Specifying evidence-based behaviour change techniques to aid smoking cessation in pregnancy

Lorencatto, Fabiana.,[1,2] West, Robert,[1,3] & Michie, Susan.[1,2]

[1] NHS Centre for Smoking Cessation and Training (NCSCT), University College London, WC1E 7HB

[2] Centre for Outcomes Research and Effectiveness, University College London, WC1E 7HB

[3] Cancer Research UK Health Behaviour Research Centre, University College London, WC1E 6BT

Corresponding author: Fabiana Lorencatto, University College London, 441a, 1-19 Torrington Place, London, WC1E 7HB. Tel: 02076791231 Email: Fabi.lorencatto@ncsct.co.uk

ABSTRACT (max 250 words)

Introduction: Behavioural support aids smoking cessation in pregnancy. However, it remains unclear which component behaviour change techniques (BCTs) contribute to effectiveness, or the extent to which these are applied in practice. This study aimed to examine: i) which BCTs were included in effective behavioural support interventions for pregnant smokers, and ii) the prevalence of use of these BCTs by the English Stop Smoking Services (SSSs).

Methods: From a Cochrane review of smoking cessation behavioural support in pregnancy, seven interventions were identified as effective in that they increased the odds of cessation by at least 50% and differences between intervention and control conditions were statistically significant. BCTs in each intervention were identified using an established taxonomy of BCTs. Thirteen treatment manuals from SSSs were coded for inclusion of BCTs.

Results: Thirty-seven BCTs were identified across trials of behavioural support for pregnant smokers, with an average of eight BCTs, and a range of six to 34 BCTs, per intervention. Eleven BCTs were present in at least two effective interventions [e.g. facilitate goal setting (n=6), advise on social support (n=2), action planning (n=5), provide rewards contingent on successfully stopping smoking (n=4)]. Only 15.4% of treatment manuals from SSSs contained all eleven BCTs; 53.8% contained at least six of them.

Conclusions: Whilst BCTs associated with effective interventions can be identified from systematically reviewed literature, English SSSs appear to use only a limited proportion of these in practice.

INTRODUCTION

Smoking while pregnant is a major preventable cause of infant mortality and morbidity (Cnattingius, 2004). Promoting smoking cessation in pregnancy is therefore a public health priority (Dept. of Health, 2000). There are several types of interventions available for helping pregnant smokers to quit, including medications and face-to-face or telephone behavioural support. Smoking cessation behavioural support involves advising on and facilitating activities aimed at helping the quit attempt to succeed. There is good evidence from published randomized controlled trials (RCTs) that behavioral support can aid cessation in pregnant smokers (Lumley, Chamberlain, Dowsell et al. 2009), whereas to date there is not good evidence for the efficacy of nicotine replacement therapy (Silagy, Lancaster, Stead et al. 2007) and other stop-smoking medications are contra-indicated during pregnancy (NICE, 2010). In the UK, an increasing number of English NHS Stop Smoking Services (SSSs) offer free, specialist behavioural support tailored to the needs of specific population groups such as pregnant smokers. Of the 21,839 pregnant women setting a quit date with a SSS in 2010/2011, 27% were abstinent at 4-week follow up, confirmed by CO verification (NHS, 2011).

However despite their overall effectiveness, behaviour change interventions, such as behavioural support for smoking cessation, are typically complex in that they consist of multiple, potentially interacting behaviour change techniques (BCTs). BCTs are the replicable components of an intervention designed to alter or redirect causal processes regulating behaviour (Michie, Hyder, West et al. 2011). As a result of the complexity of these interventions, it is not clear which specific component BCTs have been included in existing effective RCTs of behavioural support for smoking cessation in pregnancy, and therefore which BCTs should form the basis for practice. It also remains unknown the extent to which BCTs forming behavioural support interventions in effective trials are subsequently employed in practice by the NHS SSSs.

A reliable coding-based method for specifying the content of smoking cessation behavioural support interventions in terms of their component BCTs has recently been developed (Michie et al. 2011). This is in the form of a taxonomy of 43 conceptually distinct smoking cessation BCTs that are described using consistent terminology and detailed definitions. BCTs in the taxonomy are organized hierarchically, categorised by four behaviour change functions: 1) 'Boost motivation,' 2) 'Maximize self-regulatory capacity and skills,' 3) 'Promote adjuvant activities,' and 4) 'General aspects of the role/interaction.' (Michie, et al. 2011). This taxonomy has been reliably applied as a coding framework to specify BCTs comprising published descriptions of effective generic individual and group behavioural support interventions, and to examine the extent to which these identified evidence-based BCTs featured in treatment manuals from the NHS SSSs (Michie, Churchill & West, 2010). It has also supported the identification of a sub-set of BCTs featured in generic NHS SSSs behavioural support treatment manuals that were reliably associated with improved 4-week CO-validated quit outcomes in the NHS SSSs (West, Walia, Michie et al, 2011). To our knowledge, the functional components of effective behavioural support interventions in specialist population groups such as pregnant smokers have not yet been specified in this way.

The present study aims to apply the taxonomy of smoking cessation BCTs to: (i) examine which BCTs were used in effective RCTs of behavioural support interventions for smoking cessation in pregnancy, and how these compare to previously identified evidence-based BCTs for generic behavioural support; and (ii) to assess the extent to which treatment manuals from specialist pregnancy NHS SSSs include BCTs identified as evidence-based for pregnancy-specific behavioural support.

METHODS

This study followed the methods of Michie, Churchill & West (2010) and was conducted in two stages.

i) Stage 1: Specifying evidence-based BCTs for smoking cessation behavioural support in pregnancy

Component BCTs included in effective behavioural support interventions were specified using a published taxonomy of smoking cessation BCTs (Michie et al. 2011) as a coding framework. Effective interventions were identified from the Cochrane review, '*Interventions for promoting smoking cessation in pregnancy*' (Lumley, Chamberlain, Dowswell et al. 2009). An intervention was classified as effective if it increased the probability of cessation by at least 50% (OR≥1.50) and the differences between the intervention and control group were statistically significant ($p<0.05$) (Michie, Churchill & West 2010). Lead authors of interventions identified as effective were contacted twice with a request for their trial protocol or any additional available materials detailing the intervention's content; where no protocol was available or no response received, coding was conducted using the intervention description in the corresponding published trial report.

Coding was conducted by assigning a BCT label from the taxonomy where appropriate to sections of the trial report or manual that described the intervention treatment condition. Data on the frequency of BCT use across trials was extracted throughout. A BCT was classified as 'evidence-based' if it featured in at least two of the effective interventions included in the review (criteria from Michie, Churchill & West 2010). The sub-set of BCTs identified as evidence-based for smoking cessation in pregnancy was then compared with the sub-set of BCTs identified as evidence-based for generic individual behavioural support (n=14 BCTs) (Michie, Churchill & West, 2010), and also to a second, distinct sub-set of 14 BCTs found to be associated with improved 4-week quit outcomes in NHS SSSs (West, Walia, Michie et al., 2010).

ii) *Stage 2: Examine prevalence of use of evidence-based BCTs by the SSSs*

The content of SSSs treatment manuals for smoking cessation behavioural support in pregnancy were coded for the presence of the sub-set of evidence-based BCTs identified in stage 1. Service Managers from all English NHS primary care trusts (PCTs) (n=152) were contacted on up to three occasions with a request for any available service treatment manuals or guidance documents outlining content recommendations and specifications for delivering behavioural support to pregnant smokers. Two researchers independently assessed the documents received to determine whether they constituted a treatment manual, presently defined as a formal, written plan specifying procedures to be followed in providing a specific treatment or support for smoking cessation to pregnant smokers. Manuals were coded for component BCTs following the same content analysis coding procedures as stage 1. The proportion of SSSs treatment manuals that contained all identified evidence-based BCTs for pregnancy-specific support, and that which contained at least six BCTs (i.e. more than half), was noted.

For both published trial descriptions/protocols and SSSs treatment manuals, a second independent coder coded a sub-set of materials (33%). Inter-rater reliability for identifying the same BCTs from intervention descriptions was assessed using percentage agreement. Where one coder failed to identify a BCT or a different BCT was identified, disagreement was registered. Discrepancies were resolved through discussion or through consultation with a behaviour change expert (SM).

RESULTS

i) *Stage 1: Evidence-based BCTs for smoking cessation behavioural support in pregnancy*

The Cochrane review of interventions for promoting smoking cessation in pregnancy included 56 randomized controlled trials (RCTs). Seven interventions, all RCTs of one-to-one behavioural support, were classified as effective according to our study criteria (Heil, Higgings, Bernstein et al., 2008; Polanska, Hanke, Sobala et al., 2004; Higgins, Heil, Solomon et al., **2004**; Hjalmarson, Hahn &

Savenberg 1991; Donatelle, Prows, Champeau et al., 2009; Walsh, Redman, Brinsmead et al., 1997; Lawrence, Aveyard, Cheng et al., 2003). Three studies were conducted in the USA, three in Europe (UK, Poland, Sweden) and one in Australia. A trial manual and additional information on intervention content was received for only one trial (Walsh et al., 1997).

Inter-rater coding reliability was high (93% agreement), with all discrepancies resolved through discussion. Thirty-seven of the original 43 BCTs (86%) in the taxonomy were identified at least once across effective trials of behavioural support for pregnant smokers (Table 1). No new BCTs not already included in the taxonomy were identified. The number of BCTs identified per effective behavioural support intervention condition ranged from six to 34, with an average of eight BCTs per intervention (SD 9.9). Eleven BCTs (29.7%) were identified in at least two interventions, therefore meeting our effectiveness criteria (Table 2). Of these, three (27.2%) served the behaviour change function 'boost motivation;' four (36.4%) served the function 'maximising self-regulatory capacity and skills;' one (9.1%) served 'promoting adjuvant activities;' and three (27.2%) pertained to 'general aspects of the role/interaction' (Table 1).

Of the 11 identified evidence-based BCTs for behavioural support in pregnancy, nine (81.8%) were also featured in the sub-set of evidence-based BCTs for generic one-to-one behavioural support (Michie, Churchill, & West, 2010). Only two BCTs in the sub-set of evidence-based BCTs for smoking cessation in pregnancy were not included in the original generic set. These were: 'Advise on/facilitate use of social support' and 'Provide rewards contingent on successfully stopping smoking.' Of the 11 evidence-based BCTs identified for pregnancy-specific support, four (28.6%) were also included in the second sub-set of BCTs identified as associated with improved 4-week quit rates in the NHS SSSs (West Walia, Michie et al., 2011). These were: 'Provide rewards contingent on successfully

stopping smoking'; 'Measure CO'; 'Advise on/facilitate use of social support'; and 'Facilitate relapse prevention and coping' (Table 2).

ii) *Stage 2: Prevalence of use of evidence-based BCTs by the SSSs*

Of the 152 SSS managers contacted, 128 (84%) responded. Of these, 113 (88%) reported having a service dedicated to providing behavioural support to pregnant smokers. Of these, only 32 (25%) reported having treatment manuals. Documents were received from 23 (72%) services, of which 13 (57%) were classified as manuals and contained sufficient detail for BCT identification.

Inter-rater reliability for coding BCTs was high (88%), with all discrepancies easily resolved through discussion. Manuals contained a range of two to 11 evidence-based BCTs per manual, with an average of seven (SD 2.79) BCTs per manual, (Table 3). Two manuals contained all 11 evidence-based BCTs (15.4%), and seven manuals (53.8%) contained at least six (i.e. more than half) of the identified evidence-based BCTs (Table 3).

DISCUSSION

Eleven evidence-based behaviour change techniques (BCTs) for smoking cessation behavioural support in pregnancy were identified from published descriptions of the content of multiple effective behavioural support interventions for pregnant smokers. This sub-set of evidence-based BCTs is consistent with previous studies highlighting the evidence-base for specific smoking cessation BCTs (Michie, Churchill & West 2010; West, Walia, Michie et al., 2011); four BCTs from this sub-set have also featured in a sub-set of fourteen BCTs demonstrated to be reliably associated with improved four-week quit rates in the NHS SSSs (West, Walia, Michie et al., 2010). Furthermore only two BCTs identified as evidence-based for smoking cessation in pregnancy were not also identified in more than two effective generic behavioural support RCTs: 'provide rewards contingent on successfully stopping

smoking' and 'advise on/facilitate use of social support.' A review of the use of incentives in smoking cessation interventions with pregnant smokers has found that rewards and incentives have been incorporated into some worksite and community-based smoking cessation interventions with pregnant smokers, particularly those of lower socio-economic status, to achieve successful quit outcomes (Donatelle, Udson, Dobie et al., 2004). Similarly, providing positive social support within behavioural support, such as by giving compliments and expressing willingness to help with daily activities, has been found to be associated with improved quit outcomes in pregnancy (McBride, Grothaus, Pirie et al., 1998). There is also evidence suggesting that pregnant women are more likely to notice their partner's social support during a quit attempt than are non-pregnant women (Haug, Fugelli, Aaro et al., 1994). The emergence of BCTs uniquely evidence-based for pregnancy-specific behavioural support interventions underlines the need to tailor support provided to the unique needs of this population group. Design of future trial and practice interventions targeting pregnant smokers should emphasise BCTs addressing social support and/or providing rewards or incentives contingent on smoking cessation.

The sub-set of eleven identified evidence-based BCTs for smoking cessation in pregnancy included at least one BCT addressing each of the four behaviour change functions outlined by the taxonomy. Behaviour change functions reflect the mechanisms by which BCTs work to support smoking cessation, for example by boosting motivation or facilitating self-regulation. The four behaviour change functions embedded in the structure of taxonomy are consistent with a wider theory of motivation developed in relation to smoking cessation, PRIME theory (West, 2009). By systematically identifying and labeling component BCTs in interventions it is possible to examine and clearly describe behavioural support interventions by their key active ingredients and the corresponding mechanisms of action, and link these to overarching theoretical frameworks.

Despite a large proportion of SSSs reporting that they provided specialist pregnancy cessation services, we found that only a very small proportion had specific treatment manuals. Current use of evidence-based BCTs by the NHS SSSs appears to be limited. Although most of the existing SSS treatment manuals contained more than half of the eleven evidence-based BCTs, only two manuals contained all eleven. It would seem appropriate to align practice in terms of the content of treatment manuals with the identified evidence base.

This study had several limitations. **There are many factors that influence outcomes of behavioural support interventions other than their content, such as general communication and therapeutic skills, methods of delivery and setting (Davidson, Goldstein, Kaplan et al., 2003); these are rarely mentioned in published trials (Glasziou, Chalmers, Altman et al., 2010). Ideally the evidence-based of BCTs would be established by examining associations between individual techniques and outcomes in effective and ineffective intervention. However, both the descriptions of intervention content and number of trials available to us were too limited to support analytic methods, such as meta-regression, to partial out the influence of additional influencing factors and analyse effectiveness by individual BCT.** A second limitation is that treatment manuals rather than measures of actual practice were used as a basis for examining the prevalence of use of evidence-based BCTs in SSSs. Translation of intended practice as specified in treatment manuals into actual practice is rarely uniform and often lacks intervention fidelity (Borrelli, Sepinwall, Bellg, et al., 2005). Future research should conduct process evaluations and investigate BCTs used in actual practice by applying the taxonomy to code audio- or video-recorded behavioural support sessions into component BCTs. A third limitation is the range of countries providing data as service data were from England only.

A final consideration is that although a set of 11 component BCTs were identified as evidence-based for behavioural support interventions in pregnancy, other BCTs from the full taxonomy may also be relevant, but did not feature in sufficient studies to enable identification. **This is likely given that the present set of evidence-based BCTs were identified from only seven trials; had additional effective trials been identified or examined then potentially further evidence-based BCTs may have been identified as relevant. Similarly, five BCTs have been previously established as evidence-based for generic individual-behavioural support (Michie et al. 2010) that were not presently identified as evidence based for smoking cessation in pregnancy. These were: 'advise on stop smoking medication,' 'give options for additional/later support,' 'provide information on withdrawal symptoms,' 'assess past history of quit attempts,' and 'prompt commitment from the client.' Yet, all of the latter techniques are likely to also be of some relevance to smoking cessation support in pregnancy, despite not presently being identified as evidence-based. For example, numerous stop smoking medications are contraindicated in pregnancy (i.e. varenicline, zyban, certain forms of oral NRT; NICE, 2010). Therefore, delivering the BCT 'advise on stop smoking medications' is likely to be relevant to stop smoking support in pregnancy despite not being identified as evidence-based. Also**, additional BCTs may be important in their own right for effectively helping smokers to quit, while others, such as 'building rapport' and 'eliciting client views' may adopt a more adjuvant role in supporting the effective delivery of BCTs identified as evidence-based. Practitioners delivering interventions may thus consider applying other component BCTs from the taxonomy in addition to those identified as evidence-based in this study.

In conclusion, given the current state of evidence, the present methods represent the best available intial step towards systematically specifying the content of an effective behavioural support intervention for smoking cessation in pregnancy. These findings represent a first attempt towards establishing which specific BCTs to use in supporting pregnant smokers to quit. This furthers our

understanding of how interventions work and what mechanisms contribute to their effectiveness, in turn helping inform the design of future interventions. These findings also provide a first snapshot of the BCTs currently used by the English SSSs when delivering support to pregnant smokers trying to quit, and provide a basis for investigating variations in current practice. This work forms part of an ongoing research program conducted by the NHS Centre for Smoking Cessation and Training (ncsct.co.uk) that is underpinning a national training programme for Stop Smoking Practitioners.

Funding: This work was supported by the NHS Centre for Smoking Cessation and Training that is supported by the Department of Health (DOH T336/BSS/M award number 49945)

Declaration of interests: Fabiana Lorancatto has received travel funds and hospitality from Pfizer, who manufacture Champix; Robert West has received travel funds and hospitality from, and undertaken research and consultancy for pharmaceutical companies that manufacture or research products aimed at helping smokers to stop. These products include nicotine replacement therapies, Champix and Zyban. This has led to payments to him personally and to his institution. He undertakes lectures and training in smoking cessation methods which have led to payments to him personally and to his institution. He also receives royalties from books on smoking cessation. He has received research grants from medical charities and government departments; Susan Michie has received travel funds and hospitality from Pfizer, who manufacture Champix. She has received fees for speaking at educational events sponsored by Pfizer. She has received research funds and consultancy payments from the Department of Health and the Department of Transport.

REFERENCES

Bellg, A., Borrelli, B., Resnick, B., et al. (2004). Enhancing treatment fidelity in health behaviour change studies: best practices and recommendations from the NIH Behaviour Change Consortium. *Health Psychology,* vol. 22 (5), pp. 443-451. doi:10.1037/0278-6133.23.5.443

Borrelli, B., Sepinwall, D., Bellg, A., et al. (2005). A new tool to assess treatment fidelity and evaluation of treatment fidelity across 10-years of health behaviour research. *Journal of Consulting and Clinical Psychology,* vol. 73 (5), pp. 852-860. doi:10.1037/0022-006X.73.5.852

Cnattingius, S. (2004). The Epidemiology of smoking during pregnancy: Smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research,* 6 (2), pp. 125-140. doi:10.1080/14622200410001669187

Davidson, K., Goldstein, M., Kaplan, R., et al. (2003). Evidence-based behavioural medicine: What is it and how do we achieve it? *Annals of Behavioural Medicine,* vol. 26 (3), pp.161-171. doi:10.1207/S15324796ABM2603_01

Department of Health (2000). *Saving lives- our healthier nation.* London: The Stationery Office.

Donatelle, R., Prows, S., Champeau, D., et al. (2009). Randomised controlled trial using social support and financial incentives for high risk pregnant smokers: significant other supporter (SOS) program. *Tobacco Control,* vol. 9 (3), pp. 67-69. doi:10.1136/tc.9.suppl_3.iii67

Donatelle, R., Hudson, D., Dobie, S., et al. (2004). Incentives in smoking cessation: status of the field and implications for research and practice with pregnant smokers. *Nicotine & Tobacco Research,* vol. 6 (2), pp. 163-179. doi:10.1080/14622200410001669196

Glasziou, P., Chalmers, I., Altman, D. et al. (2010). Taking healthcare interventions from trial To practice. *British Medical Journal,* vol. 341, p.384-387. doi:10.1136/bmj.c3852

Haug, K., Fugelli, P., Aaro L. & Foss, O. (1994). Is smoking intervention in general practice more successful among pregnant than non-pregnant women? *Family Practice,* vol. 11, pp. 111-116. doi:10.1093/fampra/11.2.111

Heil, S., Higgins, S., Bernstein, I., et al. (2008). Effects of voucher-based incentives on abstinence from cigarette smoking and fetal growth among pregnant women. *Addiction,* vol.103, pp. 1009-1018. doi:10.1111/j.1360-0443.2008.02237.x

Higgins, S., Heil, S., Solomon, L., et al. (2004). A pilot study on voucher-based incentives to promote abstinence from cigarette smoking during pregnancy and postpartum. *Nicotine & Tobacco Research,* vol. 6(6), pp. 1015-1020. doi:10.1080/14622200412331324910

Hjalmarson, A., Hahn, L., Svanberg, B. (1991). Stopping smoking in pregnancy: effect of a self-help manual in controlled trial. *British Journal of Obstetrics and Gynaecology,* vol. 98, pp. 260-264. doi: 10.1111/j.1471-0528.1991.tb13390.x

Lawrence, T., Aveyard, P, Cheng, K., et al. (2003). A cluster randomized controlled trial of smoking cessation in pregnant women comparing interventions based on the transtheoretical (stages of change) model to standard care. *Tobacco Control,* vol.12, pp. 168-177. doi:10.1136/tc.12.2.168

Lumley J, Chamberlain C, Dowswell T, et al. (2009). Interventions for promoting smoking cessation during pregnancy. *Cochrane Database of Systematic Reviews*, Issue 3, article no. CD001055. doi: 10.1002/14651858

McBride, C., Grothaus, L., Lando, H., et al. (1998). Partner smoking status and pregnant smoker's perceptions of support for and likelihood of smoking cessation. *Health Psychology,* vol. 17 (1), pp. 63-69. doi:10.1037/0278-6133.17.1.63

Michie, S., Churchill, S., & West, R. (2011). Identifying evidence-based competences required to deliver behavioral support for smoking cessation. *Annals of Behavioural Medicine,* vol. 41 (1), pp. 59-70. doi:10.1007/s12160-010-9235-z

Michie, S., Hyder, N., West, R., & Walie, A. (2010). Development of a taxonomy of behaviour change techniques used in individual behavioural support for smoking cessation. *Addictive Behaviours*, vol. 36 (4), pp. 315-319. doi:10.1016/j.addbeh.2010.11.016

National Institute for Health and Clinical Excellence (2010). *How to stop smoking in pregnancy and following childbirth.* Retrieved from: http://www.nice.org.uk/nicemedia/live/13023/49345/49345.pdf

NHS Centre for Smoking Cessation and Training (2009). Retrieved from: http://www.ncsct.co.uk

NHS Information Centre (2011) Statistics on NHS Stop Smoking Services: England, April 2010 to December 2010. NHS IC. Accessed on 04-08-2011. Retrieved from: http://www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles/nhs-stop-smoking-services

Polanska, K., Hanke, W., Sobala, W., et al. (2004). Efficacy and effectiveness of the smoking cessation program for pregnant women. *International Journal of Occupational Medicine and Environmental Health,* vol. 17 (3), pp. 369-377.

Silagy, C., Lancaster, T., Stead, L., et al. (2007). Nicotine replacement therapy for smoking Cessation (Review). *Cochrane Database of Systematic Reviews,* Issue 3. doi: 10.1002/14651858.CD000146.pub2.

Walsh, R., Redman, S., Brinsmead, M., et al. (1997). A smoking cessation program at a public antenatal clinic. *American Journal of Public Health,* vol. 87, pp. 1201-1204. doi:10.2105/AJPH.87.7.1201

West, R., Walia, A., Michie, S., Walia, A. (2010). Behaviour change techniques used by English Stop Smoking Services and their associations with short-term quit outcomes. *Nicotine & Tobacco Research,* vol. 12 (7), pp. 742-747. doi:10.1093/ntr/ntq074

West, R. (2009). The multiple facets of cigarette addiction and what they mean for encouraging and helping smokers to stop. Journal of *Chronic Obstructive Pulmonary Disease,* vol. 6, pp. 277-283. doi:10.1080/15412550903049181

TABLES

Table 1. The frequency of BCTs identified in effective behavioural support interventions, grouped according to behaviour change function

BCT Code	BCT Label	BCT definition	Number of effective interventions (max n=7)
Specific focus on the target behaviour (B) and maximising motivation (M)			
BM1	Provide information on consequences of smoking and smoking cessation	Give, or make more salient, information about the harm caused by smoking and the benefits of stopping; distinguish between the harms from smoking and nicotine; debunk myths about low tar and own-roll cigarettes and cutting down	7
BM2	Boost motivation and self efficacy	Give encouragement and bolster confidence in ability to stop	1
BM3	Provide feedback on current behaviour	Give feedback arising from assessment of current self-reported or objectively monitored behaviour (e.g. expired-air CO) and/or progress towards becoming a permanent non-smoker	1
BM4	Provide rewards contingent on successfully stopping smoking	Give praise or other rewards if the person has not smoked	4
BM5	Provide normative information about others' behaviour and experiences	Give information about how the smoker's experience compares with other people's	2
BM6	Prompt commitment from the client there and then	Encourage the smoker to affirm or reaffirm a strong commitment to start, continue or restart the quit attempt	1
BM7	Provide rewards contingent on effort or progress	Give praise or other rewards for the effort the smoker is making and if the smoker has engaged in activities such as correct use of medication that aid cessation	1
BM8	Strengthen ex-smoker identity	Explain the importance of regarding smoking as something that is 'not an option', including the 'not a puff' (NAP) rule, encourage the smoker to re-evaluate the attraction to smoking, and construct a new identity as someone who 'used to smoke'	1
BM9	Identify reasons for wanting and not wanting to stop smoking	Help the smoker to arrive at a clear understanding of his or her feelings about stopping smoking, why it is important to stop and any conflicting motivations	1
BM10	Explain the importance of abrupt cessation	Explain why it is better to stop abruptly rather than cut down gradually if at all possible	1
BM11	Measure CO	Measure expired-air carbon monoxide concentration	6
Maximising self-regulatory capacity and skill (BS)			
BS1	Facilitate barrier identification and problem solving	Help the smoker to identify general barriers (e.g. susceptibility to stress) that might make it harder to stay off cigarettes and develop general ways of addressing these	2
BS2	Facilitate relapse prevention and coping	Help the smoker understand how lapses occur and how they lead to relapse and to develop specific strategies for preventing lapses or avoiding lapses turning into relapse	3
BS3	Facilitate action planning/develop treatment plan	Work with smoker to generate a clear quit plan including preparations for the quit attempt (e.g. obtaining medication)	5
BS4	Facilitate goal setting	Help the smoker to set a quit date and goals that support the aim of remaining abstinent	6

BS5	Prompt review of goals	Review how far the smoker has achieved the main goal of abstinence and any other goals that are supportive of it (e.g. putting in place plans to avoid triggers)	1
BS6	Prompt self-recording	Help the smoker to establish a routine of recording potentially useful information (e.g. situations or times when urges are strong and less strong)	0
BS7	Advise on changing routine	Advise on ways of changing daily or weekly routines to minimise exposure to smoking cues	1
BS8	Advise on environmental restructuring	Advise on ways of changing the physical environment to minimise exposure to smoking cues (e.g. removing ashtrays from the house)	1
BS9	Set graded tasks	Set small achievable goals where appropriate (e.g. take one day at a time)	1
BS10	Advise on conserving mental resources	Advise on ways of minimising stress and other demands on mental resources (activities that require mental effort)	1
BS11	Advise on avoiding social cues for smoking	Give specific advice on how to avoid being exposed to social cues for smoking (e.g. explaining to friends that you have stopped)	1

Promoting adjuvant activities (A)

A1	Advise on stop-smoking medication	Explain the benefits of medication, safety, potential side effects, contra-indications, how to use them most effectively, and how to get them; advise on the most appropriate medication for the smoker and promote effective use	1
A2	Advise on/facilitate use of social support	Advise on or facilitate development of social support from friends, relatives, colleagues or 'buddies'	2
A3	Adopt appropriate local procedures to enable clients to obtain free medication	Enact the necessary procedures to ensure that the smoker gets his/her medication easily and without charge where appropriate	0
A4	Ask about experiences of stop smoking medication that the smoker is using	Assess usage, side effects and benefits experienced of medication(s) that the smoker is currently using	0
A5	Give options for additional and later support	Give information about options for additional support where these are available (e.g. websites, self-help groups, telephone helpline)	1

General aspects of the role/interaction (RC)

RD1	Tailor interactions appropriately	Use relevant information from the client to tailor the behavioural support provided	0
RD2	Emphasise choice	Emphasise client choice within the bounds of evidence based practice	1
RI1	Assess current and past smoking behaviour	Assess amount smoked, age when started, pattern of smoking behaviour	7
RI2	Assess current readiness and ability to quit	Assess current level of motivation to stop and confidence in success	5
RI3	Assess past history of quit attempts	Assess number and duration of past quit attempts and experiences related to these, including factors that led back to smoking	1
RI4	Assess withdrawal symptoms	Assess the presence and severity of nicotine withdrawal signs and symptoms	0
RC1	Build general rapport	Establish a positive, friendly and professional relationship with the smoker and foster a sense that the smoker's experiences are understood	1
RC2	Elicit and answer questions	Prompt questions from the smoker and answer clearly and accurately	1
RC3	Explain the purpose of CO monitoring	Explain to the smoker the reasons for measuring CO at different time points, e.g. before and after the quit date	0
RC4	Explain expectations regarding treatment programme	Explain to the smoker the treatment programme, what it involves, the active ingredients and what it requires of the smoker	1

RC5	Offer/direct towards appropriate written materials	Distinguish what are, and are not, appropriate written materials and offer/direct clients to these in ways that promote their effective use	7
RC6	Provide information on withdrawal symptoms	Describe to smokers what are, and are not, nicotine withdrawal symptoms, how common they are, how long they typically last, what causes them and what can be done to alleviate them	1
RC7	Use reflective listening	Adopt a style of interaction that involves listening carefully to the smoker and where appropriate reflecting back to the smoker key elements of what s/he is saying	1
RC8	Elicit client views	Prompt the client to give views on smoking, smoking cessation and any aspects of the behavioural support programme	1
RC9	Summarise information / confirm client decisions	Provide a summary of information exchanged and establish a clear confirmation of decisions made and commitments entered into	1
RC10	Provide reassurance	Give general reassurance to the smoker that his/her experiences are normal and time limited, and provide positive expectations of success based on experience with other smokers in the same situation	1

Table 2. Evidence-based BCTs (identified in ≥ 2 effective RCTs) for specialist pregnancy behavioural support compared to BCTs previously identified as evidence-based for generic individual behavioural support* and as associated with improved 4-week quit outcomes.**

BCT	Evidence-based for Specialist pregnancy behavioural support	Evidence-based for generic individual behavioural support*	Associated with four week quit outcomes**
BM4 Provide rewards contingent on successfully stopping smoking	✓	✓	✓
BM11 Measure CO	✓	✓	✓
BS2 Facilitate relapse prevention and coping	✓	✓	✓
BM1 Provide information on the consequences of smoking and smoking cessation	✓	✓	X
BS1 Facilitate barrier identification and problem solving	✓	✓	X
BS3 Facilitate action planning/ identify relapse triggers	✓	✓	X
BS4 Facilitate goal setting	✓	✓	X
RI1 Assess current and past smoking behaviour	✓	✓	X
RI2 Assess current readiness and ability to quit	✓	✓	X
RC5 Offer/Direct towards appropriate written materials	✓	✓	X
A2 Advise on/facilitate use of social support	✓	X	✓
A1 Advise on stop smoking medication	X	✓	✓
A5 Give options for additional and later support	X	✓	✓
RC6 Provide information on withdrawal symptoms	X	✓	X
RI3 Asses past history of quit attempts	X	✓	X
BM6 Prompt commitment from the client there and then	X	✓	X
RC8 Elicit Client views	X	X	✓
BS7 Advise on changing routine	X	X	✓
A3 Ask about experiences of stop smoking medications that the Smoker is using	X	X	✓
BS10 Advise on conserving mental resources	X	X	✓
RC9 Summarise information/ confirm Client decisions	X	X	✓
RC10 Provide reassurance	X	X	✓
BM2 Boost motivation and self-efficacy	X	X	✓

*From Michie, Churchill & West 2010; ** From West, Walia, Michie et al. 2010

Table 3. Prevalence of identified evidence-based BCTs in NHS SSSs treatment manuals (n=13) for smoking cessation behavioural support in pregnancy

BCT	SSS 1	SSS 2	SSS 3	SSS 4	SSS 5	SSS 6	SSS 7	SSS 8	SSS 9	SSS 10	SSS 11	SSS 12	SSS 13
BM11 Measure CO	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RC5 Offer/ Direct towards appropriate written materials		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
BM1 Provide information on the consequences of smoking and smoking cessation	✓	✓		✓		✓	✓	✓	✓	✓		✓	✓
RI2 Assess current readiness and ability to quit	✓			✓	✓	✓		✓	✓	✓	✓	✓	
BM4 Provide rewards contingent on successfully stopping smoking	✓	✓		✓				✓	✓	✓	✓	✓	
BS3 Facilitate action planning		✓				✓	✓	✓	✓	✓	✓	✓	
BS4 Facilitate goal setting		✓			✓	✓		✓	✓	✓	✓	✓	
A2 Advise on/facilitate use of social support	✓			✓		✓	✓	✓		✓		✓	✓
BS2 Facilitate relapse prevention and coping		✓		✓		✓	✓	✓		✓	✓	✓	
RI1 Assess current and past smoking behaviour	✓			✓		✓				✓		✓	✓
BS1 Facilitate barrier identification and problem solving						✓		✓		✓	✓	✓	
Total	6	7	2	8	4	10	6	10	6	11	8	11	5