facilities may have some bearing on this finding (House of Commons Health

Committee, 2005). Specifically, both studies that reported significant declines in patients’ daily cigarette consumption up to 3 months post discharge were conducted more recently, and in facilities with complete smoking bans and concurrent provision of combined pharmacological and behavioural nicotine dependence treatment (Prochaska et al., 2006; Siru et al., 2010). Furthermore, two studies reported more positive smoking outcomes when stricter smoking rules were introduced, including significantly larger proportions of patients making a quit attempt (Etter et al., 2008) and reporting a desire to quit (Keizer et al., 2009). Additionally, in one of these studies, the larger proportion of patients making a quit attempt was accompanied by higher rates of patients receiving NRT and advice to quit (Etter et al., 2008). Conversely, of the four studies conducted in facilities that permitted smoking in designated rooms or at designated times, three reported increases in cigarette consumption (Keizer and Eytan, 2005; Keizer et al., 2009; Smith and O’Callaghan, 2008) and one reported a reduction in motivation to quit (Downey et al., 1998). None of these four studies reported provision of nicotine dependence treatment, and one study suggested continued exposure to cigarette smoke on the unit, despite the introduction of the smoking restrictions (Smith and O’Callaghan, 2008). These findings also suggest that adherence to the smoking ban and receipt of nicotine dependence treatment during a smoke-free psychiatric hospitalization may be important factors that influence patients’ smoking behaviours, as evidenced in general medical settings (Rigotti et al., 2000; Williams and Jones, 2012).

The findings of this review suggest that smoking bans generally, and complete bans in particular, may have a beneficial effect in terms of helping patients initiate changes in their smoking behaviour. However, none of the identified studies suggested significant increases in smoking cessation post discharge. Such findings suggest that the smoking bans, of either form, may have had a limited long-term beneficial effect. The extent to which such outcomes were a function of the effectiveness of smoking bans per se or of the manner of their implementation in the specific study facilities is unknown as the included studies did not adequately describe the extent of smoke-free policy adherence and provision of nicotine dependence treatment, key determinants of the likely success of a smoking ban (Bowman and Stockings, 2012; Lawn and Campion, 2010; Rigotti et al., 2000). Where these details were reported, patient receipt of NRT and brief advice to quit were suboptimal, and in half the studies, smoking continued to occur on the unit despite the smoking restrictions (Etter et al., 2008; Patten et al., 1995; Ratschen et al., 2010; Resnick and Bosworth, 1989; Smith and Grant, 1989; Smith and O’Callaghan, 2008; Smith et al., 2012), which may have impacted post-discharge smoking behaviours. The limited findings for cessation post discharge should also be considered in light of the knowledge that smokers with a mental

disorder have greater difficulty in quitting than the general population (Cooper et al., 2012), and as such it is not surprising that few participants successfully abstained from smoking without further cessation aids post discharge. These findings are consistent with previous research conducted in general medical settings indicating that a post-discharge effect on smoking rates is most likely to occur when cessation support is provided to patients post discharge, in addition to that provided during the inpatient stay (Rigotti et al., 2012). Consequently, the positive changes in smoking behaviour identified in this review are perhaps of greater importance, particularly so given that no studies reported that the purpose of the smoking restrictions were to encourage cessation post discharge. These findings further highlight the opportunity provided by a smoke-free psychiatric admission in initiating smoking cessation treatment among smokers with a mental disorder.

An important limitation of this review is the lack of adequately powered, high-quality, controlled studies in this field, which precluded any quantitative examination of the results. Ideally, future research in this area should describe the level of smoking restriction imposed and the nicotine dependence treatment routinely provided by the facility. Patient receipt of nicotine dependence treatment (including the type(s) of NRT used, daily dosage, and length of use), its adequacy in managing nicotine withdrawal, and details of patient adherence to the smoking restrictions should be collected either through medical record audit, patient observation, or self-report. Examination of such factors may assist in developing a greater understanding of the potential impact of admission to a smoke-free hospital on patients' post-discharge smoking behaviour.

Consistent with health policy initiatives, total smoking bans in general medical settings reduce second-hand smoke exposure (Tobacco Advisory Group, 2005) and are associated with reductions in smoking and improvements in health behaviour among staff and clients (Duffy et al., 2010; Gadomski et al., 2010). Psychiatric treatment settings carry equal legislative responsibility to provide a safe and healthy environment for their staff and clients (Tobacco Advisory Group, 2005). Implementation of total smoking bans in inpatient psychiatric settings, including routine identification and treatment of tobacco use, is imperative in achieving this goal (Royal College of Physicians and Royal College of Psychiatrists, 2013) and for providing an opportunity for patients to address their tobacco smoking in a supportive environment (Prochaska, 2009). However, it is apparent that continued cessation support following discharge is needed to increase the likelihood of cessation being maintained.

### Acknowledgements

EAS is supported by an Australian Postgraduate Award. The authors would like to thank Miss Jane Goodwin and Dr Luke Wolfenden for their assistance with the risk of bias assessment.

### Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

### Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

### References

- American Psychiatric Association (1996) Practice guideline for the treatment of patients with nicotine dependence. *American Journal of Psychiatry* 153: 1–31.
- Australian Institute of Health and Welfare (2007) *National drug strategy household survey: detailed findings*. Canberra: AIHW.
- Benowitz NL, Schultz KE, Haller CA, et al. (2009) Prevalence of smoking assessed biochemically in an urban public hospital: a rationale for routine cotinine screening. *American Journal of Epidemiology* 170: 885–891.
- Bowman J and Stockings E (2012) Smoking cessation for hospitalised patients: intensive behavioural counselling started in hospital and continued after discharge increases quit rates; with additional benefit from adding nicotine replacement therapy. *Evidence-Based Nursing* 16: 21–22.
- Callinan JE, Clarke A, Doherty K, et al. (2010) Legislative smoking bans for reducing secondhand smoke exposure, smoking prevalence and tobacco consumption. *Cochrane Database of Systematic Reviews* 4: CD005992.
- Campion J, Lawn S, Brownlie A, et al. (2008) Implementing smoke-free policies in mental health inpatient units: learning from unsuccessful experience. *Australasian Psychiatry* 16: 5.
- Cooper J, Mancuso SG, Borland R, et al. (2012) Tobacco smoking among people living with a psychotic illness: the second Australian Survey of Psychosis. *Australian and New Zealand Journal of Psychiatry* 46: 851–863.
- Diaz F, Rendon D, Velasquez D, et al. (2006) Datapoints: smoking and smoking cessation among persons with severe mental illnesses. *Psychiatric Services* 57: 462.
- DiClemente CC, Prochaska JO, Fairhurst SK, et al. (1991) The process of smoking cessation: an analysis of precontemplation, contemplation, and preparation stages of change. *Journal of Consulting and Clinical Psychology* 59: 295–304.
- Downey KK, Pomerleau CS, Huth AC, et al. (1998) The effect of a restricted smoking policy on motivation to quit smoking in psychiatric patients. *Journal of Addictive Diseases* 17: 1–7.
- Duffy SA, Scholten RL and Karvonen-Gutierrez CA (2010) The relation of tobacco use during hospitalization to post-discharge smoking cessation among US veterans. *Preventive Medicine* 50: 285–287.
- Etter M, Khan AN and Etter J-F (2008) Acceptability and impact of a partial smoking ban followed by a total smoking ban in a psychiatric hospital. *Preventive Medicine* 46: 572–578.
- Fagerstrom KO, Kunze M, Schoberberger R, et al. (1996) Nicotine dependence versus smoking prevalence: comparisons among countries and categories of smokers. *Tobacco Control* 5: 52–56.
- Fathallah N, Maurel-Donnarel E, Baumstarck-Barrau K, et al. (2012) Three-year follow-up of attitudes and smoking behaviour among hospital nurses following enactment of France's national smoke-free workplace law. *International Journal of Nursing Studies* 49: 80–810.
- Fiore M, Jaen C and Baker T (2008) *Treating tobacco use and dependence: 2008 update: clinical practice guideline*. Rockville, MD: US Department of Health and Human Services, Public Health Service.
- Gadomski A, Stayton M, Krupa N, et al. (2010) Implementing a smoke-free medical campus: impact on inpatient and employee outcomes. *Journal of Hospital Medicine* 5: 51–54.

- Hagman B, Delnevo C, Hrywna M, et al. (2008) Tobacco use among those with serious psychological distress: results from the national survey of drug use and health. *Addictive Behaviors* 33: 582–592.
- Hall S, Havassy B and Wasserman D (1990) Commitment to abstinence and acute stress in relapse to alcohol, opiates and nicotine. *Journal of Consulting and Clinical Psychology* 58: 175–181.
- Hehir AM, Indig D, Prosser S, et al. (2012) Evaluation of a smoke-free forensic hospital: patients' perspectives on issues and benefits. *Drug and Alcohol Review* 31: 672–677.
- Higgins J and Green S (2011) *Cochrane handbook for systematic reviews of interventions*. Version 5.0.2 (updated September 2009) The Cochrane Collaboration. Available at: www.cochrane-handbook.org.
- House of Commons Health Committee (2005) *Smoking in public places: first report of session 2005–06*. London: The Stationery Office.
- Jones DR, Macias C, Barreira PJ, et al. (2004) Prevalence, severity, and co-occurrence of chronic physical health problems of persons with serious mental illness. *Psychiatric Services* 55: 1250–1257.
- Jonas JM and Eagle J (1991) Smoking patterns among patients discharged from a smoke-free inpatient unit. *Hospital and Community Psychiatry* 42: 636–638.
- Keizer I, Descloux V and Eytan A (2009) Variations in smoking after admission to psychiatric inpatient units and impact of a partial smoking ban on smoking and on smoking-related perceptions. *International Journal of Social Psychiatry* 55: 109–125.
- Keizer I and Eytan A (2005) Variations in smoking during hospitalization in psychiatric in-patient units and smoking prevalence in patients and health-care staff. *International Journal of Social Psychiatry* 51: 317–328.
- Kozlowski LT, Porter CQ, Orleans CT, et al. (1994) Predicting smoking cessation with self-reported measures of nicotine dependence: FTQ, FTND, and HSI. *Drug and Alcohol Dependence* 34: 211–216.
- Lawn S and Campion J (2010) Factors associated with success of smoke-free initiatives in Australian psychiatric inpatient units. *Psychiatric Services* 61: 300–305.
- Lawn S and Pols R (2005) Smoking bans in psychiatric inpatient settings? A review of the research. *Australian and New Zealand Journal of Psychiatry* 39: 866–885.
- Lawrence D, Hancock KJ and Kisely S (2013) The gap in life expectancy from preventable physical illness in psychiatric patients in Western Australia: retrospective analysis of population based registers. *British Medical Journal* 346: f2539.
- Lawrence D, Mitrou F and Zubrick SR (2009) Smoking and mental illness: results from population surveys in Australia and the United States. *BMC Public Health* 9: 1–14.
- Lineberry TW, Allen JD, Nash J, et al. (2009) Population-based prevalence of smoking in psychiatric inpatients: a focus on acute suicide risk and major diagnostic groups. *Comprehensive Psychiatry* 50: 526–532.
- Moher D, Liberati A, Tetzlaff J, et al. (2009) Preferred Reporting Items for Systematic Reviews and Meta-Analyses: the PRISMA statement. *PLoS Medicine* 6, e1000097.
- Morgan VA, Waterreus A, Jablensky A, et al. (2012) People living with psychotic illness in 2010, the second Australian national survey of psychosis. *Australian and New Zealand Journal of Psychiatry* 46: 735–752.
- Moss TG, Weinberger AH, Vessicchio JC, et al. (2010) A Tobacco Reconceptualization in Psychiatry (TRIP): towards the development of tobacco-free psychiatric facilities. *American Journal on Addictions* 19: 293–311.
- Patten CA, Bruce BK, Hurt RD, et al. (1995) Effects of a smoke-free policy on an inpatient psychiatric unit. *Tobacco Control* 4: 372–379.
- Popay J, Roberts H, Sowden A, et al. (2006) Guidance on the conduct of narrative synthesis in systematic reviews. In: Economic and Social Research Council, *A product from the ESRC methods programme*. Lancaster, UK: Institute of Health Research.
- Prochaska JJ (2009) Ten critical reasons for treating tobacco dependence in inpatient psychiatry. *Journal of the American Psychiatric Nurses Association* 15: 404–409.
- Prochaska JJ, Fletcher L, Hall SE, et al. (2006) Return to smoking following a smoke-free psychiatric hospitalization. *American Journal on Addictions* 15: 15–22.
- Ratschen E, Britton J, Doody G, et al. (2010) Smoking attitudes, behaviour, and nicotine dependence among mental health acute inpatients: an exploratory study. *International Journal of Social Psychiatry* 56: 107–118.
- Ratschen E, Britton J, Doody GA, et al. (2009) Smoke-free policy in acute mental health wards: avoiding the pitfalls. *General Hospital Psychiatry* 31: 131–136.
- Resnick MP and Bosworth EE (1989) A smoke-free psychiatric unit. *Hospital and Community Psychiatry* 40: 525–527.
- Rigotti N, Arnsten JH, McKool KM, et al. (2000) Smoking by patients in a smoke-free hospital: prevalence, predictors and implications. *Preventive Medicine* 31: 159–166.
- Rigotti N, Clair C, Munafò M, et al. (2012) Interventions for smoking cessation in hospitalised patients. *Cochrane Database of Systematic Reviews* 5: CD001837.
- Royal College of Physicians and Royal College of Psychiatrists (2013) *Smoking and mental health*, council report CR178. London: Royal College of Physicians.
- Rustin TA and Tate JC (1993) Measuring stages of change in cigarette smokers. *Journal of Substance Abuse Treatment* 10: 209–220.
- Shmueli D, Fletcher L, Hall SE, et al. (2008) Changes in psychiatric patients' thoughts about quitting smoking during a smoke-free hospitalization. *Nicotine & Tobacco Research* 10: 875–881.
- Shiffman S, Dresler CM, Hajek P, et al. (2002) Efficacy of a nicotine lozenge for smoking cessation. *Archives of Internal Medicine* 162: 1267–1276.
- Siru R, Hulse GK, Khan RJK, et al. (2010) Motivation to quit smoking among hospitalised individuals with and without mental health disorders. *Australian and New Zealand Journal of Psychiatry* 44: 640–647.
- Smith J and O'Callaghan C (2008) Exploration of in-patient attitudes towards smoking within a large mental health trust. *The Psychiatrist* 32: 166–169.
- Smith PH, Homish GG, Kozlowski LT, et al. (2012) Effects of a complete smoking ban on inpatients at an intermediate to long-term psychiatric facility. *Community Mental Health Journal* 49: 193–198.
- Smith WR and Grant BL (1989) Effects of a smoking ban on a general hospital psychiatric service. *Hospital and Community Psychiatry* 40: 497–502.
- Tobacco Advisory Group (2005) *Going smoke-free: the medical case for clean air in the home, at work and in public places*, London: Royal College of Physicians.
- US Department of Health and Human Services (2004) The health consequences of smoking: a report of the surgeon general. *Office on Smoking and Health*. Atlanta: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.
- Williams JH and Jones TE (2012) Smoking cessation post-discharge following nicotine replacement therapy use during an inpatient admission. *Internal Medicine Journal* 42: 154–159.