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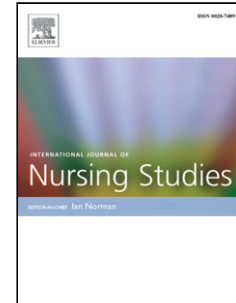
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Nurses' smoking habits and their professional smoking cessation practices. A systematic review and meta-analysis

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Abstract

Background: A better understanding of whether nurses' own smoking behaviours influence their engagement with smoking cessation interventions is needed.

Aim: To establish whether the smoking status of nurses is associated with their professional smoking cessation practices.

Methods: Twelve electronic databases covering English and Spanish language publications from 01 Jan 1996 to 25 Mar 2015 were systematically searched. Studies were included if they reported nurses' smoking cessation practices in relation to their personal smoking habits. Proportions of nurses' smoking status and smoking cessation practices were pooled across studies using random effects meta-analysis.

Results: Fifteen studies were included in this systematic review. Levels of reportedsmoking cessation interventions were generally low across the studies. The meta-analyses suggested that nurses' personal smoking status was not associated significantly with nurses always asking patients about their smoking, but nurses who smoked were 13% less likely to advise their patients to quit and 25% less likely to arrange smoking cessation follow-up. More intense interventions (assessing motivation and assisting) were not significantly associated with the smoking status of the nurse.

Conclusions: The smoking status of nurses appears to have a negative impact in the delivery of smoking cessation practices. The overall level of nurses' engagement with the delivery of smoking cessation interventions requires attention if nurses are to be effective agents of smoking cessation.

Keywords:

5As;

meta-analysis;

nurses

smoker;

smoking cessation;

systematic review;

tobacco.

INTRODUCTION

Smoking behaviour is one of the most significant hazards to public health. Tobacco smoking is currently responsible for nearly 6 million deaths worldwide each year, including deaths attributable to direct tobacco use as well as exposure to second-hand smoke. It is predicted that, if current trends continue, the annual death toll could rise to up to eight million by 2030 (WHO 2013). In the United States, it is estimated that on average smokers die 13-14 years earlier than non-smokers (13.2 years for men and 14.5 years for women) (CDC 2002). Diseases associated to smoking include chronic obstructive pulmonary disease (COPD), cardiovascular diseases and cancer amongst others (USDHHS 2004).

The potential benefits derived from quitting tobacco smoking include increased number of life years, improved quality of life, avoidance of premature death and a reduction in the costs associated with clinical conditions related to smoking (Edwards 2004, Duaso and Duncan 2012). Evidence-based tobacco cessation strategies are the most cost-effective interventions for preventing morbidity and mortality. There are a number of strategies that can aid in helping people to quit smoking. These range from providing brief advice to more intensive strategies including individual counselling to group therapy (Fiore et al. 2002, Fiore and Robinson 2008, Fiore et al. 2008). The "5As" is a brief intervention approach which aims to reach as many smokers as possible in the population and provides an opportunity to advise them to quit smoking (Fiore et al. 2008). This approach is endorsed by numerous international smoking cessation guidelines including US, Australia and England (Zwar et al 2004; NICE, 2006; Fiore et al. 2008) The 5As comprise: *ask* about tobacco use; *advise* to quit; *assess* willingness to make a quit attempt; *assist* in quit attempt; and, *arrange* follow-up.

Health professionals are expected to contribute to tobacco cessation strategies (WHO 2003). Whilst this public health role is shared between health care disciplines, nurses, as the largest contingent of the workforce and with more sustained contact with patients, have many opportunities to fulfil this role. While there is evidence to suggest that nurses can be effective in providing cessation interventions (Rice et al. 2013),

several studies have suggested that the delivery of smoking cessation interventions by health professionals including nurses is sub-optimal (Segaar et al. 2007).

One factor which may contribute to sub-optimal tobacco control activity is the professionals' own smoking behaviours. For example, it has been reported that nurses who smoke rate their role as health educator and their general attitude to the dangers of smoking lower compared to non-smoking or ex-smoking nurses (McKenna et al. 2001), and are less effective at providing support (McCarty et al 2001). Furthermore, qualified and student nurses' own smoking behaviour has been found to be one of the most significant variables predicting attitudes towards giving smoking cessation advice (Reeve et al. 1996, Hall et al. 2005, McCann et al. 2005). In a study from a major hospital in Australia, non-smoking nurses were more likely than smokers to see helping patients who wanted to quit smoking as definitely part of their role (Gomm et al. 2002). Recent studies have also suggested that smoking may be affecting the implementation of the 5As among other health professionals (Tong et al. 2010, Duaso et al. 2014).

Thus the literature suggests that the smoking status of nurses may be a barrier to tobacco interventions, and more specifically to the provision of the 5As. The aim of this review was to establish whether the smoking status of nurses is associated with their engagement in smoking cessation, defined as practising any of the 5As: asking, advising, assessing, assisting, or arranging follow-up.

METHODS

Search strategies

Six electronic English databases (MEDLINE, EMBASE, PsycINFO, CINAHL, British Nursing Index and Web of Science) and six Spanish databases (IBECS, Scielo, CUIDEN, ENFISPO, LILACS and MEDES) were searched using a combination of free

text search terms (including nurse$, GP$ [quit$ or stop$ or ceas$ or giv$] adj smoking). Keyword combinations and specific search terms are set out in Table 1 (further details on the search terms are available from the authors). The databases were searched up to 9th March 2015 using OvidSp. Citations in eligible papers and previous reviews were also examined for additional papers that met the inclusion criteria for the review. No attempt was made to access unpublished studies or other "grey" literature in an attempt to limit to the best-quality research.

Eligibility criteria

Studies were selected for inclusion in this review if they: (1) reported and categorized nurses' smoking status; (2) reported nurses' smoking cessation practices comparable to some/all the 5As of smoking cessation; (3) reported statistical relationships between (1) and (2); (4) were published in English or Spanish; and (5) were published after the introduction of the 5As approach (1996 onwards). The exclusion criteria were: (1) studies that only reported nurses' attitudes towards smoking cessation, confidence in their ability to help patients to quit and/or intention to counsel their patients; (2) smoking cessation practice outcomes were not measured following any of the 5As; and (3) nurses' data were not reported independently but mixed with data from other health professionals (e.g. doctors, dentists) and/or unqualified staff (e.g. nursing students). Papers were not restricted by study design.

Study identification

Initial screening of papers was undertaken by three of the authors (MD, SB and AM) who identified potential papers meeting the inclusion criteria from the abstracts. MD and SB searched the English language papers and AM searched the Spanish papers. Full texts were obtained for the relevant papers. We also obtained full texts for any papers that did not have an abstract or its inclusion was unclear. All papers were examined to ensure that they met all the inclusion criteria. Each author also

independently checked a proportion of abstracts initially examined by the other authors. We resolved any uncertainties by discussion. After removing duplicates, a total of 4459 abstracts were screened. Out of these, 230 full-text articles were assessed for eligibility. Finally, a total of fifteen studies met the inclusion criteria for this review. A summary of the literature identified at each stage of the search process can be found in the PRISMA flow chart (Moher, Liberati et al. 2009) documented in Figure 1.

Data extraction and analysis

Three authors (MD, SB and AM) extracted the following data from each included paper: country of study, study design and setting, study sample, measurements and main results. All smoking cessation practices reported in the included studies were grouped into five categories (5As). A coding checklist was developed and variables were included in the analysis if the authors reported comparable measurements (Supplementary Table S1). The fourth author (AW) independently verified the extracted data, and helped to resolve any uncertainties. The methodological quality of the studies was assessed using an adaptation of the Centre for Evidence-Based Management Survey Scoring System (CEBMa).The adapted tool used a 0–6 scoring system to appraise the methodological quality of cross-sectional surveys, including representativeness of the sample, response rate, validity of the tool and assessment of statistical significance. Sub-group analysis related to bias assessment was not possible due to the small number of studies included. The quality of the study was taken into account when interpreting the findings.

Statistical analysis was carried out using Comprehensive Meta-analysis Software version 2 and meta. Frequencies and proportions were extracted from individual studies and 3 risk ratios (RR) (smokers vs non-smokers) were calculated per each smoking cessation practice (5As). Random-effects meta-analysis models were used to assess the effect of the nurse's personal smoking history on smoking cessation practices.

Heterogeneity was tested using the chi-square Q statistic (significance level $p<0.1$) and the descriptive percentage of variance due to heterogeneity among studies was assessed using I^2 statistic (Higgins et al. 2003). Publication bias was visually inspected using funnel plots and Egger's tests were conducted to test the symmetry (Egger et al. 1997).

Narrative synthesis was used to analyse the findings of studies that did not provide proportions but specifically reported the association of smoking status of nurses with their cessation practices.

RESULTS

Overview of Selected Papers

We found fifteen studies examining the association between nurses' smoking habits and their professional smoking cessation practices. A summary of each study is set out in Table 2. Supplementary information on the measures used in the included studies can be found in Supplementary Table S1.

Nine studies were conducted in North America, in the US (n=8) and Canada (n=1). The rest were from European countries Spain (n=3), Czech Republic (n=1), Serbia (n=1) and Iceland (n=1). A total of 13,350 nurses were included. The study sample sizes ranged from 87 to 3,482 nurse participants and comprised hospital-based nurses (n=5), primary care nurses (n=3), a mixed hospital and primary care sample (n=3), paediatric nurses (n=2), psychiatric nurses (n= 1) and oncology nurses (n=1). Almost half the studies (n=7) recruited national samples of nurses working in various settings, while the remainder were local and/or regional samples.

The smoking prevalence of the participants ranged from 4.0% to 47.1% and was lower in the studies conducted in North America compared to the European studies. A total of 1,696 nurses who smoke are included in this review.

Most of the studies employed cross-sectional surveys (n=13). Two studies, Borrelli et al. (2001) and Sarna et al. (2014), were intervention studies to evaluate smoking cessation programmes from which only baseline data were included. Four out of the eight studies were rated as high quality and ten were rated as moderate quality using the checklist. Reported survey response rates ranged from 21% to 99%. A summary of each study is set out in Table 2.

Asking patients about smoking status

Eleven studies reported whether nurses always or almost always asked their patients about their smoking habits. The reported practices ranged from 22% of a US sample of paediatric nurses (Deckter et al. 2009) to 91% of a national study of general nurses also in the US (Sharp et al. 2009). Only one study found that being a smoker was associated to statistically significant differences in tobacco assessment (Pericas et al 2007) (Table 3). The meta-analysis confirmed the results of the majority of individual studies (Figure 2), as the pooled risk ratio of asking patients about their smoking was not significantly associated with the nurses' smoking status.

Advising patients to stop smoking

Thirteen out of the fifteen included studies reported whether nurses consistently urged their patients to stop smoking. Every study reported lower rates of advice among nurses who smoked compared to non-smokers, although only six found these differences to be statistically significant (Table 3). Primary random-effect meta-analysis suggested that, compared to non-smokers, nurses who smoked had a 13% increased risk of not advising their patients to quit [RR = 0.87; 95% confidence interval (CI) = 0.80 to 0.95; P < 0.05]. Medium levels of heterogeneity were found ($I^2 = 47$) suggesting some inconsistency across the studies (Figure 3).

Assessing patients' willingness to make a quit attempt

Motivation to stop smoking is one of the key predictors of successful quit attempts (Smit et al. 2014). Six studies reported whether nurses assess patients' interest in quitting smoking the rates ranging from 18 to 71%. None of the included studies found statistically significant differences between nurses who were current smokers and non-smokers. The pooled risk ratio was also not clinically or statistically significant (Figure 4).

Assisting in quit attempt

Overall reported rates of aiding the patient in their quitting attempt were low in the eight included studies ranging from 5.9% (Geller et al. 2011) to 38.3% (Sarna et al.

2009) (Table 3). In a national study of Icelandic nurses, Svavarsdottir et al (2007) found that over half of the nurses (55.3%) had never provided smoking cessation assistance to their clients. While there were no significant differences according to smoking status concerning smoking cessation counselling, non-smoking nurses discussed the risk of smoking and refer to clients to the quit smoking telephone line more often (p= 0.006 and p=0.004, respectively)

The other seven studies found no significant differences in assisting clients to quit by nurses' smoking status and the meta-analysis was also non-significant (Figure 5).

Arranging follow up

The last step of the 5As is to ensure follow-up contact either in person or over the telephone. Despite the importance of follow up for relapse prevention, according to the included studies, very few nurses seem to be doing so(Table 3). Primary random-effect meta-analysis suggested that, compared to non-smokers, nurses who smoked are less likely to arrange additional visits to review patients' progress towards quitting [RR = 0.75; 95% confidence interval (CI) = 0.60 to 0.94; P < 0.05]. Low levels of heterogeneity were found (I^2 = 10.9) suggesting consistency across the studies (Figure 6).

Publication bias

There was funnel plot asymmetry in two out of the five meta-analyses. Asking (Egger's test t = 2.871 df =6, p =0.028) and advising current smokers vs non-smokers (Egger's test t = 3.409 df =8, p =0.009) (see Supplementary files Table S2; Figure S1). This suggests that smaller studies may have different results to larger studies.

DISCUSSION

This review aimed to examine the association between nurses' smoking habits and their professional smoking cessation practices. Meta-analyses of the currently available studies suggest that, while the smoking status of nurses does not affect whether they routinely identify patients who smoke, it may have an impact on advising patients to quit and arranging follow-up. Nurses are ideally placed to make 'every encounter count' and promote smoking cessation opportunistically (RCN 2012). Yet this review indicates that nurses who smoked are 13% less likely to always or frequently advise their patients to stop and 25% less likely to arrange a follow-up visit either in person or over the telephone.

On the other hand, nurses who smoked did not seem to be less likely to assess motivation to quit, assist with quitting attempts or refer their patients to a smoking cessation programme. This might be explained by the fact that ten out of the fifteen included studies were conducted in countries with high legislative and preventive regulations so that the national emphasis on tobacco control might have eroded the differences in practices of the nurses with different smoking statuses. Also the gradual increase of teaching on tobacco use in nursing schools (Wewers et al. 2004, Sarna et al. 2009) may have reduced any potential differences in professional practice.

Correlations between personal health behaviours and health promotion practices have been found consistently across a range of health behaviours (Zhu et al 2011, Bakhshi and While 2014, Zhu et al 2014, Bakhshi et al 2015). The findings reported here are partly consistent with a systematic review of doctors' smoking status and their delivery of smoking cessation treatments to patients (Duaso et al. 2014). Doctors who smoked were also found to be less likely than non-smokers to advise and counsel their patients to quit but more likely to refer them to smoking cessation programmes.

Research describing health promotion experiences of tobacco-dependent nurses suggests that nurses who smoke may feel conflicted about their ability to intervene (Heath et al. 2004, Radsma and Bottorff 2009). However nurses seem to use a variety of strategies to counteract ambivalence and, by doing so, are able to resist the need

to change their own behaviour (Radsma and Bottorff 2009). This could offer an explanation of this systematic review's findings; by managing ambivalence, nurses are able to fulfil some of their smoking cessation responsibilities (even if, at a minimal level). As Radsma and Bottorff (2009) noted, the challenge remains how best to support nurses who are smokers to become "unambivalent participants" in smoking cessation efforts.

This systematic review suggests that the smoking behaviour of nurses' matter because it may influence their clinical nursing practice. There is growing evidence that personal health behaviours of health professionals may have an impact on how patients view their credibility as a health promoter. A UK survey found that 37% of the public would not accept health advice from a healthcare professional who appeared to have an unhealthy lifestyle (DoH, 2009). Nurses should therefore be encouraged to stop smoking. "Practicing what we preach" will not only help nurses to improve their health but may also be an effective strategy to increase the provision of a lifesaving intervention to smokers (While 2015).

This review included only a sub-set of existing studies addressing the delivery of nurses' smoking cessation interventions due to the inclusion criteria. Nonetheless our findings suggest that overall the delivery of the 5 As is sub-optimal. This is consistent with other studies that have also found that, while patients are often asked about their smoking habits and advised to stop smoking, assistance and follow-up rates are lower (Tong et al. 2010). While it is positive to see that most nurses are asking patients about smoking and urging them to stop, it is disappointing that they fail to engage in more comprehensive interventions. Tobacco dependence is a chronic relapsing condition that requires ongoing treatment (USDHHS, 2004). Smokers need to be supported with both behavioural and pharmacological strategies to overcome their addiction. Calls have been made to maximize the potential that nurses, the largest group of health care professionals, have in reducing tobacco use (Bilaous, 2016).

Strengths and limitations of the review

The strengths of this review include a comprehensive search strategy of both English and Spanish databases, rigorous and reproducible extraction of data and the contacting of authors for further information. The use of the random effects model reflects a more conservative approach and strengthens the confidence in the estimation results presented here.

The search revealed a moderate number of relevant studies which were mostly conducted in North America and Europe limiting the generalisability of the findings. Another key limitation of this work is that nurses' self-reported smoking cessation practices may be subject to a socially desirable response bias. However, none of the included studies was specifically designed to test the hypothesis of whether personal tobacco dependence impacts smoking cessation practices which reduces the potential for such bias. All studies included were cross-sectional which precludes the attribution of causal relationships. Six out of the fifteen studies did not achieve a satisfactory response rate (>50%). It could be that nurses who smoked and did not promote smoking cessation were less likely to take part. We did not have enough power to carry out sub-group analysis but visual inspection of the forest plot does not suggest that the quality of the study would have a major impact on the pooled risk ratio estimates.

The relatively small number of studies that met the inclusion criteria reduced the power to explore between-study heterogeneity resulting from countries with different smoking prevalence among nurses. Further empirical evidence is needed from countries with lower tobacco control efforts to explore whether the interaction between health professional personal smoking behaviours and smoking cessation practices is mediated by acceptability of smoking and tobacco control efforts.

CONCLUSIONS

The meta-analyses of the currently available studies suggest that the smoking status of nurses reduces the rate of consistently advising patients to stop smoking and

arranging follow-up visits. The sub-optimal delivery of smoking cessation interventions within nursing practice requires attention if nurses are to contribute to public health efforts relating to tobacco control.

CONTRIBUTION TO THE PAPER

What is already known about this topic?

•   Nurses are ideally placed to make 'every encounter count' and promote smoking cessation opportunistically. However the delivery of smoking cessation interventions by nurses is sub-optimal.

•   One factor which may contribute to reduced tobacco control activity is nurses' own smoking behaviours.

What this study adds

•   Meta-analyses of the currently available studies suggest that nurses often ask patients about their smoking habits and advise them to stop smoking; however assistance to quit and follow-up rates are low.

•   While the smoking status of nurses does not affect whether they routinely identify patients who smoke, it seems to reduce the rate of consistently advising patients to stop smoking and arranging follow-up visits.

References

Bakhshi, S. and While, A.E. (2014) "Health professionals' alcohol-related professional practices and the relationship between their personal alcohol attitudes and behavior and professional practices: a systematic review." Int J Environ Res Public Health. 11 (1): 218-248.

Bakhshi, S., Sun, F., Murrells, T. and While, A.E. (2015) "Nurses' health behaviours and physical activity-related health promotion practices". Br J Community Nurs. 20(6): 289-296.

Bialous, S. A. and L. Sarna (2016). "ISNCC Tobacco Position Statement." Cancer Nurs 39(1): 80-81.

Borrelli, B., et al. (2001). "Smoking-cessation counseling in the home: Attitudes, beliefs, and behaviors of home healthcare nurses." Am J Prev Med 21(4): 272-277.

Casas More, R., C. Martin Cantera, M. Inglada Fibla, L. Roig Remon and C. Moreno Crespo (2002). "Tackling tobacco dependency among a Health District's employees." Aten Primaria 29(4): 218-222.

CDC (2002). "Annual smoking-attributable mortality, years of potential life lost, and economic costs—United States, 1995-1999." MMWR Morb Mortal Wkly Rep 51(14): 300-303.

CEBMa. "CEBMa Critical questions for a survey."   Retrieved 20/07/2015, 2015, from http://www.cebma.org/wp-content/uploads/Critical-Appraisal-Questions-for-a-Survey.pdf

Deckter, L., et al. (2009). "Are Pediatric Emergency Department Nurses Delivering Tobacco Cessation Advice to Parents?" J Emerg Nurs 35(5): 402-405.

DoH (2009) Fitness to practise : the health of healthcare professionals. London: Department of Health

Duaso, M. and D. Duncan (2012). "Health impact of smoking and smoking cessation strategies: current evidence." Br J Community Nurs **17**(8): 356-363.

Duaso, M. J., M. S. McDermott, A. Mujika, E. Purssell and A. While (2014). "Do doctors' smoking habits influence their smoking cessation practices? A systematic review and meta-analysis." Addiction **8**(10): 12680.

Edwards, R. (2004). "The problem of tobacco smoking." BMJ **328**(7433): 217-219.

Egger, M., G. Davey Smith, M. Schneider and C. Minder (1997). "Bias in meta-analysis detected by a simple, graphical test." BMJ **315**(7109): 629-634.

Fernández Hernández, M. J. and F. Ibáñez Pérez (2005). "Smoking and attitudes to smoking among primary care nurses in Bilbao (Spain)." Enferm Clin **15**(3): 156-162.

Fiore M.C., J. C. R., Baker T.B., Bailey W.C., Benowitz N.L., Curry S.J., Dorfman S.F., Froelicher E.S., Goldstein M.G., Healton C.G., Henderson P.N., Heyman R.B., Koh H.K., Kottke T.E., Lando H.A., Mecklenburg R.E., Mermelstein R.J., Mullen P.D., Orleans C.T., and S. M. L. Robinson L., Tommasello A.C., Villejo L. and Wewers M.E (2008). "Treating tobacco use and dependence: 2008 update U.S. Public Health Service Clinical Practice Guideline executive summary." Respir Care **53**(9): 1217-1222.

Fiore, M. C., C. R. Jaen, T. B. Baker, W. C. Bailey, N. L. Benowitz, S. J. Curry and S. Dorfman (2008). Treating tobacco use and dependence: 2008 Update. Washington DC., US Department of Health and Human Services.

Fiore, M. C., D. K. Hatsukami and T. B. Baker (2002). "Effective tobacco dependence treatment." JAMA **288**(14): 1768-1771.

Geller, A. C., D. R. Brooks, B. Woodring, S. Oppenheimer, M. McCabe, J. Rogers, A. Timm, E. A. Resnick and J. P. Winickoff (2011). "Smoking Cessation Counseling for Parents During Child Hospitalization: A National Survey of Pediatric Nurses." Public Health Nursing **28**(6): 475-484.

Gomm M, Lincoln P, Egeland P, Rosenberg M. Helping hospitalised clients quit smoking: a study of rural nursing practice and barriers. Aust. J. Rural Health 2002; 10: 26–32.

Heath, J., J. Andrews, F. J. Kelley and J. Sorrell (2004). "Caught in the middle: experiences of tobacco-dependent nurse practitioners." J Am Acad Nurse Pract **16**(9): 396-401.

Higgins, J. P., S. G. Thompson, J. J. Deeks and D. G. Altman (2003). "Measuring inconsistency in meta-analyses." BMJ **327**(7414): 557-560.

McCann, T. V., E. Clark and K. Rowe (2005). "Undergraduate nursing students' attitudes towards smoking health promotion." Nurs Health Sci **7**(3): 164-174.

McCarty, M. C., D. J. Hennrikus, H. A. Lando and J. T. Vessey (2001). "Nurses' attitudes concerning the delivery of brief cessation advice to hospitalized smokers." Prev Med **33**(6): 674-681.

McKenna, H., P. Slater, T. McCance, B. Bunting, A. Spiers and G. McElwee (2001). "Qualified nurses' smoking prevalence: their reasons for smoking and desire to quit." J Adv Nurs **35**(5): 769-775.

Merrill, R., et al. (2010). "The importance of tobacco cessation training for nurses in Serbia." J Contin Educ Nurs **41**(2): 89-96.

Moher, D., A. Liberati, J. Tetzlaff and D. G. Altman (2009). "Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement." Journal of Clinical Epidemiology **62**(10): 1006-1012.

National Institute for Health and Clinical Excellence (NICE) (2006).Brief Interventions and referral for smoking cessation in primary care and other settings. Available at: http://www.nice.org.uk/PH1

Pericás, J., Ayensa, J.A., Milán, J., Contreras, P., Serra, F., Sureda, A.M. (2007) "the smoking habits of registeres nurses in teh community f teh Balearic Islands". Enfermería 16 (58), 26-30

Radsma, J. and J. L. Bottorff (2009). "Counteracting ambivalence: nurses who smoke and their health promotion role with patients who smoke." Res Nurs Health **32**(4): 443-452.

Rice, V. H., J. Hartmann-Boyce and L. F. Stead (2013). "Nursing interventions for smoking cessation." Cochrane Database Syst Rev **12**(8).

Sarna, L. P., Brown JK, Lillington L, Rose M, Wewers ME, Brecht ML. (2000). "Tobacco interventions by oncology nurses in clinical practice: report from a national survey." Cancer 89(4): 881-889.

Sarna, L. P., S. A. Bialous, E. Kralikova, A. Kmetova, V. Felbrova, S. Kulovana, K. Mala, E. Roubickova, M. J. Wells and J. K. Brook (2014). "Impact of a smoking cessation educational program on nurses' interventions." J Nurs Scholarsh **46**(5): 314-321.

Sarna, L., S. Bialous and M. Wells (2009). "Frequency of nurses' smoking cessation interventions: report from a national survey." J Clin Nurs **18**(14): 2066-2077.

Sarna, L., et al. (2012). "Nurses' treatment of tobacco dependence in hospitalized smokers in three states." Res Nurs Health 35(3): 250-264.

Schultz, A. S. H., S. Hossain and J. L. Johnson (2009). "Modeling influences on acute care nurses' engagement in tobacco use reduction." Res Nurs Health **32**(6): 621-633.

Segaar, D., M. C. Willemsen, C. Bolman and H. De Vries (2007). "Nurse adherence to a minimal-contact smoking cessation intervention on cardiac wards." Res Nurs Health **30**(4): 429-444.

Sharp, D. L., S. W. Blaakman, R. E. Cole and J. S. Evinger (2009). "Report from a national tobacco dependence survey of psychiatric nurses." J Am Psychiatr Nurses Assoc **15**(3): 172-181.

Smit, E. S., C. Hoving, K. Schelleman-Offermans, R. West and H. de Vries (2014). "Predictors of successful and unsuccessful quit attempts among smokers motivated to quit." Addict Behav **39**(9): 1318-1324.

Svavarsdottir, M. and G. Hallgrimsdottir (2008). "Participation of Icelandic nurses in smoking cessation counselling." J Clin Nurs 17(10): 1335-1341.

Tong, E. K., R. Strouse, J. Hall, M. Kovac and S. A. Schroeder (2010). "National survey of U.S. health professionals' smoking prevalence, cessation practices, and beliefs." Nicotine Tob Res **12**(7): 724-733.

USDHHS (2004). The Health Consequences of Smoking: a report of the Surgeon General. Atlanta, GA.

Wewers, M. E., K. Kidd, D. Armbruster and L. Sarna (2004). "Tobacco dependence curricula in U.S. baccalaureate and graduate nursing education." Nurs Outlook **52**(2): 95-101.

WHO (2003). WHO Framework Convention on Tobacco Control Geneva, WHO.

WHO. (2013). "Tobacco. Fact sheet Nº 339." Retrieved 22/05/2014, 2014, from http://www.who.int/mediacentre/factsheets/fs339/en/.

While, A. E. (2015). "Promoting healthy behaviours – do we need to practice what we preach?" London J Prim Care 7(6): 112-114.

Zhu, D.Q., Norman, I.J. and While, A. (2011) "The relationship between doctors' and nurses' own weight status and their weight management practices: a systematic review." Obes Rev.12 (6): 459-469.

Zhu, D.Q., Norman, I.J. and While, A. (2014) Nurses'misperceptions of weight status associated with their body weight, demographics and health status. Public Health Nutr. 17(3): 569-578.

Zwar N, Richmond R, Borland R, Stillman S, Cunningham M, Litt J. (2004) Smoking cessation guidelines for Australian general practice: practice handbook. Canberra: Australian Government Department of Health and Ageing.

Figure 1: PRISMA flow chart
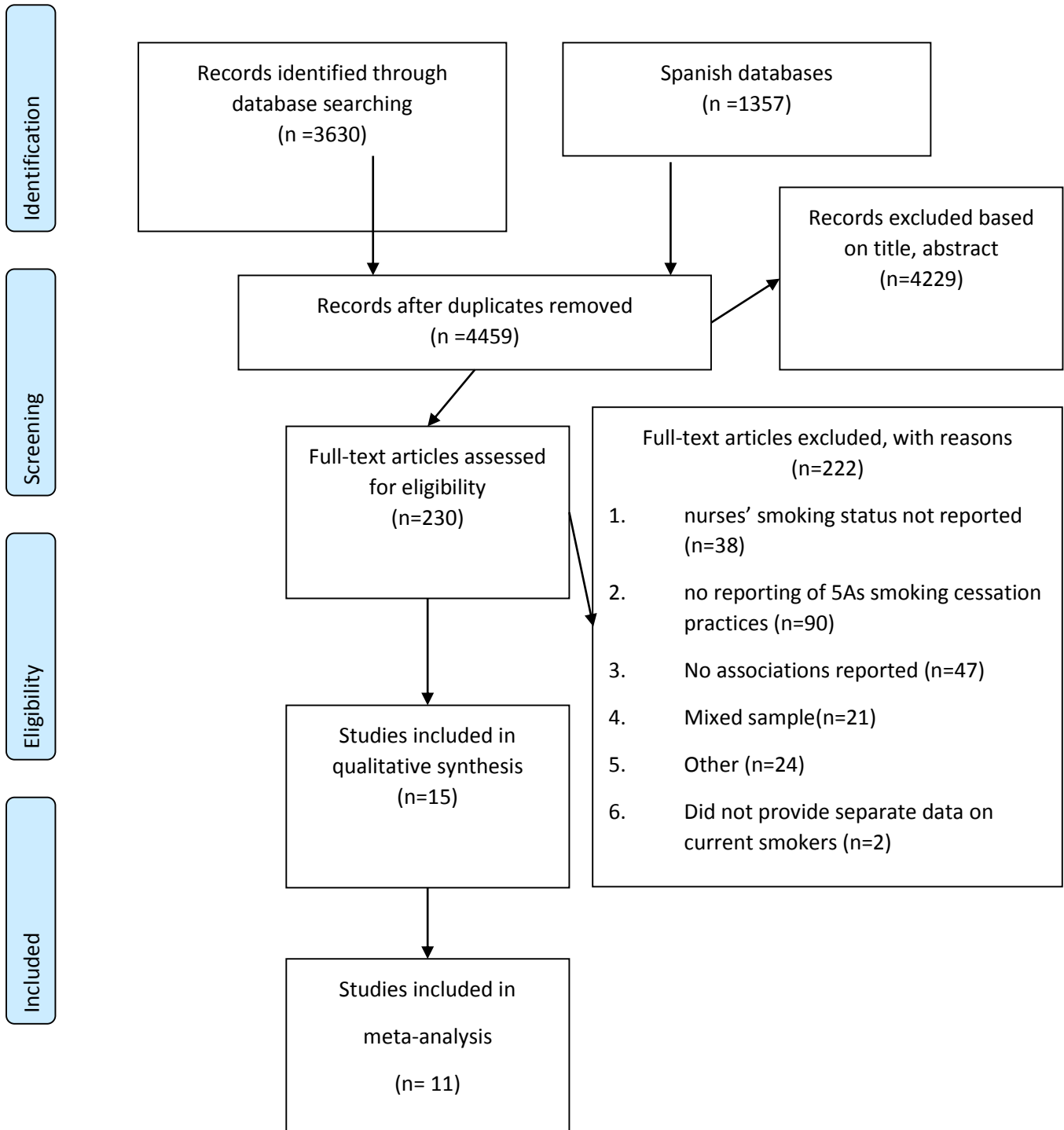
Figure 2. Comparison of nurses' reported practice of consistently asking their patients about their smoking status by smoking status of the nurse.

Study	Smokers Events	Total	Non-smokers Events	Total	RR	95%-CI	W(fixed)	W(random)
Fernandez (2005)	41	47	104	109	0.91	[0.81; 1.03]	5.9%	15.3%
Pericas (2007)	33	100	127	276	0.72	[0.53; 0.97]	6.4%	3.3%
Sarna (2009)	238	312	2304	3050	1.01	[0.95; 1.08]	40.2%	26.2%
Schultz (2009)	17	34	116	177	0.76	[0.54; 1.09]	3.5%	2.6%
Sharp (2009)	45	49	1067	1174	1.01	[0.93; 1.10]	8.0%	21.3%
Geller (2011)	16	38	332	771	0.98	[0.67; 1.43]	2.9%	2.2%
Sarna (2012)	177	211	1301	1496	0.96	[0.91; 1.03]	30.3%	26.9%
Sarna (2014)	16	32	44	65	0.74	[0.50; 1.09]	2.7%	2.2%
Fixed effect model		823		7118	0.95	[0.92; 1.00]	100%	--
Random effects model					0.96	[0.90; 1.01]	--	100%

Heterogeneity: I-squared=40.5%, tau-squared=0.0023, p=0.1084

Figure 3. Comparison of nurses' reported practice of consistently advising their patients to stop smoking by smoking status of the nurse.

Study	Smokers Events	Total	Non-smokers Events	Total	RR	95%-CI	W(fixed)	W(random)
McCarthy (2001)	19	72	99	325	0.87	[0.57; 1.32]	3.6%	3.8%
Borrelli (2001)	4	17	67	152	0.53	[0.22; 1.28]	1.3%	1.0%
Casas (2002)	20	48	73	106	0.61	[0.42; 0.87]	4.5%	5.0%
Pericas (2007)	85	100	266	276	0.88	[0.81; 0.96]	14.0%	23.9%
Sarna (2009)	193	312	1966	3050	0.96	[0.88; 1.05]	36.1%	23.2%
Schultz (2009)	1	35	27	177	0.19	[0.03; 1.33]	0.9%	0.2%
Sharp (2009)	41	50	1003	1177	0.96	[0.84; 1.10]	8.1%	18.2%
Geller (2011)	5	38	197	771	0.51	[0.23; 1.18]	1.8%	1.1%
Sarna (2012)	137	211	1126	1496	0.86	[0.78; 0.96]	27.6%	21.6%
Sarna (2014)	9	30	33	65	0.59	[0.33; 1.07]	2.1%	2.0%
Fixed effect model		913		7595	0.87	[0.83; 0.92]	100%	--
Random effects model					0.87	[0.80; 0.95]	--	100%

Heterogeneity: I-squared=47%, tau-squared=0.0065, p=0.0488

Figure 4. Comparison of nurses' reported practice of consistently assessing their patients' interest to stop smoking by smoking status of the nurse.

Study	Smokers Events	Total	Non-smokers Events	Total	RR	95%-CI	W(fixed)	W(random)
Sarna (2009)	197	312	1962	3050	0.98	[0.90; 1.07]	53.9%	55.0%
Schultz (2009)	8	35	40	177	1.01	[0.52; 1.97]	2.0%	1.1%
Geller (2011)	4	38	149	771	0.54	[0.21; 1.39]	2.1%	0.5%
Sarna (2012)	139	211	1081	1496	0.91	[0.82; 1.01]	39.5%	42.4%
Sarna (2014)	8	32	26	65	0.62	[0.32; 1.22]	2.5%	1.0%
Fixed effect model		628		5559	0.94	[0.88; 1.00]	100%	--
Random effects model					0.94	[0.88; 1.01]	--	100%

Heterogeneity: I-squared=1.9%, tau-squared=0.0002, p=0.3958

Figure 5. Comparison of nurses' reported practice of consistently assisting their patients in their quit attempt by smoking status of the nurse.

| Study	Smokers Events	Total	Non-smokers Events	Total	RR	95%-CI	W(fixed)	W(random)
Fernandez (2005)	19	47	62	109	0.71	[0.48; 1.04]	8.0%	6.6%
Sarna (2009)	118	312	1171	3050	0.99	[0.85; 1.14]	46.3%	43.7%
Schultz (2009)	3	35	25	177	0.61	[0.19; 1.90]	1.8%	0.7%
Geller (2011)	1	38	47	771	0.43	[0.06; 3.05]	0.9%	0.3%
Sarna (2012)	105	211	771	1496	0.97	[0.84; 1.12]	40.6%	46.8%
Sarna (2014)	8	32	17	65	0.96	[0.46; 1.98]	2.4%	1.8%
Fixed effect model		675		5668	0.94	[0.85; 1.04]	100%	--
Random effects model					0.95	[0.86; 1.05]	--	100%

Heterogeneity: I-squared=0%, tau-squared=0, p=0.5919
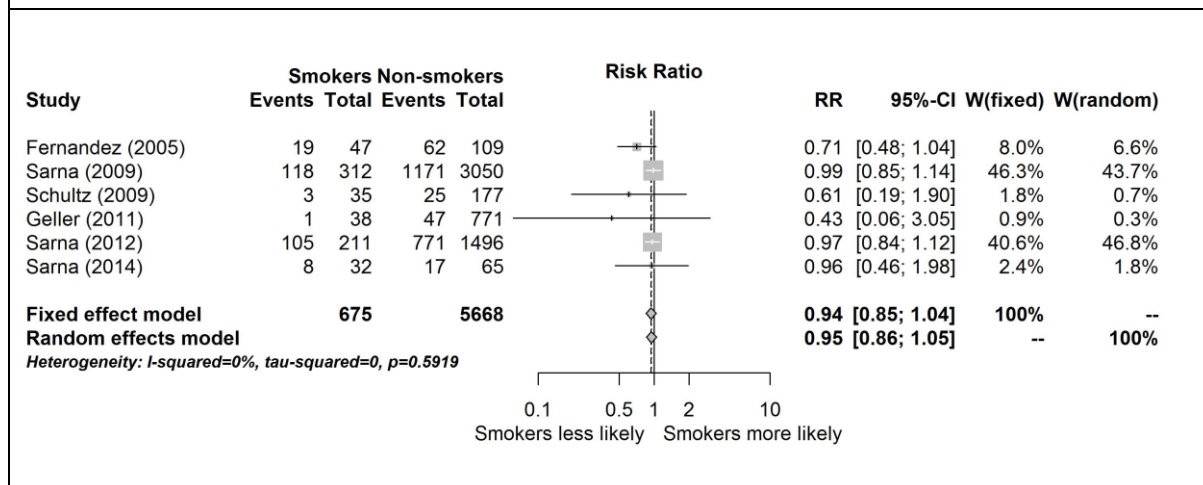
Figure 6. Comparison of nurses' reported practice of consistently assisting their patients in their quit attempt by smoking status of the nurse.
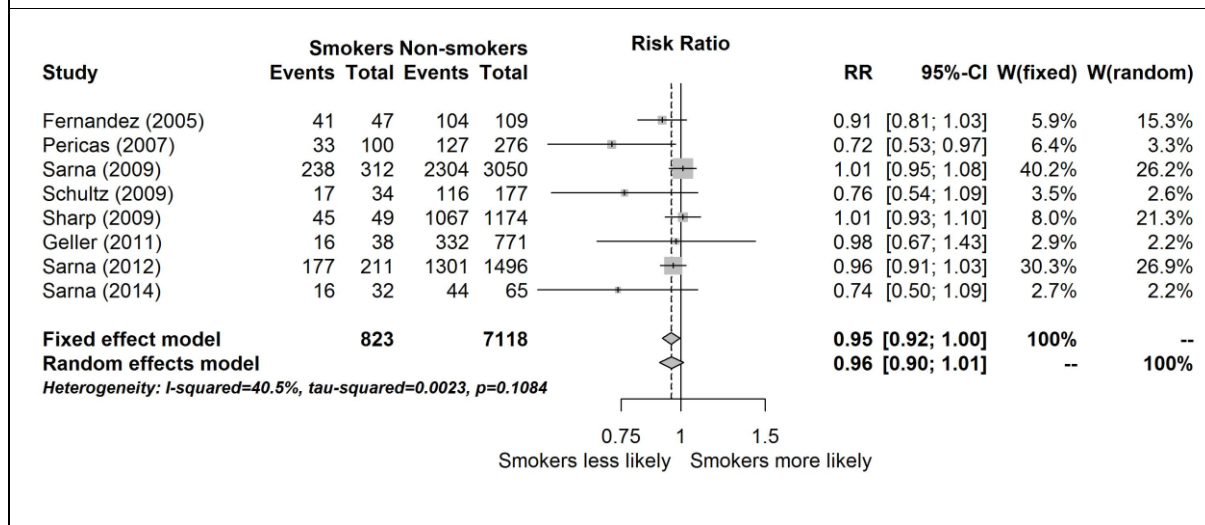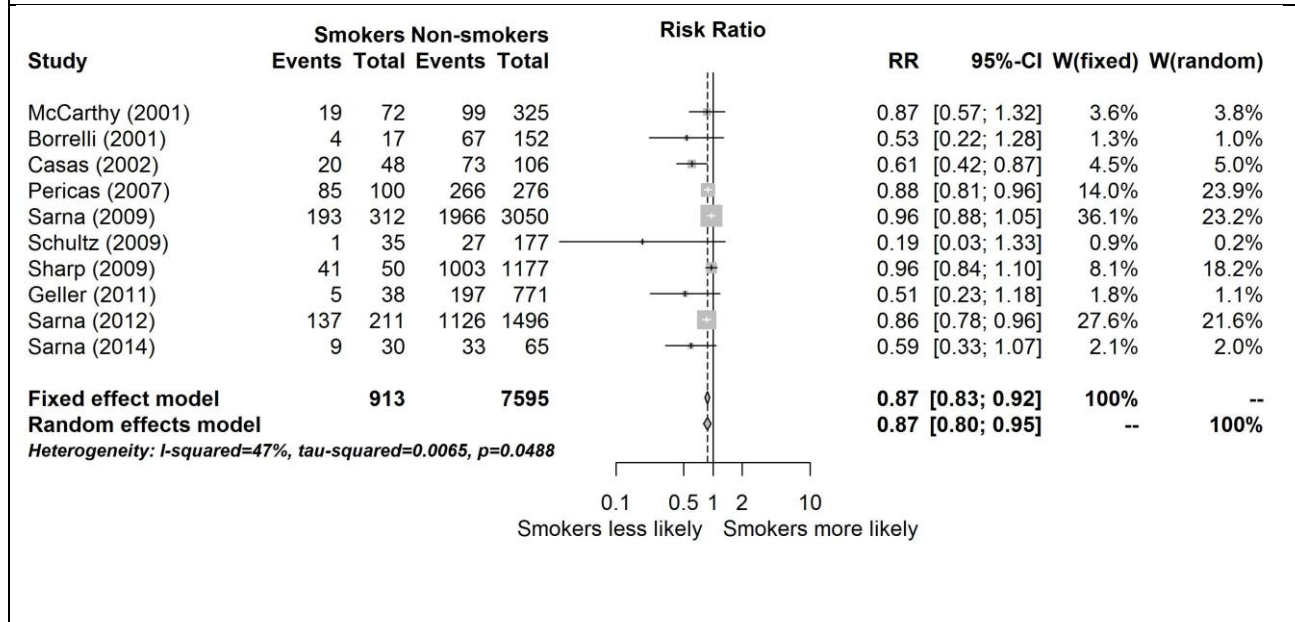

Study	Smokers Events	Total	Non-smokers Events	Total	RR	95%-CI	W(fixed)	W(random)
Sarna (2009)	48	312	614	3050	0.76	[0.58; 1.00]	50.9%	49.9%
Geller (2011)	2	38	23	771	1.76	[0.43; 7.21]	1.0%	2.5%
Sarna (2012)	42	211	407	1496	0.73	[0.55; 0.97]	44.9%	46.4%
Sarna (2014)	1	32	11	65	0.18	[0.02; 1.37]	3.2%	1.2%
Fixed effect model		593		5382	**0.74**	**[0.61; 0.90]**	**100%**	--
Random effects model					**0.75**	**[0.60; 0.94]**	--	**100%**

Heterogeneity: I-squared=10.9%, tau-squared=0.0067, p=0.3383

Risk Ratio: 0.1 0.5 1 2 10

Smokers less likely   Smokers more likely
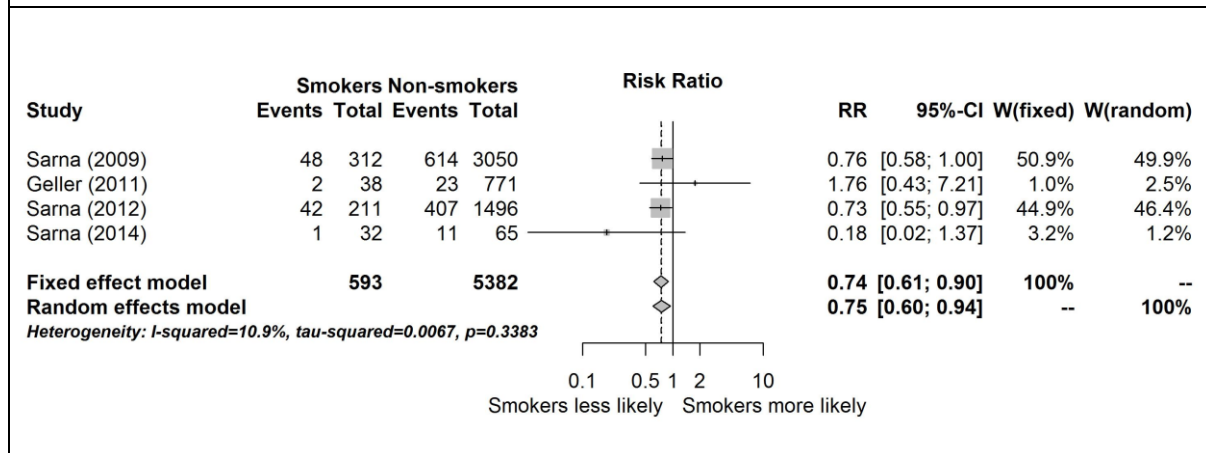
Table 1: Search terms

Facets	Search terms
Smoking	Smoking; cigarette
Health professional	Health professional; healthcare professional; healthcare provider; medical professional; medical staff; nurse
Practices	Practice; health promotion; prevention; health education; intervention; healthcare delivery; counseling; advice; quit; stop; cessation

Table 2: Details of included studies

First author (publication year)	Location	Study design	Sample size (Response rate)	Nurses' role	Sample origin	Source of data	Smoking prevalence	Ask	Advise	Assess	Assist	Arrange	Quality Score
Borrelli (2001)	US	RCT	104 (94%)	Primary care nurses	Regional	Paper	13%	-	✓	-	-	-	5
Casas et al. (2002)	Spain	Cross-sectional	154 (52%)	Primary care nurses	Local (1 district)	Authors	31.2%	-	✓	-	-	-	3
Deckter et al. (2009)	US	Cross-sectional	87 (67%)	Paediatric Nurses	Local	Paper	4.6%	✓	-	-	-	-	3
Fernández et al. (2005)	Spain	Cross-sectional	156 (72%)	Primary care nurses	Local	Paper and author	30.1%	✓	-	-	✓	-	5
Geller et al. (2011)	US	Cross-sectional	888 (60%)	Paediatric nurses	National	Paper	4.7%	✓	✓	✓	✓	✓	5
Merrill et al. (2010)	Serbia	Cross-sectional	232 (68%)	Hospital & health care nurses	Local	Paper	47.1%	-	✓	-	-	-	4
McCarty et al. (2001)	US	Cross-sectional	397 (99%)	Hospital nurses	Local (4 hospitals)	Paper	18.0%	-	✓	-	-	-	3
Pericas et al. (2007)	Spain	Cross-sectional	376 (87%)	Hospital & primary care nurses	Regional	Paper	26.7%	✓	✓	-	-	-	5
Sarna et al. (2000)	US	Cross-sectional	1,508 (38%)	Oncology nurses	National	Paper	7.0%	✓	✓	✓	✓	-	4

First author (publication year)	Location	Study design	Sample size (Response rate)	Nurses' role	Sample origin	Source of data	Smoking prevalence	Ask	Advise	Assess	Assist	Arrange	Quality Score
Sarna et al. (2009)	US	Cross-sectional	3,482 (21%)	Hospital nurses	National	Paper	9.3%	✓	✓	✓	✓	✓	3
Sarna et al. (2012)	US	Cross-sectional	1,790 (not reported)	Hospital nurses	National (3 states)	Paper	12.4%	✓	✓	✓	✓	✓	3
Sarna et al. (2014)	Czech Republic	Before-and-after study	98 (not reported)	Hospital nurses	National (8 hospitals)	Paper	33.0%	✓	✓	✓	✓	✓	2
Schultz et al. (2009)	Canada	Cross-sectiona	214 (58%)	Hospital nurses	Regional (1 state)	Paper and author	17.3%	✓	✓	✓	✓	-	4
Sharp et al. (2009)	US	Cross-sectiona	1,365 (32%)	Psychiatric nurses	National	Paper and author	4.0%	✓	✓	-	-	-	3
Svavarsdottir et al. (2007)	Iceland	Cross-sectiona	868 (36%)	Hospital & primary care nurses	National	Paper	5.7%	✓	✓	-	✓	-	4

Table 3: Reported smoking cessation practices (5As) by nurses' smoking status in individual studies

	Total	Smoker	Non-Smoker	
	N (%)	N (%)	N (%)	p value*
ASK				
Deckter et al. (2009)	19 (22.00)	-	-	n.s.
Fernandez et al. (2005)	145 (92.95)	41 (87.23)	104 (95.41)	0.067
Geller et al. (2011)	348 (43.02)	16 (42.11)	332 (43.06)	0.908
Pericas et al. (2007)	160 (42.55)	33(32.70)	127(46.10)	0.024
Sarna et al. (2000)	965 (64.00)	-	-	n.s.
Sarna et al. (2009)	2542 (75.61)	238 (76.28)	2304 (75.54)	0.772
Sarna et al. (2012)	1478 (86.59)	177(83.89)	1301(86.97)	0.219
Sarna et al. (2014)	60 (61.86)	16 (50.00)	44 (67.69)	0.092
Schultz et al. (2009)	133 (63.03)	17 (50.00)	116 (65.54)	0.086
Sharp et al. (2009)	1112 (90.92)	45 (91.84)	1067 (90.89)	0.820
Svavarsdottir et al. (2007)	505 (68.00)	-	-	n.s.
ADVISE				
Borrelli et al. (2001)	71 (42.01)	4 (23.53)	85 (44.08)	0.104
Casas et al. (2002)	93 (60.39)	20 (41.67)	73 (68.87)	0.001
Geller et al. (2011)	202 (24.97)	5 (13.16)	197 (25.55)	0.085
McCarty et al. (2001)	118 (29.72)	19 (26.39)	99 (30.46)	0.494
Merril et al. (2010)	35 (15.21)	-	-	n.s.
Pericas et al. (2007)	351 (93.35)	85 (85.10)	266 (96.40)	0.000
Sarna et al. (2000)	482 (32.00)	-	-	n.s.
Sarna et al.(2009)	2159 (64.22)	193 (61.86)	1966 (64.46)	0.361
Sarna et al. (2012)	1263 (73.99)	137(64.93)	1126(75.27)	0.001
Sarna et al. (2014)	42 (44.21)	9 (30.00)	33 (50.77)	0.058
Schultz et al. (2009)	28 (13.21)	1 (2.86)	27 (15.25)	0.048
Sharp et al. (2009)	1044(85.09)	41 (82.00)	1003 (85.22)	0.532
Svavarsdottir et al. (2007)		-	-	<0.05

	Total	Smoker	Non-Smoker	
ASSESS				
Geller et al. (2011)	153 (18.91)	4 (10.53)	149 (19.33)	0.176
Sarna et al. (2000)	573 (38.00)	-	-	n.s.
Sarna et al. (2009)	2159 (64.22)	197 (63.14)	1962 (64.33)	0.677
Sarna et al. (2012)	1220 (71.47)	139 (65.88)	1081 (72.26)	0.055
Sarna et al. (2014)	34 (35.05)	8 (25.00)	26 (40.00)	0.145
Schultz et al. (2009)	48 (22.64)	8 (22.86)	40 (22.60)	0.973
ASSIST				
Fernandez et al. (2005)	81 (51.92)	19 (40.43)	62 (56.88)	0.059
Geller et al. (2011)	48 (5.93)	1 (2.63)	47 (6.10)	0.378
Sarna et al. (2000)	543 (36.00)	-	-	n.s.
Sarna et al. (2009)	1289 (38.34)	118 (37.82)	1171 (38.39)	0.843
Sarna et al. (2012)	876 (51.32)	105 (49.76)	771 (51.54)	0.629
Sarna et al. (2014)	25 (25.77)	8 (25.00)	17 (26.15)	0.903
Schultz et al. (2009)	28 (13.21)	3 (8.57)	25 (14.12)	0.375
Svavarsdottir et al. (2007)	388 (44.7)	-	-	n.s
ARRANGE				
Geller et al. (2011)	25 (3.09)	2 (5.26)	23 (2.98)	0.428
Sarna et al. (2009)	662 (19.69)	48 (15.38)	614 (20.13)	0.045
Sarna et al. (2012)	449 (26.31)	42(19.91)	407 (27.21)	0.024
Sarna et al. (2014)	12 (12.37)	1 (3.13)	11 (16.92)	0.052

*Overall P value corresponds to Chi square or Yates chi square correction if any expected frequency was below 1