Reliability of identification of behavior change techniques in intervention descriptions

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Abstract

Purpose: To assess frequency of identification as well as inter-coder and test-retest reliability of identification of behavior change techniques (BCTs) in written intervention descriptions.

Methods: Forty trained coders applied the "Behavior Change Technique Taxonomy version 1" (BCTTv1) to 40 intervention descriptions published in protocols and repeated this one month later.

Results: Eighty of 93 defined BCTs were identified by at least one trained coder and 22 BCTs were identified in 16 (40%) or more of 40 descriptions. Good inter-coder reliability was observed across 80 BCTs identified in the protocols: 66 (80%) achieved mean PABAK (Prevalence and Bias adjusted Kappa) scores of 0.70 or greater and 59 (74%) achieved mean scores of 0.80 or greater. There was good within-coder agreement between baseline and one month, demonstrating good test re-test reliability.

Conclusions: BCTTv1 can be used by trained coders to identify BCTs in intervention descriptions reliably. However, some frequently-occurring BCT definitions require further clarification.

Keywords: behavior change, intervention, behavior change technique, taxonomy, inter-coder reliability, test-retest reliability

Introduction

Behavior change is fundamental to many global priorities including health protection. For example, growing obesity has led to the increased prevalence of a variety of illnesses including cardiovascular disease, type 2 diabetes and some cancers (1). Weight control depends on changes in diet and physical activity patterns (2). Similarly, HIV prevention depends on abstinence, protected sexual intercourse and HIV testing (3). Development of a science that can guide the systematic development of behavior change interventions (BCIs) is, therefore, essential to advances in preventive medicine (4).

A science of behavior change depends on a shared understanding of the nature of evaluated BCIs including the constituent parts that may have promoted, or inhibited, intervention effectiveness (5-7). This, in turn, depends on researchers and practitioners being able to use published intervention descriptions to reliably understand exactly what was delivered in any particular BCI.

Intervention evaluation descriptions, such as published protocols, report (i) intervention development, content and delivery and (ii) evaluation or trial methods. Several guidelines including CONSORT (8, 9) have clarified best practice in reporting evaluation methods, for example, specifying who receives the intervention, reporting participant numbers and allocation in each trial arm at each stage, statistical analyses conducted etc. However further progress is required to achieve satisfactory reporting of intervention content and methods. CONSORT guidelines specify that evaluators should report, "*precise details of interventions [as]… actually administered*" and extension guidance has been provided (9, 10). The Workgroup for Intervention Development and Evaluation Research (WIDER) group agreed four key

recommendations regarding reporting of intervention content (11, 12, 13) and this group have been influential in encouraging journal editors to ensure that transparent and accessible intervention descriptions are available before publication of intervention outcomes (6). Other authors have also specified minimum information required for reporting of BCIs and TIDieR (Template for Intervention Description and Replication) provides an international interdisciplinary consensus checklist with illustrative examples to enable improved reporting of BCIs (10, 14).

Progress depends on developing reliable shared methods of reporting and classifying BCI content that can demonstrably enable different readers, or coders, to (i) identify the same elements in the same intervention description, so achieving good inter-coder reliability, and (ii) identify the same elements when reading the same intervention description on different occasions, so achieving good test-retest reliability.

Techniques used to change behavior patterns are central to BCI design and construction (15-17). Consequently, developing definitions of behavior change techniques (BCTs) included in BCIs is fundamental to the development of a science of behavior change. This is critical both to developers of BCIs and to systematic reviewers seeking to synthesize findings and identify explanatory associations between BCTs and intervention efficacy.

One definition of a "BCT" is,

> "an active component of an intervention designed to change behaviour. The defining characteristics of a BCT are that it is "observable, replicable, irreducible, a component of an intervention designed to change behaviour and a postulated active ingredient within the intervention. It is thus the smallest component compatible with retaining the postulated active ingredients, i.e. the proposed

mechanisms of change, and can be used alone or in combination with other BCTs." (p.182, 18).

In practice the challenge for BCI designers is to identify, distinguish between and specify BCTs in descriptions of BCIs. The challenge for readers of such descriptions, including reviewers, is to identify these BCTs. In this paper we assess how reliably readers can identify pre-defined BCTs from BCI descriptions.

A number of authors have developed taxonomies of BCTs and have used these to identify BCTs in published BCI descriptions. In a meta analytic review, Albarracín, Gillete, Earl, Glasman and Durantini (7) showed, (i) that 10 distinct techniques (e.g., provision of factual information, attitudinal arguments and normative arguments) could be reliably identified in published descriptions of interventions designed to promote condom use and (ii) that inclusion of particular BCTs was associated with intervention effectiveness for particular target audiences. For example, provision of normative arguments was associated with greater effectiveness for BCI recipients less than 21 years old but with less effectiveness for older audiences. The results generated detailed recommendations for BCI designers and allowed theory testing, indicating, for example, that fear arousal was not associated with effectiveness of condom-use promotion BCIs. Following this work, Abraham and Michie (6) developed, and tested the reliability of, a more comprehensive, cross-behavior taxonomy of BCTs that linked BCTs to a variety of theories applied to behavior change. This taxonomy named and defined 22 change techniques and four sets of multi-technique intervention components. Taxonomy developers and trained coders were found to use BCT definitions reliably (that is, they showed high inter-coder reliability) across 195 descriptions of BCIs targeting a range of behaviors, as well as a sample of 13 pairs of descriptions taken from published papers and manuals describing condom-use promotion BCIs. This taxonomy has been widely applied. For example, in a meta-analytic review, Michie,

Abraham, Whittington, McAteer and Gupta (19) applied the taxonomy to BCIs targeting dietary behaviors and physical activity and found that interventions including self-monitoring and at least one other technique derived from control theory (20) were efficacious in changing behavior. Subsequently, BCT taxonomies relevant to specific behavior patterns have been developed: promotion of physical activity and healthy eating (19, 21), smoking cessation (22, 23) reduction of excessive alcohol consumption (24), prevention of sexually transmitted infections (7, 25) and changing professional behavior patterns (26) as well as other generally-applicable taxonomies (27).

Building on previous taxonomies, Michie et al. developed a BCT taxonomy (BCTT) that incorporated BCTs from all previously published taxonomies (28, 29). The first version (v1) of this taxonomy provides the most comprehensive list of cross-behavior BCTs defined to date. BCTTv1 is hierarchically organized and was developed on the basis of international expert consensus. It comprises 93 labeled and defined BCTs. Coders have been trained to use BCTTv1 and to identify BCTs in BCI descriptions. Below we refer to such coders as "trained coders". Coder selection and training procedures are described elsewhere (30).

The Present Study

This research evaluated the utility of BCTTv1 and reliability of identification of defined BCTs in intervention descriptions. To our knowledge, this is the most comprehensive test of any BCT taxonomy to date. In addition to the key questions of inter-coder reliability and test-retest reliability, a series of other questions were considered using quantitative and qualitative exploration of coders' responses. Eight research questions were addressed:

1. How often are particular BCTs identified in intervention descriptions?

2. To what extent do trained coders agree when using BCT labels and definitions to identify BCTs in intervention descriptions, that is, how good is inter-coder reliability – and is inter-coder reliability stable over a one-month period?
3. Do coders identify the same BCTs at baseline as they do one month later, that is, how good is test-retest reliability.
4. Do particular intervention descriptions generate greater or lesser inter-coder reliability in BCT identification?
5. Do different indices of inter-reliability generate meaningfully different patterns reliability data?
6. How does the reliability of BCT identification by trained coders correspond to that of taxonomy developers – and is that relationship stable over a one-month period?
7. Is the confidence of trained coders in identifying BCTs from intervention descriptions stable over a one month period and is it associated with greater observed inter-coder reliability and agreement with taxonomy developers?
8. Do trained coders judge any particular BCT labels and definitions to be in need of clarification and how do such judgments relate to observed inter-coder reliability?

Method

Materials

Forty descriptions of behavior change interventions included in published protocols were used to test reliability of identification of BCT labels and definitions. Protocols were selected from those published between 2009 and 2010 in three interdisciplinary journals, namely, *BMC Public Health* (*N*=24), *Implementation Science* (*N*=11), and *BMC Public Health Services Research* (*N*=5). Quota sampling ensured that the 40 descriptions included interventions designed to

promote or change behaviors in three broad categories; behaviors to prevent illness (*N*=13), behaviors to improve illness management (*N*=13) and behaviors of health care professionals (*N*=14).

Coders used BCTTv1 [28] to identify BCTs in intervention descriptions. A coding task booklet (comprising the 40 intervention descriptions and task instructions) was developed and sent to each coder. A list of the 40 protocols from which intervention descriptions were extracted is presented as Table 1. The coding booklet is available as an (ESM).

Trained Coders

Coder training was advertised through scientific and professional organisations, and the project website. Interested respondents were asked to complete a self-evaluation form. Those involved in the development of BCTTv1 were excluded. Eligible coders were contacted by email and offered an honorarium of £560 to complete the coding task, estimated to take two days. Forty-eight coders were recruited. Training was conducted over four, one-hour sessions, led by an expert tutor, in most cases via teleconference call (for further details of recruitment and training, see Wood et al. [30]). Of these, 72.5% were from the UK, 17.5% from other European countries, 5% from USA and 5% from Australia. They ranged in age from 24 to 60 years (*M* = 37.13, *SD* = 7.45) and 70% were women. Eighty percent had obtained a research or clinical doctorate and 13% identified themselves as active practitioners in their field. Eighty-eight percent rated themselves as being highly confident in using the taxonomy to specify intervention content after training.

BCT identification by Trained Coders

The 48 coders were randomized into 24 coding pairs. Each member of a pair received the same set of 20 (of the 40) intervention descriptions to code. A random number generator was used to create pairs and allocate intervention descriptions to pairs. Of the 48 coders, 40 coders

(20 coding pairs) completed the exercise. Coders were not required to explain why they wished to drop out of the study. This generated 8-12 (as opposed to the planned 12) sets of reliability data for each of the 40 intervention descriptions.

For each intervention description, coders indicated where in the description a BCT was identified, which BCT was identified and also rated their confidence in their identification, using '+' = 'present in all probability but evidence not clear' and '++' = 'present beyond all reasonable doubt and clear evidence'. Trained coders completed the coding task at two time points, one month apart. After completing the task for the first time ("Time 1"), coders were asked to return all materials and to delete any copies they had made. One month later, coders were re-sent coding materials (including the same 20 descriptions presented in a different order) and asked to complete the coding exercise again ("Time 2"). Of the 48 coders, 32 completed the exercise at time 2 (16 coding pairs, comprising the same trained coders as Time 1). Coding took about one day of work for each coder on each occasion and coders were paid an honorarium for their time.

Feedback on BCT definitions and labels

Coders were also invited to provide free response written feedback about using BCTTv1 and identify BCT definitions and labels that remained unclear after completing the task. No guidance was given on what feedback was required and it was clarified that such feedback was optional (see ESM).

CT Identification by Taxonomy Developers

During the development of BCTTv1, six taxonomy developers (CA, SM, MJ, JF, WH and MR) independently applied BCT definitions included in BCTTv1 to intervention descriptions using the same coding method as described above for trained coders. At that time 86 of the 93 definitions were available. Developers were randomly assigned to pairs. Each developer pair coded between 9 and 14 intervention descriptions selected from the same 40 published

protocols used by trained coders. Developer pairs then checked their agreement. Remaining disagreement between developer pairs was subsequently reviewed and discrepancies were resolved by discussion within pairs. Where resolution remained unclear, SM and MR reviewed discrepancies and proposed a particular coding decision. The BCT coding resulting from this process were circulated to the group of six developers and agreed as final. This created a "resolved set of BCT identifications by developers".

Data Analyses

Reliability of coding judgments was assessed using the Prevalence and Bias Adjusted Kappa (PABAK) statistic (31). Coders at time 1 were randomly divided into pairs. The number of agreements and disagreements between each coding pair was used to calculate mean PABAK scores for each trained coder pair, for each BCT and for each intervention description.

Test-retest reliability of trained coder judgments was assessed using PABAK. Coders at time 1 were paired with themselves at time 2 and the number of agreements and disagreements was used to calculate mean PABAK scores for each intervention description. The mean of these scores was then calculated to provide a PABAK score for each coder.

Stability of trained coder inter-coder reliability between time 1 and one month later was assessed by bivariate correlations and paired t-tests, as was the relationship between trained coder judgments and the resolved agreements between taxonomy developers

The number of high confidence ratings by each trained coder for each BCT was recorded at time 1 and at time 2. The percentage of high confidence ratings was calculated for each BCT, using the frequency of BCT identification across the 40 intervention descriptions as a denominator. Stability of high confidence ratings was assessed using paired t-tests (by pairing percentage of high confidence ratings at time 1 with percentage of high confidence ratings made at time 2).

Trained coder agreement with taxonomy developers was calculated using PABAK for each individual trained coder paired with the resolved set of developer BCT identifications. Mean PABAK scores were calculated for each trained coder and for each BCT.

Qualitative analyses of feedback comments

Free response feedback provided by coders in the coding booklet was subjected to content analyses and findings grouped according to our research aims, namely, (i) BCT definitions and labels that remain unclear/require refinement, (ii) methods to facilitate valid and reliable application and, (iii) methods to improve the usability of BCTTv1. The lead researcher on these analyses (CW) read coders' feedback and sorted responses into categories. An independent coder (KS) checked allocation of feedback to categories. Discrepancies were resolved through discussion between the two researchers.

Measures of reliability and their interpretation

Cohen's kappa (32) has been widely applied but underestimates reliability when the number of instances is small or there is an asymmetric distribution between agreements and disagreements (33). PABAK was used here because it adjusts for both prevalence of occurrence of BCTs and bias in rates of identification of BCTs (e.g. when both coders agree that many BCT's are absent and/or chance agreement is high). Gwet (33) tested alternative indices to Cohen's kappa and concluded the AC1 statistic (see Gwet (34), equations 7 and 8) had optimal output characteristics, particularly when the frequencies of occurrence are small.

Conventionally, 0.70 and above is regarded as acceptable inter-coder reliability. In the absence of evidence-based guidance we considered means above and below 0.70 and 0.80 and used a two-tailed chi-square test (applying the Yates' correction for continuity) to test whether PABAK or AC1 generated higher numbers of BCTs reliability scores of 0.70 or above.

Results

We present the findings by research question below. Of particular importance are the questions of how often BCT descriptions were found to be relevant to the 40 intervention descriptions provided by protocols (question 1), which BCT descriptions were found be reliably identified (question 2) and whether reliability was affected by the descriptions themselves (question 4).

Table 2 lists the 93 BCT labels included in BCTTv1, ordered by the frequency of identification by trained coders in their initial (time 1) coding exercise. Subsequent columns, apart from the final two, refer to time 1 coding and display (i) the number of intervention descriptions (out of 40) in which each BCT was identified, (ii) the percentage of identifications made with high ("++") confidence, (iii) the range of PABAK mean scores between pairs for each BCT, (iv) the mean PABAK score between pairs and (v) the mean AC1 score between pairs. The final two columns present time 2 data for (vi) the percentage of identifications made with high ("++") confidence and (vii) the mean PABAK scores between pairs.

Agreement rates were similar across the 20 trained coder pairs at time 1. All coding pair means were clustered around the overall PABAK mean (Range = .07, *M*=.86, *SD* = .02) indicating that there were no outlying pairs. Consequently, all pairs were included in subsequent analyses.

1. How often were particular BCTs identified in intervention descriptions?

At time 1, 80 of the 93 BCTs (86%) were identified by at least one coder; 22 BCTs were identified in 16 or more intervention descriptions (i.e., in at least 40% of the 40 descriptions). These are referred to as "frequently" identified. Twenty-five BCTs were identified in between 6 and 15 intervention descriptions ("occasionally" identified), 33 BCTs were identified in 1-5 descriptions ("rarely" identified) and 13 were not identified in any description at time 1, although two of these were identified by coders at time 2.

2. *To what extent did trained coders agree when using BCT labels and definitions to identify BCTs in intervention descriptions, that is, how good was inter-coder reliability – and was inter-coder reliability stable over a one-month period?*

Mean PABAK scores ranged from 0.30 to 1.00 (*overall mean* = 0.85; *sd* = 0.18; overall median = 0.92); 64 of the 80 observed BCTs (80%) achieved mean PABAK scores of 0.70 or greater and 59 (74%) achieved mean PABAK scores of .80 or greater. Thus, overall, good inter-coder reliability was observed across BCTs by trained coders. All occasionally and rarely identified BCTs achieved mean PABAK scores of 0.70. Mean PABAK scores were, however, significantly lower for the 22 frequently observed BCTs than for other BCTs (mean for frequently observed = 0.60; remaining = 0.94, $F = 222.89$, $p < 0.001$).

Six of the 22 (27%) frequently identified BCTs reached the 0.70 threshold with four further BCTs scoring 0.68 or 0.69. These were *Problem solving* (0.68), *Action Planning* (0.68) *Behavioral practice/rehearsal* (0.68) and *Monitoring of behavior by others without feedback* (0.69). The remaining 12, were; *Prompts/cues* (PABAK 0.66), *Feedback on outcome(s) of behavior* (0.62), *Goal setting* (outcome) (0.61), *Feedback on behavior* (0.57), *Adding objects to the environment* (0.57), *Information about health consequences* (0.50), *Social support (practical)* (0.51), *Goal setting (behavior)* (0.48), *Information about social and environmental consequences* (0.50), *Credible source* (0.40), *Instruction on how to perform behavior* (0.31) and *Social support (unspecified)* (0.30).

There was a strong correlation between inter-coder reliability at time 1 and at time 2, $r = .97$, $p<.001$. A paired t-test showed that the overall pattern of mean PABAK scores across trained coder pairings did not significantly change between time 1 and time 2 coding, $t(15) = -.05$, $p = .97$. The pattern of mean PABAK scores across the BCTs identified also did not change significantly, ($t(79) = .56$, $p = .58$; time 1 PABAK $M = .88$, $SD = .17$; time 2: $M = .87$, $SD = .17$). At time

2, 12 of the 22 frequently observed BCTs (54%) had mean PABAK scores below 0.70, of these, 10 also fell below this threshold at time 1. Thus, inter-coder reliability remained stable over time.

3. *Did coders identify the same BCTs at time 1 and time 2 (one month later), that is, how good was test-retest reliability.*

Thirty two coders provided data at both time points. Mean PABAK scores ranged from 0.84 to 0.99; 14 coders (44%) achieved mean PABAK scores of 0.80 or greater and 18 (56%) achieved mean PABAK scores of 0.90 or greater. Thus, good test re-test reliability was observed across coders.

4. *Do particular intervention descriptions generate greater or lesser inter-coder reliability in BCT identification?*

We considered PABAK scores across intervention descriptions (as opposed to BCTs). Mean PABAK scores ranged between 0.73 and 0.96 across the 40 intervention descriptions (M = .87; SD = .05). Only 4 of 40 descriptions had mean PABAK scores below 0.80 (Mean PABAK for the four descriptions = .76, SD = .04). Two of the descriptions described interventions targeting behavior to prevent illness (M = .73 and M = .77), one described an intervention targeting behaviors to improve illness management (M = .79) and one described an intervention targeting the behavior of health care professionals (M = .78). All four intervention descriptions were from protocols published in BMC Public Health. There was, therefore, no indication that any particular description or subset of descriptions influenced coding reliability.

5. *Do PABAK and AC1 generate meaningfully different patterns reliability data?*

The correlation between mean PABAK and mean AC1 scores, across BCTs at time 1 was near perfect (r = .96, p < .001, two-tailed), reflecting the mathematical similarity of the two formulae. Our data show that for all occasionally and rarely identified BCTs, both statistics indicate reliable identification of BCTs (i.e., above 0.70). Of the 22 frequently identified BCTs, 20 meet the

threshold of 0.70 when reliability is represented by AC1 whereas only 6 (27%) meet this threshold when represented by PABAK ($\chi 2$ (df = 1, n = 44) = 15.89, p < .001.). AC1 was significantly more likely than PABAK to result in scores above the 0.70 threshold (χ^2 (df = 1, *n* = 160) = 10.58, *p* < .001), generating higher reliability scores for 59 BCTs and lower scores for 10.

6. *How does the reliability of BCT identification by trained coders correspond to that of taxonomy developers- and is this relationship stable over a one month period?*

Table 3 shows data for 15 BCTs (out of 86 available at the time of coding) which were identified at least 5 times across the 40 intervention descriptions by taxonomy developers. These are ordered by the frequency of identification by the developers. Subsequent columns show (i) the number of descriptions in which the BCT was identified (out of 40), (ii) the mean PABAK scores across the six developers, (iii) the mean PABAK scores for the 15 BCTs for trained coders at time 1 and (iv) the percentage of identifications made by trained coders with high ("++") confidence. Columns iii and iv are repeated from Table 2. The final column shows trained coder agreement with the resolved set of developer identifications (as described above).

Mean PABAK scores for the developers ranged from 0.60 to 0.90 (overall *M* = .77) with all but one BCT achieving an average PABAK score of 0.70 or above. Similarly, mean trained coders' PABAK scores (for these 15 BCTs) ranged from 0.40 to 0.85 (overall *M* = .70) with six BCTs having average PABAK scores below 0.70. The average reliability scores for developers and trained coders are correlated with a large effect size (*r* = .69, *p* < .01, two tailed; [33]) but were, nonetheless, significantly different (*t*(14) = 3.01, *p* < .01) with developers achieving higher PABAK scores. One BCT, *Credible source*, reduces the overall inter-coder reliability for both groups (PABAK score = .60 and .40 for developers and trained coders, respectively). Without this BCT, overall average PABAK scores, across these 15 BCTs rise to 0.78 and 0.72, respectively.

There was a moderately strong correlation between trained coders' agreement with the resolved set of developer identifications at time 1 and trained coders' agreement with developers at time 2, $r = .67$, $p < .001$. A paired t-test showed that the overall pattern of mean PABAK scores across trained coder-developer pairs did not change significantly, $t(31) = .84$, $p = .41$. Trained coder agreement with the 15 BCTs identified by developers also did not change significantly, ($t(14) = .39$, $p = .70$. Thus the relationship between trained coders identifications and the resolved set of developer identifications for these 15 BCTs remained stable over one month.

7. *Is the confidence of trained coders in identifying BCTs from intervention descriptions stable over a one month period and is it associated with greater observed inter-coder reliability and agreement with taxonomy developers?*

Across the 80 BCTs identified at time 1, the percentage of BCT identifications judged by coders to have been made with high confidence ("++") ranged from 0–100%. The average percentage was 57%. Coders were more confident about identifying BCTs at time 2 compared to the same BCTs at time 1, over all BCTs $t(79) = 2.08$, $p<.05$ (mean percentage of judgments made with high confidence at time 1: $M = 57$, $SD = 23.65$; time 2: $M = 63.04$, $SD = 23.11$) and when considering only BCTs agreed as present by the taxonomy developers, $t(14) = 2.78$, $p < .05$ (mean percentage of judgments made with high confidence '++': time 1: $M = 66.47$, $SD = 11.51$; time 2: $M = 71.73$, $SD = 10.55$).

Confidence in BCT identification was *not* associated with greater inter-coder reliability. Perhaps surprisingly, mean PABAK scores were *not* positively correlated with confidence, but rather tended to be negatively correlated with confidence, $r(78) = -.37$, $p = .07$ (two tailed).

Trained coders' confidence in their identification of these 15 BCTs was also *not* associated with agreement between trained coders and the resolved set of identifications by taxonomy developers (r (13) = .26, p > .1).

8. *Did trained coders judge any particular BCT labels and definitions to be in need of clarification and how do such judgments relate to observed inter-coder reliability?*

Twelve BCT definitions were highlighted as being unclear or requiring further refinement. Nine of these (75%) were among the 12 BCTs achieving mean PABAK scores of less than .68 (listed above). Thus there was considerable correspondence between coders' individual judgments of BCT definition clarity and BCT inter-coder reliability.

Half of the definitions judged to be in need of further clarification belonged to sets of BCTs referring to the same underlying change mechanism as indicated by their inclusion in the same BCTTv1 BCT grouping). For example, coders noted that if distinctions between the three Social Support BCTs were clearer (i.e. *3.1.* (as numbered in BCTTv1) *Social support -unspecified, 3.2. Social support - practical and, 3.3. Social support - emotional)*, users would find it easier to decide when unspecified forms of support could more accurately be specified as, for example, "practical". Similar definition refinement was recommended for the three information provision BCT variants (i.e. *5.1. Information about health consequences, 5.6. Information about emotional consequences and, 5.3. Information about social and environmental consequences).*

At time 1, four BCTs achieved mean PABAK scores of 0.68 and 0.69 (see research question 2 above). Considering these as being close enough to the 0.70 threshold to be counted as reliably identified, three additional definitions were identified as needing refinement. These were BCT number 6.1. *Demonstration of the behaviour, 1.4. Action planning* and *12.1. Restructuring the physical environment.* These belonged to a set of four pairs of BCT definitions that coders found difficult to distinguish, namely, 4.1. *Instruction on how to perform the behaviour* versus 6.1.

Demonstration of the behaviour; 1.1. *Goal setting (behaviour) versus 1.4. Action planning; 1.1. Goal setting (behaviour)* versus 1.3. *Goal setting (outcome)* and *12.1. Restructuring the physical environment* versus 12.5. *Adding objects to the environment.* Guidance was requested on how to distinguish between these BCT definition pairs.

Coders also noted that identification of 9.1. *Credible source* required inferences regarding intervention recipients' evaluation of the credibility of those delivering interventions and that this could be unclear. Coders also suggested that inter-coder reliability could be improved by providing additional guidance documents.

Discussion

Eighty of the 93 BCTs defined in BCTTv1 were identified in 40 intervention descriptions by at least one trained coder; 22 BCTs were identified in at least 16 (40%) of the 40 intervention descriptions and 47 BCTs were identified in at least six (15%). Good overall inter-coder reliability was observed across the 80 identified BCTs, with 80% achieving mean PABAK scores of at least 0.70 and 74% with scores of 0.80 or greater. However, poorer reliability was observed for frequently occurring BCTs with just 12 of the 22 (55%) achieving mean PABAK scores of 0.68 or better. Further work is needed to refine definitions of a number of frequently-observed BCTs to ensure better reliability of identification in future tests.

Inter-coder reliability remained similar across two tests separated by one month, indicating temporal stability. There was good agreement between each coder's judgments at time 1 and at time 2 demonstrating good test re-test reliability. Trained coders also showed good identification agreement with a set of resolved set of agreements between taxonomy developers for 15 BCTs.

Inter-coder agreement was similar across intervention descriptions suggesting that particular descriptions were not more or less difficult to code for BCT presence. Using only 40 descriptions, this study was not powered to assess differences between reliability of BCT identifications across different behavioral targets (for example, behaviors to prevent illness versus behaviors to improve illness management) but we found no evidence of such differences. Moreover, no evidence of such differences was found by Abraham and Michie (6) who were able to compare reliability of frequently occurring BCTs across three separate systematic reviews. Future larger studies could explore this issue but it may be that adequacy of BCT definition rather than the application context is critical to reliability of identification.

Trained coders' and taxonomy developers' confidence in their BCT identification varied across BCTs and showed an overall increase between time 1 and time 2 (one month later). Trained coders' confidence in BCT identification tended to be negatively correlated with inter-coder agreement. Coder's confidence was not correlated with trained coder agreement with the resolved set of taxonomy developers' identification of 15 BCTs. Thus perceived confidence does not appear to be a useful indicator of accuracy of identification of BCTs in intervention descriptions and may not be a useful index of coder competence or training efficacy.

The BCTTv1 taxonomy of BCT labels and definitions is an important development providing the most comprehensive listing of BCTs to date (28). Of the 93 definitions included in BCTTv1, 80 (86%) were identified in at least one intervention description by at least one trained coder while 13 (14%) were not identified. Only 22 (24%) were identified in 16 or more of the 40 intervention descriptions considered here. Of these 22, 18 (82%) were previously defined in the in the Abraham and Michie (2008) taxonomy (6). The latter taxonomy was developed as a parsimonious tool to identify commonly occurring BCTs in intervention descriptions and was tested using intervention descriptions in 195 published papers and 13 paper-manual pairs. The

present findings confirm that the BCTs defined by Abraham and Michie are commonly occurring. Abraham and Michie defined 22 BCTs and 4 packages of BCTs as opposed to the 93 separate BCTs included in BCTTv1. It is important when applying any taxonomy of change techniques to the categorization of intervention descriptions (e.g., in meta analyses) or to the design of interventions that the defined techniques are directly relevant to the intervention aims and content. For example, interventions aiming to alter habitual or impulsive processes are likely to incorporate different techniques to interventions targeting reflective motivational processes (see e.g., van Beurden, Greaves, Smith & Abraham for a review of techniques found to alter impulsive processes involved in unhealthy eating [35]). The relevance of techniques is especially important when a variety of intervention characteristics need to be considered because reliable application of longer lists of defined techniques necessitates more intensive training. The data reported here provides good overall inter-coder and test-retest reliability for 80 of the 93 BCTs defined in BCTTv1 as applied by trained coders. Thus, with appropriate training, the taxonomy can be used to identify a range of BCTs included in intervention descriptions. Further larger-scale, tests could clarify the relevance of these technique definitions to a wider range of interventions and also test the replicability of the training used here.

In addition to testing levels of inter-coder and test-retest reliability, we sought to identify BCT definitions that might be applied more reliably with further clarification or guidance. Sixteen of 22 (72%) frequently identified BCTs achieved PABAK scores of less than 0.70 with nine of these falling below 0.60. The poorer reliability of frequently occurring BCTs observed in this study may be due to the number of BCT definitions coders needed to remember and distinguish between. BCTs with poorer reliability included four pairs of BCTs defining variants of the same underlying change mechanism, namely, (i) *Information about (a) health consequences* and (b) *social and environmental consequences, Goal setting* in relation to (a) *outcomes* and (b)

behaviors, (iii) *Feedback on* (a) *behavior* and (b) *outcome(s) of behavior* and (iv), *Social support* both (a) *practical* and (b) *unspecified.* This may indicate limits to degree of specification of BCTs in coding of the content of interventions from intervention descriptions.

Perhaps surprisingly, given previous larger-scale tests of BCT identification reliability (e.g., Abraham & Michie, 6), inter-coder reliability was poor for *Instruction on how to perform behavior*. Individual coder feedback suggested confusion with *Demonstration of the behavior.* This was one of four pairs of BCTs (including two goal setting definitions) with which coders reported difficulty. Both *Prompts/cues* and *Adding objects to the environment* also fell below the 0.70 threshold. Further development and testing of these BCT definitions is warranted.

Trained coders also commented on the definition of *Credible source* which showed poor inter-coder reliability among coders and the lowest inter-coder reliability score among taxonomy developers. The importance of message-source credibility has previously been recognized (36) and coding for source characteristics in intervention descriptions has been shown to predict intervention effectiveness in meta-analytic studies. Perceived professional competence of intervention facilitators has been found to predict effectiveness of HIV-preventive interventions as has matching group membership between facilitators and recipients, for example, matched gender (37). Thus coding intervention descriptions for message source or facilitator characteristics is important. However, it may be important to distinguish between perceived professional competence of those delivering interventions and their "credibility" which could also be based on common group membership. Moreover, it is important to distinguish between characteristics of those delivering interventions and the content of what they deliver. Thus source characteristics (including credibility, similarity and many others) are best viewed as aspects of the delivery of techniques that may moderate the effectiveness of

such techniques. This distinction between delivery characteristics and content is helpfully highlighted by Schulz et al. (2010) in the ITAX taxonomy [27].

Coders provided clear feedback suggesting further distinctions and clarification of BCTs definitions. It may, however, be appropriate to remain somewhat circumspect about trained coders' feedback on clarity of BCT definitions since coders' confidence in BCT identification was not predictive of observed inter-coder reliability and indeed tended to be negatively correlated with reliability. Coder confidence was also not associated with correspondence with a resolved set of agreements between developers for 15 BCTs.

The characteristics of the coders trained for this study are typical of those likely to want to use BCT labels and definitions to identify intervention components associated with greater intervention effectiveness, for example when conducting meta-analyses (6, 17, 38). However, it is unclear whether the training undertaken here would allow less informed participants to achieve reliability of BCT identification. Future studies should continue to monitor inter-coder reliability of BCT identification in new datasets and to report on the training intensity needed to achieve reliability for a specified number of BCT definitions (in this case 93).

We compared inter-coder reliability assessments generated by the PABAK and AC1 statistics and, reassuringly, our findings indicate that these indices generate very similar patterns of inter-coder scores across all identified BCTs. However, we found that the two indices differ significantly in their representation of reliability for the most frequently observed BCTs, with PABAK generating lower reliability scores than AC1. These frequently observed BCTs were less reliably identified than other BCTs. Thus our findings suggest that, at least in some contexts, the two statistics may not be interchangeable. Guessing may be more likely for frequently-occurring than for rare BCTs resulting in occurrence of the random effects that AC1 controls so AC1 may be a more appropriate index. Further developments of reliability indices (33) control for

additional sources of error and more recently proposed indices may give an even better indication of the true reliability of coding.

In conclusion, our results demonstrate that BCTTv1 can be used by trained coders to reliably identify BCTs included in intervention descriptions. Certain BCT definitions, including those describing a number of the frequently occurring BCTs require further consideration and refinement and further reliability testing. Future tests should employ more than 40 intervention descriptions to better assess generalizability of findings. Nonetheless, BCTTv1 provides a uniquely extensive list of BCTs which can be used both by developers and implementers of behavior change interventions and by systematic reviewers wishing to identify effective BCTs within complex interventions.

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Author note

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Table 1. List of 40 protocols from which intervention descriptions were extracted: sampled across Implementation Science, BMC Public Health and BMC Public Health Services

Year of publication	Journal	Reference
2010	BMC Public H	Murphy et al. (2010). A pragmatic randomised controlled trial of the Welsh National Exercise Referral Scheme: protocol for trial and integrated economic and process evaluation. BMC Public Health, 10, 352. doi:10.1186/1471-2458-10-352
2010	BMC Public H	Ahmad et al. (2010). Effect of medication review and cognitive behaviour treatment by community pharmacists of patients discharged from the hospital on drug related problems and compliance: design of a randomised controlled trial. BMC Public Health, 10, 133. doi:10.1186/1471-2458-10-133
2010	Imp. Science	Ivers et al. (2010). Feedback GAP: study protocol for a cluster randomised trial of goal setting and action plans to increase the effectiveness of audit and feedback interventions in primary care. Implementation Science, 5, 98. doi:10.1186/1748-5908-5-98
2010	BMC Public H	Skouteris et al. (2010). Healthy eating and obesity prevention for pre-schoolers: a randomised controlled trial. BMC Public Health, 10, 220. doi:10.1186/1471-2458-10-220
2010	BMC Public H	Castelnuovo et al. (2010). TECNOB: study design of a randomised controlled trial of a multidisciplinary telecare intervention for obese patients with type-2 diabetes. BMC Public Health, 10, 204. doi:10.1186/1471-2458-10-204
2010	Imp. Science	McKenzie et al. (2010). Improving the care for people with acute low back pain by allied health professionals (the ALIGN trial): A cluster randomised trial protocol. Implementation Science, 5, 86. doi:10.1186/1748-5908-5-86
2010	BMC Public H	Wyers et al. (2010). Efficacy and cost-effectiveness of nutritional intervention in elderly after hip fracture: design of a randomised controlled trial. BMC Public Health, 10, 212. doi:10.1186/1471-2458-10-212
2010	BMC Public H	Wyse et al. (2010). A cluster randomised trial of a telephone-based intervention for parents to increase fruit and vegetable consumption in their 3- to 5-year-old children: study protocol. BMC Public Health, 10, 216. doi:10.1186/1471-2458-10-216
2010	BMC Public HS	Sanfélix-Genovés et al. (2010). Impact of a multifaceted intervention to improve the clinical management of osteoporosis. The ESOSVAL-F study. BMC Health Services Research, 10, 292. doi:10.1186/1472-6963-10-292
2010	BMC Public H	Siddiqi et al. (2010). An intervention to stop smoking among patients suspected of TB - evaluation of an integrated approach. BMC Public Health, 10, 160. doi:10.1186/1471-2458-10-160
2010	BMC Public HS	Mc Namara et al. (2010). Engaging community pharmacists in the primary prevention of cardiovascular disease: protocol for the Pharmacist Assessment of Adherence, Risk and Treatment in Cardiovascular Disease (PAART CVD) pilot study. BMC Health Services Research, 10, 264. doi:10.1186/1472-6963-10-264
2010	BMC Public H	Spijkers et al. (2010). Effectiveness of a parenting programme in a public health setting: a randomised controlled trial of the positive parenting programme (Triple P) level 3 versus care as usual provided by the preventive child healthcare (PCH). BMC Public Health, 10, 131. doi:10.1186/1471-2458-10-131

2010	BMC Public HS	McNamara et al. (2010). Development and Evaluation of a Psychosocial Intervention for Children and Teenagers Experiencing Diabetes (DEPICTED): a protocol for a cluster randomised controlled trial of the effectiveness of a communication skills training programme for healthcare professionals working with young people with type 1 diabetes. BMC Health Services Research, 10, 36. doi:10.1186/1472-6963-10-36
2010	BMC Public H	Colagiuri et al. (2010). The Sydney Diabetes Prevention Program: A community-based translational study. BMC Public Health, 10, 328. doi:10.1186/1471-2458-10-328
2010	Imp. Science	McAlister et al. (2010). The preventing recurrent vascular events and neurological worsening through intensive organized case-management (PREVENTION) trial protocol (clinicaltrials.gov identifier: NCT00931788). Implementation Science, 5, 27. doi:10.1186/1748-5908-5-27
2010	BMC Public HS	Lau et al. (2010). Evaluation of a community pharmacy-based intervention for improving patient adherence to anti-hypertensives: a randomised controlled trial. BMC Health Services Research, 10, 34.doi:10.1186/1472-6963-10-34
2010	Imp. Science	Rost, K., Marshall, D. (2010). Marketing depression care management to employers: design of a randomised controlled trial. Implementation Science, 5, 22. doi:10.1186/1748-5908-5-22
2010	Imp. Science	Garner et al. (2010).The Reinforcing Therapist Performance (RTP) experiment: Study protocol for a cluster randomised trial. Implementation Science, doi:10.1186/1748-5908-5-5
2010	BMC Public H	Johnston et al. (2010). The study protocol for a randomised controlled trial of a family-centred tobacco control program about environmental tobacco smoke (ETS) to reduce respiratory illness in Indigenous infants. BMC Public Health, 10, 114. doi:10.1186/1471-2458-10-114
2010	BMC Public H	Taylor et al. (2010). Motivational interviewing for screening and feedback and encouraging lifestyle changes to reduce relative weight in 4-8 year old children: design of the MInT study.BMC Public Health, 10, 271. doi:10.1186/1471-2458-10-271
2010	BMC Public H	Geimer et al. (2010) Use of a liquid nicotine product to promote smoking cessation, BMC Public Health, doi:10.1186/1471-2458-10-155
2010	BMC Public H	Gonseth et al. (2010). Smoking cessation, BMC Public Health, doi:10.1186/1471-2458-10-348
2010	BMC Public H	Mann et al. (2010). Diabetes screening attendance, BMC Public Health, doi:10.1186/1471-2458-10-768
2010	BMC Public H	Menza et al. (2010). Reduction in use of methamphetamine, doi:10.1186/1471-2458-10-774 BMC Public Health
2010	BMC Public H	Rosenkranz et al. (2010). Health promotion and obesity prevention including physical activity (PA) /inactivity and healthy eating (encompassing a range of behaviours) among Junior Girl Scout, BMC Public Health, doi:10.1186/1471-2458-10-81
2010	BMC Public H	Werkman et al. (2010). Physical activity and dietary intake (encompassing a range of behaviours), doi:10.1186/1471-2458-10-110 BMC Public Health
2009	BMC Public H	Buis et al.(2009). Physical activity, doi:10.1186/1471-2458-9-331 BMC Public Health
2010	BMC Public H	Bull et al. (2010). Physical activity (encompassing a range of behaviours), doi:10.1186/1471-2458-10-463 BMC Public Health
2010	BMC Public H	Claesson et al. (2010). Eating/food intake and physical activity to manage weight gain among pregnant obese women. doi:10.1186/1471-2458-10-766 BMC Public Health,

2010	BMC Public H	Storro et al. (2010). men and infants risk behaviours for allergic diseases (encompassing a range of behaviours). doi:10.1186/1471-2458-10-443 BMC Public Health
2010	BMC Public H	Ramos et al. (2010). Smoking cessation, doi:10.1186/1471-2458-10-89 BMC Public Health
2010	Imp. Science	Leon et al. (2010). HIV screening,doi:10.1186/1748-5908-5-8 Implementation Science
2010	Imp. Science	Pilling et al. (2010). Patients talking to their providers about hypertension (to change provider prescribing behaviour), doi:10.1186/1748-5908-5-23 Implementation Science
2010	BMC Public H	Bilardi et al. (2010). General Practitioners (GPs) treatment of Chlamydia (encompassing a range of behaviours), doi:10.1186/1471-2458-10-70 BMC Public Health,
2010	BMC Public H	Brousseau et al. (2010). Administration of vaccinations, doi:10.1186/1471-2458-10-750 BMC Public Health
2010	Imp. Science	Kauth et al. (2010). Therapists' skill development in, and application of, Cognitive Behavioural Therapy (CBT), doi:10.1186/1748-5908-5-75 Implementation Science
2010	Imp. Science	Kennedy et al. (2010). Target behaviour/s: creating, finding, and implementing self-care support for people with long-term health conditions (encompassing a range of behaviours) Nb. This is a service level intervention that targets the behaviours of general practitioners, nurses, practice managers, clerical and reception staff, doi:10.1186/1748-5908-5-7 Implementation Science
2010	Imp. Science	McCluskey et al. (2010). Rehabilitation therapists delivery of the 'Out-and-About Implementation Program' (encompassing a range of behaviourus), doi:10.1186/1748-5908-5-59 Implementation Science,
2010	Imp. Science	Ramsay et al. (2010). Primary care doctors' test requesting behaviour, doi:10.1186/1748-5908-5-71 Implementation Science,
2010	BMC Public HS	Cantrell et al. (2010). Provision of smoking cessation assistance by community health centres, doi:10.1186/1472-6963-10-25 BMC Health Services Research

Table 2. Mean agreement between trained coder pairs and confidence about the presence or absence of 93 BCTs in 40 intervention descriptions

BCT label BCTs ordered according to frequency of observation at Time 1	Time 1					Time 2	
	N descriptions where BCT identified by trained coders (max = 40)	*%* BCT identifications with high confidence ratings (" ++")	Range of PABAK (between trained coder pairings)	Mean PABAK (between trained coder pairs)	Mean AC1 (between trained coder pairs)	*%* BCT identifications with high confidence ratings (i.e. ++)	Mean PABAK (between trained coder pairings)
Frequently identified (16+ descriptions)							
3.1. Social support (unspecified)	36	66	-.10 to .50	.30	.69	70	.38
4.1. Instruction on how to perform behaviour	35	68	-.20 to .60	.31	.68	79	.36
3.2. Social support (practical)	34	57	.10 to .90	.51	.76	74	.53
9.1. Credible source	32	69	-.10 to .90	.40	.71	68	.43
5.3. Information about social and environmental consequences	31	68	-.10 to .90	.50	.78	76	.57
1.1. Goal setting (behaviour)	30	68	.10 to .90	.48	.79	76	.58
5.1. Information about health consequences	28	71	.10 to .80	.50	.70	80	.40
12.5. Adding objects to the environment	28	69	0 to 1.00	.57	.75	69	.49
2.2. Feedback on behaviour	26	73	0 to .80	.57	.79	76	.58
1.2. Problem solving	26	74	.30 to .90	.68	.85	76	.69
2.7. Feedback on outcome(s) of behaviour	26	62	0 to .90	.62	.82	77	.65
1.4. Action planning	25	60	.10 to 1.00	.68	.84	60	.69
7.1. Prompts/cues	24	54	.30 to 1.00	.66	.83	65	.66
2.1. Monitoring of behaviour by others without feedback	23	40	.40 to 1.00	.69	.83	49	.67
1.3. Goal setting (outcome)	21	65	.30 to .90	.61	.81	76	.61
2.3. Self-monitoring of behaviour	21	64	.30 to .90	.72	.84	68	.69
6.1. Demonstration of the behaviour	20	78	.30 to 1.00	.70	.85	80	.69
8.1. Behavioural practice/rehearsal	19	71	.50 to .90	.68	.83	89	.66
12.1. Restructuring the physical environment	17	65	.50 to 1.00	.77	.89	65	.79
2.5. Monitoring of outcome(s) of behaviour without feedback	16	56	.70 to .90	.77	.84	54	.68
1.5. Review behaviour goal(s)	16	53	.50 to 1.00	.75	.87	55	.74
1.7. Review outcome goal(s)	16	48	.50 to 1.00	.80	.88	68	.76
Occasionally identified (6-15 descriptions)							
2.4. Self-monitoring of outcome(s) of the behaviour	15	61	.50 to .90	.79	.88	65	.76
3.3. Social support (emotional)	15	62	.40 to 1.00	.85	.92	73	.85

4.2. Information about antecedents	15	43	.70 to 1.00	.87	.96	50	.93
8.3. Habit formation	14	52	.70 to 1.00	.91	.97	46	.94
11.1. Pharmacological support	13	82	.40 to 1.00	.82	.93	90	.87
6.2. Social comparison	13	75	.50 to 1.00	.76	.91	74	.83
2.6. Biofeedback	13	61	.50 to 1.00	.83	.92	72	.83
1.6. Discrepancy between current behaviour and goal	11	41	.50 to 1.00	.87	.94	64	.88
5.2. Salience of consequences	11	59	.60 to 1.00	.87	.95	64	.94
10.2. Material reward (behaviour)	10	80	.70 to 1.00	.85	.92	78	.85
13.2. Framing/reframing	9	61	0 to 1.00	.92	.95	80	.89
10.1. Material incentive (behaviour)	9	66	.40 to 1.00	.80	.94	64	.89
15.1. Verbal persuasion about capability	9	38	.70 to 1.00	.91	.96	64	.91
12.2. Restructuring the social environment	8	64	.60 to 1.00	.90	.96	64	.92
10.3. Non-specific reward	8	55	.70 to 1.00	.95	.95	67	.91
11.2. Reduce negative emotions	8	71	.60 to 1.00	.90	.95	80	.90
1.9. Commitment	7	70	.50 to 1.00	.95	.97	71	.94
10.4. Social reward	7	60	.70 to 1.00	.90	.95	59	.91
1.8. Behavioural contract	7	44	.80 to 1.00	.92	.97	65	.94
10.6. Non-specific incentive	7	33	.70 to 1.00	.94	.98	50	.96
9.2. Pros and cons	6	84	.70 to 1.00	.94	.97	74	.94
6.3. Information about other's approval	6	31	.50 to 1.00	.94	.97	54	.93
11.3. Conserving mental resources	6	25	.70 to 1.00	.96	.98	76	.97
5.6. Information about emotional consequences	6	75	.60 to 1.00	.99	.97	50	.95
8.2. Behaviour substitution	6	87	.70 to 1.00	.92	.95	73	.90
Rarely identified (5 descriptions or less)							
7.5. Remove aversive stimulus	5	29	.80 to 1.00	.97	.99	25	.98
8.6. Generalization of target behaviour	5	33	.70 to 1.00	.97	.97	42	.95
10.8. Incentive (outcome)	4	63	.80 to 1.00	.93	.98	78	.96
5.4. Monitoring of emotional consequences	4	29	.90 to 1.00	.98	.97	47	.94
15.4. Self-talk	4	25	.80 to 1.00	.98	1.00	0	.99
8.7. Graded tasks	4	0	.80 to 1.00	.98	.99	25	.98
8.4. Habit reversal	4	50	.80 to 1.00	.96	.98	60	.97
10.10. Reward (outcome)	4	62	.80 to 1.00	.96	.96	81	.91
13.1. Identification of self as role model	3	85	.80 to 1.00	.98	.98	94	.97
12.3. Avoidance/reducing exposure to cues for the behaviour	3	75	.90 to 1.00	.98	.97	57	.94
12.6. Body changes	3	38	.80 to 1.00	.97	.98	80	.97
14.10. Remove punishment	3	33	.80 to 1.00	.99	.99	25	.98

9.3. Comparative imagining of future outcomes	3	40	.80 to 1.00	.97	.98	90	.96
16.3. Vicarious consequences	3	50	.50 to 1.00	.98	.99	100	.99
7.2. Cue signaling reward	2	0	.80 to 1.00	1.00	.99	75	.98
14.5. Rewarding completion	2	50	.80 to 1.00	.96	.97	50	.95
4.3. Re-attribution	2	50	.90 to 1.00	1.00	.97	78	.94
13.4. Valued self-identity	2	14	.90 to 1.00	.98	.97	63	.95
7.3. Reduce prompts/cues	2	75	.90 to 1.00	.98	.98	71	.96
14.4. Reward approximation	2	67	.80 to 1.00	.97	.98	60	.98
16.6. Situation-specific reward	2	100	.90 to 1.00	1.00	.99	67	.98
14.2. Punishment	2	67	.90 to 1.00	.99	.99	100	.99
15.3. Focus on past-success	2	0	.90 to 1.00	1.00	.99	0	.99
7.4. Remove access to the reward	2	100	.80 to 1.00	.98	.99	100	.99
13.5. Identity associated with changed behaviour	1	33	.90 to 1.00	.99	.98	40	.97
10.5. Social incentive	1	8	.90 to 1.00	1.00	.99	100	.98
14.3. Remove reward	1	79	.90. to 1.00	.97	.99	85	.98
10.11 Future punishment	1	50	.90 to 1.00	1.00	1.00	33	.99
4.4. Behavioural experiments	1	0	.90 to 1.00	1.00	.99	50	.99
14.1. Behaviour cost	1	100	.90 to 1.00	.98	.99	50	.99
7.7. Exposure	1	40	.90 to 1.00	.98	.99	0	.98
14.9. Reduce reward frequency	1	100	.90 to 1.00	1.00	1.00	0	.99
12.4. Distraction	1	100	.90 to 1.00	1.00	1.00	0	.99
8.5. Overcorrection	-	-	-	-		100	.98
13.3. Incompatible beliefs	-	-	-	-		50	.99
Not identified							
7.8. Associative learning	-	-	-	-		-	-
14.8. Reward alternative behaviour	-	-	-	-		-	-
16.1. Imaginary punishment	-	-	-	-		-	-
11.4. Paradoxical instructions	-	-	-	-		-	-
7.6. Satiation	-	-	-	-		-	-
15.2. Mental rehearsal of successful performance	-	-	-	-		-	-
14.7. Reward incompatible behaviour	-	-	-	-		-	-
10.7. Self-incentive	-	-	-	-		-	-
10.9. Self-reward	-	-	-	-		-	-
5.5. Anticipated regret	-	-	-	-		-	-
16.2. Imaginary reward	-	-	-	-		-	-

Table 3. Trained coder agreement with taxonomy developers about BCTs present in 40 intervention descriptions

BCTs ordered according to frequency of observation by taxonomy developers	***N* descriptions where BCT identified by taxonomy developers (max = 40)**	**Mean PABAK (between taxonomy developer pairs)**	**Mean PABAK (between trained coder pairs; Time 1)**	***%* BCT identifications with high confidence ratings by trained coders (" ++")**	**Mean PABAK (between trained coders and resolved taxonomy-developer Identifications)**
1.2. Problem solving	12	.75	.68	74	.74
9.1. Credible source	11	.60	.40	69	.49
2.3. Self-monitoring of behaviour	10	.75	.72	64	.71
8.1. Behavioural practice/rehearsal	9	.70	.68	71	.73
1.3. Goal setting (outcome)	7	.85	.61	65	.64
11.1. Pharmacological support	7	.85	.82	82	.83
6.1. Demonstration of the behaviour	7	.75	.70	78	.70
6.2. Social comparison	6	.90	.76	75	.80
3.2. Social support (practical)	5	.70	.57	57	.62
1.5. Review behaviour goal(s)	5	.75	.75	53	.68
12.1. Restructuring the physical environment	4	.85	.77	69	.79
10.2. Material reward (behaviour)	4	.85	.85	80	.83
10.1. Material incentive (behaviour)	4	.80	.80	66	.82
2.5. Monitoring of outcome(s) of behaviour without feedback	4	.70	.77	40	.77
7.1. Prompts/cues	3	.70	.66	54	.70

Coding Exercise

2012

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Description 1

Target behaviour/s: Physical activity

Target population/s: Participants

NERS consists of a series of motivational interviewing (MI) consultations with an EP based in a community sports centre and access to a tailored, subsidised 16 week activity programme. To be eligible for NERS, participants must be sedentary (defined as not moderately active for 3 or more times per week or deconditioned through age or inactivity), and have at least one medical condition, covering CHD risk factors, mental health, musculoskeletal, respiratory/pulmonary and neurological conditions. The primary aim of NERS is for participants to achieve 30 minutes of moderate physical activity on at least 5 days per week. Common features of the scheme are detailed below.

Delivery of the Welsh national exercise referral scheme:

16 week programme of exercise supervised by a qualified EP

• Initial face to face consultation with EP on entry - lifestyle questionnaire, health check (resting heart rate, blood pressure, BMI, and waist circumference), introduction to facilities, MI and goal setting

• Access to one to one exercise instruction and/or group exercise classes

• Discounted rate for exercise activities £1 per session.

• Four week telephone consultation with EP – review of goals and MI

• Sixteen week face to face consultation with EP - review of goals, MI, health check, lifestyle questionnaire, service evaluation questionnaire and signposted to exit routes

Post 16 week activities

• Range and cost of exit routes dependent on area

• 8 months contact by phone to check progress

• 12 months face to face review including Chester fitness step test.

Consultations occur at entry, 4 weeks (by phone) and 16 weeks. Following this, participants are contacted by telephone at 8 months to monitor progress and at 12 months they are invited to attend a review session. Routine programme monitoring systems are maintained by EPs and capture the dates of and records from initial, 4 and 16 week and 8 and 12 month consultations

Feedback (optional)

Description 2

Target behaviour/s: Management of children's healthy eating and physical activity (encompassing a range of behaviours)

Target population/s: Parents

The Intervention The MEND 2-4 program involves 10 weekly 90 minute workshops relating to general nutrition, and physical activity behaviours, that are typically held at community health and maternal and child health centres, where parents and their preschool-aged children attend together. Each program group will consist of 6-10 child-parent dyads and a MEND 2-4 trained program leader. Program leaders, who are trained extensively by MEND Australia prior to starting with a group, will be monitored and evaluated by MEND Australia staff to ensure their practice is in accordance with MEND 2-4 guidelines; parental feedback on program leaders will also be obtained. Each session involves 30 minutes of guided active play, where parents can learn how to play with their children; 15 minutes of healthy snack time based on an evidence-based exposure-based technique to promote acceptance and increased intake of fruit and vegetables and 45 minutes where the children participate in supervised crèche-style, creative play activities. Concurrently the parents attend an interactive education and skill development session, based on evidence-based group-based parent-training principles. Table 1 outlines the weekly education topics, and parents will receive handouts on these topics weekly. Pilot data reveals low attrition and that parents value the program and attend all 10 sessions. In the initial MEND 2-4 trials (UK) the participation rate was 87.6% which is high for developmental research.

Week	Workshop Title	Discussion Topic(s)	Intervention Content
1	**Welcome & introduction**	Meet the leader and pre-program measurements	Meet and welcome the families to their first MEND 2-4 physical activity and snack-time session; parents complete all pre-program forms and questionnaires and accurate child and parent anthropometric measurements (height and weight) taken.
2	**Introduction**	Introductions and individual expectations	Discussion of individual expectations and introduction of MEND 2-4 program and practicalities; Introduction of parents/carers to the behavioural model of parenting (customised as the 4Cs model (Causes, Consequences, Consistency and Copying) for the purposes of MEND 2-4).
3	**Healthy eating for families**	Healthy eating	Introduction to the five food groups, visual samples of excess sugar and fat found in foods. Discussion of appropriate treats and rewards and toddler intake of drinks.
4	**Be healthy, get active!**	Non-TV activities for toddlers	Importance of limiting TV watching among toddlers; Goal setting activity towards achievement of MEND 2-4 TV time guidelines (maximum of 1-2 hours of TV per day). Discussion of active play and activity ideas to replace time spent previously watching TV.

Week	Workshop Title	Discussion Topic(s)	Intervention Content
5	**What's in your child's food?**	Reading food labels	Reading food labels; MEND 2-4 label reading guidelines and identification of MEND 2-4 friendly food.
6	**Food without fuss**	Dealing with fussy eaters	Normalisation of fussy eating and common causes; importance of consistency around mealtimes and ideas for managing fussy eating behaviour. Strategies to reduce fear and unhelpful parenting behaviour around food at mealtimes.
7	**Portion sizes**	Healthy eating and portion sizes	Introduction to the MEND 2-4 portion sizes with visual demonstration; demonstration of difference between toddler and adult portion sizes.
8	**Fun with food**	Cooking together	Demonstration of ideas for making food preparation fun and including fruits and vegetables, how to actively involve children in preparation of snacks and parents/carers and child having fun with food together.
9	**Encouraging healthy habits**	Rules, routines and tantrum management	Establishing health as a priority within the family life-cycle. Helpful strategies for dealing with behaviours that may

Week	Workshop Title	Discussion Topic(s)	Intervention Content
			be resistant to change. MEND 2-4 sleep guidelines for toddlers.
10	**Farewell and graduation**	Evaluation and measurement	Collection of post-program measurements; MEND 2-4 certificates provided; information about follow-up activities or other local groups they may like to attend at the end of the MEND 2-4 Program.

Feedback (optional)

Description 3

Target behaviour/s: Management of 3-5-year old children's fruit and vegetable intake (encompassing a range of behaviours)

Target population/s: Parents

Intervention content

The telephone intervention script is designed to help parents modify their home food environments through addressing three key domains listed in Table 1. The first column of the table lists each domain at the point at which it appears in the schedule of support calls, while the second column lists the specific topics that are used to explore each of the given domains. Each domain has been associated with increased fruit and vegetable consumption in children as described below.

Table 1

Overview of intervention call content: behaviour change techniques and their application

Key Theme	Content	Behaviour Change Technique	Application of Behaviour Change Technique
WEEK 1 Availability and Accessibility	Dietary recommendations and serving sizes		
	Children's food diary	Prompt self-monitoring of behaviour	Parents are asked to monitor their children's intake of fruit, and vegetables over 3 days.
	Ways to provide fruit and vegetables throughout the day		
	Setting goals	Prompt specific goal-setting	Parents are encouraged to set a program goal.
WEEK 2			
Availability and Accessibility, Supportive Family Eating Routines	Changing the family routine	Prompt intention formation	Parents decide which activities they will attempt in the coming week.
	Availability and accessibility of foods in the home	Provide general encouragement	Interviewers provide positive feedback about any helpful practices occurring in the home.
	Mealtime practices	Teach to use prompts or cues	Parents learn the HELPS acronym, i.e. try to eat when Hungry, not attempting anything else at the same time (focus on Eating), at an

			appropriate Location to eat, from a Plate, and while Sitting.
	Meal planning		
	Review of goals	Prompt review of behavioural goals	Parents review the goals they set during the previous calls and evaluate their progress.
WEEK 3			
Parental role-modelling, Supportive Family Eating Routines	The Ps and Cs division of feeding responsibility	Teach to use prompts or cues	Parents learn the Ps and Cs: Parents are encouraged to Plan, Prepare and Provide. Children are encouraged to Choose (whether, what and how much to eat).
	Mealtime strategies to encourage vegetable consumption	Prompt intention formation	Parents decide which activities they will attempt in the coming week.
		Provide general encouragement	Interviewers provide positive feedback about any helpful practices occurring in the home.
	Role-modelling of fruit and vegetable consumption	Prompt identification as a role model	Parents are provided information about their importance in role-modelling fruit and vegetable consumption. Their consumption is compared with national nutrition recommendations. Tailored feedback is provided.

WEEK 4 Availability and Accessibility Parental role-modelling, Supportive Family Eating Routines	Review of weeks 1-3	Provide general encouragement	Interviewers provide positive feedback about any helpful practices occurring in the home
	Planning for the future and dealing with difficult situations	Prompt barrier identification	Parents are encouraged to identify barriers that will prevent them implementing what they have learnt and to generate solutions.
	Review of goals	Prompt review of behavioural goals	Parents review their program goal, evaluate their progress and identify how they can maintain the change

a) Availability and accessibility of fruit and vegetables

The telephone intervention encourages parents to ensure that fruit and vegetables are available and accessible in the home and that they are prepared, presented or maintained in a ready-to-eat form that encourages their consumption. This could include offering cut-up pieces of fruit or vegetable at snack times, and ensuring fruit is visible by storing it in fruit bowls.

b) Supportive family eating routines

The intervention will seek to improve parent knowledge and facilitate the acquisition of skills to support parents to eat meals as a family without the television on, establish and enforce family rules about eating and develop boundaries regarding when and how food is offered to their children.

c) Parental role-modelling of fruit and vegetable consumption

Parents will be encouraged to increase the number of serves of fruit and vegetables that they consume in front of their children and to express supportive attitudes toward the consumption of fruit and vegetables to their children, for example, by making positive and encouraging comments.

Participants will also be asked to undertake homework activities to encourage them to apply, directly into their home environment, the strategies and information covered in the telephone calls. Incorporating homework assignments into health behaviour interventions has been found to increase the size of the intervention effect. Homework activities will be optional and tailored to the needs of the participant, based on recommended home food environment practices not currently undertaken by the participant.

Intervention resources

Based on evidence indicating telephone-based dietary interventions are more effective when used in conjunction with print and other resources, all intervention participants will be mailed resource kits following completion of the baseline survey. The kit comprises a participant workbook containing information and activities, a pad of meal planners, and a cookbook including recipes high in fruit and vegetables. The resources will be used to facilitate participant engagement in the telephone support calls and assist participants to complete intervention activities between telephone contacts.

Conceptual model

The telephone-based intervention accords with the model of family-based intervention proposed by Golan and colleagues in the treatment and prevention of childhood obesity. Their model, which draws upon socioecological theory, focuses on introducing new familial norms associated with healthy eating. This is achieved through making changes within the home food environment, providing positive parental role-modelling and increasing parenting- and nutrition-related knowledge and skills. Interventions based on such a model have been shown to be effective in bringing about environmental changes in participants' homes to support healthy eating and in reducing poor eating habits of overweight and obese children of participants.

The intervention utilises a number of specific behaviour change techniques to initiate the change process as described in Table 1. The third column lists the behaviour change techniques used and the fourth column links each technique to its application in the context of the topic listed in column 2. These behaviour change techniques include prompting intention formation, barrier identification, specific goal-setting and the reviewing of such goals, self-monitoring of behaviour and identification as a role-model, teaching to use prompts or cues, and providing general encouragement, as described in the taxonomy proposed by Abraham and Michie.

Feedback (optional)

Description 4

Target behaviour/s : Management of discrete child problem behaviours (specific behaviours unspecified)

Target population/s: Parents

Intervention

The intervention to be evaluated is Triple P level 3. Triple P is a multilevel system of family intervention which provides five levels of intervention of increasing strength. Triple P intervention at level 3 (Primary Care Triple P) is a brief, narrow-focus parent programme that is aimed at parents with specific concerns about their child's behaviour or development. It combines advice, rehearsal and self-evaluation to teach parents to manage discrete child problem behaviour during four individual consultations of 20-30 minutes with the parents and their child (Table 1).

Table 1

Overview of Triple P level 3 session content

Session	Contents	Duration
1. Assessment of the presenting problem	Intake interview	15 - 30 minutes
	Options for intervention	
	Keeping track of the children's behaviour	

2. Developing a parenting plan	Feedback of assessment results	15 - 30 minutes
	Causes of child behaviour problems	
	Goals for change	
	Parenting plan (with active skills training)	
3. Review of implementation	Update on progress	15 - 30 minutes
	Refining parenting plan (with active skills training)	
	Identifying and overcoming obstacles	
	Other issues	
4. Follow-up	Update on progress	15 - 30 minutes
	Maintaining progress made	
	Other issues	

Feedback (optional)

Description 5

Target behaviour/s: Health related behaviours including physical activity and dietary intake

(encompassing a range of behaviours)

Target population/s: Participants

Intervention - Lifestyle Modification Program

The five aims of the lifestyle modifications are:

1) At least 30 min/day of moderate to vigorous intensity physical activity, including aerobic exercise 3 or more days/week plus strength training at least twice/week (210 min/week total structured exercise)

2) Reduction in the intake of energy from total fat to less than 30%

3) Reduction in the intake of energy from saturated fat to less than 10%

4) Fibre intake of at least 15 g/1000 kcal

5) Achievement of a 5% reduction in body weight at 12 months.

In addition to the 210 min/week structured exercise goal, participants are encouraged to increase incidental physical activity in ways which would enhance both cardiovascular and musculoskeletal fitness.

These five goals are entirely concordant with the Finnish DPS which was one of the most successful diabetes prevention trials. The physical activity goal, which has been modified slightly from the Finnish DPS is based on a review of the physical activity prescriptions utilised in relation to outcomes achieved in all of the successful trials of diabetes prevention, considerations of cost

and feasibility in this translational setting, as well as other literature regarding modality, volume, and intensity of exercise required to improve metabolic risk and body composition in similar cohorts. Both the Finnish DPS and the US DPP included resistance training (strength training) in their supervised exercise sessions and is explicitly specified within the physical activity goal of the SDPP. Resistance training is an anabolic form of exercise, differing substantially from aerobic exercise in its ability to induce muscle hypertrophy and associated metabolic and functional changes. It improves insulin sensitivity, glucose homeostasis, blood pressure, dyslipidaemia, markers of inflammation and catabolism, and visceral obesity, thus addressing the key metabolic abnormalities in adults at high risk of type 2 diabetes. Importantly, resistance training (but not aerobic exercise) attenuates or prevents the loss of lean tissue (muscle and bone) accompanying weight loss diets such as those prescribed in this study.

The behavioural components are based on stages of change and social cognitive theories. The intervention is delivered by dedicated program lifestyle officers from a variety of health backgrounds including dietetics, nursing, psychology and exercise physiology. The lifestyle officers undergo specific training in health coaching, group program delivery and standardized data collection used for evaluation. The health coaching approach incorporates principles from self-management, removing psychological blocks to change and confidence.

High risk individuals agreeing to participate in the lifestyle modification program complete an initial computer assisted telephone interview (CATI) survey. This survey includes socio-economic and demographic information, physical activity habits, quality of life, and self-efficacy, as well as recent health service utilisation and current medication use. Participants are then scheduled to attend an individual consultation with a lifestyle officer. At this consultation, the lifestyle officers measure height, weight and waist circumference using calibrated stadiometers, scales and tape measures, following a standardized anthropometric protocol as specified by the International Society for the Advancement of Kinanthropometry (ISAK). The individual consultation includes a general discussion about diabetes risk and prevention, an overview of the program, and uses motivational interviewing techniques to assist participants to set goals and develop tools to self-monitor. Following this session, arrangements are made for participants to attend three two-hour group programs held over a six to eight week period. Lifestyle officers conduct these group sessions of approximately 10 people, which cover theoretical, behavioural and practical aspects of diet and physical activity. The overall program motto is: "Eat better and move more". Those who are not able to or do not want to attend a group program are offered the option of three individual health coaching sessions by telephone, covering the same material. The intervention delivered to indigenous participants will be slightly modified to take account of cultural issues.

Follow up telephone calls are made by the lifestyle officers to each participant at 3, 6 and 9 months to enquire about progress, assist with behaviour change and offer participants additional support as required. In addition, participants are provided with details of local community-based

lifestyle programs which have been evaluated by the research staff and found to be consistent with the goals of the SDPP. Participants have the option of enrolling in such programs as one way to assist in achieving the SDPP physical activity and dietary goals.

At 12 months the CATI survey is repeated and participants undergo an individual assessment with the lifestyle officer and their general practitioner.

Feedback (optional)

Description 6

Target behaviour/s: Smoking cessation

Target population/s: Family members and caregivers

• **Treatment group**:

The intervention program will (i) provide information and education about the health effects of ETS exposure and use behavioural 'coaching' techniques to help mothers/caregivers and family members implement strategies to reduce the infant's ETS exposure, as well as (ii) identify the smokers among other household members and deliver culturally appropriate smoking cessation advice, counseling and treatment options as requested. An eight weeks supply of free nicotine replacement therapy (NRT) (patches or gum) will be available to participants and other household members for whom such drug therapy is indicated (i.e. they are motivated to quit, are nicotine dependent and have no contraindications to taking NRT). NRT will be provided by the IHW with appropriate counseling and follow-up. Furthermore, for those that are interested a fax referral to Quitline will be offered, with proactive call back by Quitline.

The intervention program will be delivered during three face-to-face home visits (of approximately 45-60 minutes) conducted over the first three months of the infant's life. Culturally appropriate resources (e.g. flip charts, 'No Smoking' stickers, posters, etc.) will be used to assist in both education and behavioural 'coaching'. These resources will be obtained from relevant health groups in each country who hold a repository of such resources (e.g. QUIT Victoria, the Northern Territory Department of Health and Families, Auckland Regional Public

Health Service). IHWs will deliver the program after appropriate training, and will complete standardized progress reports after each program session, which will be used at a weekly team meeting with the health workers and study personnel for discussion and ongoing training.

Feedback (optional)

Description 7

Target behaviour/s: Health behaviours including dietary intake, physical activity/inactivity,

and parenting behaviour to help reduce weight in in 4-8 year old children (encompassing a range of behaviours)

Target population/s: Family members

Phase 2: Treatment

Tailored Package group -- treatment phase

The *Tailored package* is modelled in part on our successful HEAT study and from the literature and is designed to be suitable for incorporation into primary care. Three main areas of interest will be assessed and targeted; dietary intake, physical activity/inactivity, and parenting/behaviour (Table 1). In the *Tailored Package* condition, parents will attend one session with a multi-disciplinary team (consultant session) then all further contact will be with their MInT mentor.

Table 1

Goals and target behaviours of interest.

Diet	Behaviour management
Making water the main drink	Stress management for parents
Eating more fruit and vegetables	Using attention and effective commands
Changing fast food choices	Using ground rules and rewards
Healthy snacks	Discipline and consequences
Appropriate portion size	Developing action plans
Family meals	

Physical activity/inactivity	Other
Motivating kids to be active	Helping children sleep
Reducing screen time	
Increasing moderate/vigorous activity	
Increasing family activity	

Consultant session

Information obtained from the screening, follow-up and baseline assessments (family structure, economic situation, dietary intake, physical activity, child behaviour, motivation, parental weight, parenting) will be used by the clinical psychologist to develop a formulation that is specific for each family. This formulation will provide an explanation of factors that may have contributed to the development of the child's weight, and may be maintaining the situation, as well as identifying strengths and resources in the family. The family will then meet with the "expert" team, consisting of the clinical psychologist, a dietitian, an exercise specialist and the MInT mentor to discuss and modify the formulation as appropriate and to reflect on the implications of this for possible goals for change. The main objective of this session is to assist the family in developing an understanding of their current situation, and to collaboratively identify areas in

which they may wish to make changes in. Once the goals have been identified, the session will focus on developing an individualized plan for each family consisting of strategies that they can use to achieve the goals they have identified.

Mentor sessions – timing

The MInT mentor will then become the main contact for each family. To aid in establishing new routines during the first phase of the treatment period (4 months) the mentor will contact the family each week, using an alternating but flexible schedule of in-person consultations and telephone calls. Frequency of contact will be gradually reduced over the subsequent 20 months of the intervention (fortnightly for months 5-8, monthly for months 9-12, and 3-monthly for months 13-24).

Mentor sessions – structure

During the sessions the mentor will assess progress with each goal since last contact, problem-solve with the family any difficulties arising, and negotiate goals for the next session. Each family will receive a different package of resources over time depending on identified need and there is some scope for resources to be tailored to individual families. Across the period of intervention the mentor may also (in consultation with the expert team) facilitate the introduction of new behavioural goals. The intervention will be conducted in the "spirit" of MI, taking a client-centred collaborative approach, which has been identified as just as important as the specific techniques, by adhering to the four general principles of expressing empathy, supporting self-efficacy, rolling with resistance and developing discrepancy. MI will be used as required through the life of the intervention, in consultation with the supervisors, when motivation and/or engagement is waning, and when at the transition from one target behaviour to the next (where multiple goals have been identified)

Feedback (optional)

Description 8

Target behaviour/s: Medication use/adherence

Target population/s: Patients

Study procedures

Intervention group

Medication review

The medication of patients in the intervention group will be reviewed by the community pharmacist using the full record of prescription only drugs which were dispensed by the patients' pharmacy and the patients medication evaluation profile. This profile shows when the patient has obtained his medication from the pharmacy. The GP will be consulted by telephone for details about indications for drugs and results from laboratory tests. When prescribed by a medical specialist, details about the indication for the drug will be obtained from the specialist, who will be consulted by the community pharmacist. The National guidelines for treatment of diseases will be used by community pharmacists as a method for performing medication review.

The Pharmaceutical care network Europe DRP-score form will be used to record drug problems. Each drug will be evaluated on adverse reactions, drug choice problems, dosing problems, drug use problems, drug-interactions or other problems. Causes for drug related problems will be assessed and interventions will be made. During the medication review the patient will be involved as a full partner. Any changes made will be communicated with the patient. This method for medication review will be pilot tested before use.

The occurrence of drug related problems will be discussed with the GP. The result may be an adaptation of the drug regimen. The medication review will take 10-30 minutes per patient and will depend on the complexity of the medication regimen and problems detected.

Cognitive behaviour treatment

Patients randomised to the intervention group will also receive cognitive behaviour treatment (CBT) at baseline and 1, 3, 6, 9 and 12 months by a pharmacy technician, with help of a structured interview protocol and with use of communication and motivational interviewing skills at home or in the pharmacy. The first session will be within one week of inclusion in order not to delay participant program admission. During these sessions the result of the medication review will be discussed with the patient. The patient will be informed about the effects, side effects and use of the drugs. Patients will be counselled according to the motivational interviewing principle to

sustain or improve their drug adherence. The patients understanding of his or hers condition and its treatment are considered when appropriate. If possible, home supplies of drugs are checked and rationalised at each visit. All patients receive a written outline of their drug regimen. Cancelled and redundant drugs are taken in. During the session over the counter remedies will be included in the medication review. All sessions are done by pharmacist technicians with help of a structured protocol. The patient visit will take 30-60 minutes.

Feedback (optional)

Description 9

Target behaviour/s: Healthy eating and physical activity for weight loss (encompassing a range of behaviours)

Target population/s: Patients

Intervention

The TECNOB clinical program has a total duration of 13 months and consists of two stepped down phases: inpatient (1 month) and out-patient (the following 12months). During the in-patient phase, participants undergo an intensive four-week hospital-based and medically-managed program for weight reduction and rehabilitation. Along this period, participants live in a medical hospital-like environment located on a mountain highland and far away from towns and cities. Visits from parents are allowed only in the afternoon. All patients are placed on a hypocaloric nutritionally balanced diet tailored to the individual after consultation with a dietitian (energy intake around 80% of the basal energy expenditure estimated according to the Harris-Benedict equation and a macronutrient composition of about 16% proteins, 25% fat and 59% carbohydrates). Furthermore, they receive nutritional counseling provided by a dietitian, psychological counseling provided by a clinical psychologist and have physical activity training provided by a physiotherapist.

Nutritional rehabilitation program aims to improve and promote change in eating habits and consists of both individual sessions (dietary assessment, evaluation of nutrient intake and

adequacy, nutritional status, anthropometric, eating patterns, history of overweight, readiness to adopt change) and group sessions (45 minutes each twice a week) including: information on obesity and related health risks, setting of realistic goals for weight loss, healthy eating in general, general nutrition and core food groups, weight management and behavior change strategies for preventing relapse).

Psychological counseling is provided once a week both individually and in group setting. Individual sessions, lasting 45 minutes each, are mainly based on the cognitive-behavioral approach described by Cooper and Fairburn and emphasize the techniques of self-monitoring, goal setting, time management, prompting and cueing, problem solving, cognitive restructuring, stress management and relapse prevention. Group sessions ("closed" groups of 5/6 persons), lasting 1 hour each, focus on issues such as motivation, assertiveness, self-esteem, self-efficacy and coping.

Physical activity takes place once a day except for weekend and consists of group programs (20 subjects) based on postural gymnastics, aerobic activity and walks in the open. Inpatients with specific orthopedic complications carry out individual activities planned by physiotherapists and articulated in programs of physical therapy, assisted passive and active mobilization and isokinetic exercise.

Low to moderate weight losses are expected at the end of the in-patient phase, but it is important to note that weight loss is not the primary goal of the in-patient program and each patient is made clear about this point at the very beginning of the treatment. Beyond the medical management of metabolic risk factors for health such as type 2 diabetes, developing a sense of autonomy and competence are the primary purposes of the in-hospital interventions. Patients are afforded the skills and tools for change and are supported in assigning positive values to healthy behaviors and also in aligning them with personal values and lifestyle patterns.

In the last week, just before discharge from hospital, participants are instructed for the out-patient phase of the program. They receive a multisensory armband (SenseWear® Pro2 Armband), an electronic tool that enables automated monitoring of total energy expenditure (calories burned), active energy expenditure, physical activity duration and levels (METs) and sleep/wake states duration. Patients are instructed to wear this device on the back of the upper arm and to record data for 36 hours every two weeks in a free-living context. The Armband holds up to 12 days of continuous data which the outpatients are instructed to download into their personal computer and to transmit online to a web-site specifically designed for data storing. Outpatients are also told that they can review their progress using the InnerView ® Software which analyzes and organizes data into graphs and reports. Participants are then instructed to use the TECNOB platform, an interactive web-site developed by TELBIOS S.P.A.. The TECNOB web-platform supports several functions and delivers many utilities, such as questionnaires, an animated food record diary, an agenda and a videoconference virtual room. In the "questionnaires" section, patients fill in the Outcome Questionnaire and submit data concerning weight and glycated hemoglobin. In the "food record diary" participants submit actual food intake day by day through the selection of food images from a comprehensive visual database provided by METEDA S.P.A. The same procedure is also possible through a software program called METADIETA (Meteda s.p.a.) previously installed on the outpatients' mobile phones before

discharge. Through the mobile phones outpatients maintain the contact with the dietitian who regularly sends them SMS containing syntax codes that METADIETA, the software previously installed into the outpatients' mobile phones, uses in order to visually display the food choices (frequency and portions) outpatients have to adhere according to diet prescriptions. By this way, outpatients can keep a food record diary allowing comparisons between current eating and the recommended hypocaloric diet along the whole duration of the program. The "agenda" allows the patients to remember the videoconference appointments with the clinicians and the days when to fill in the questionnaires. Moreover, the patients can use the "memo" space to note down any important event occurred to him/her in the previous week/month. Indeed, some research indicates that changes in behavior (eating and exercise) often follow discrete moments which have been variably described as life events, life crises, teachable moments or epiphanies. Life events can lead to weight loss but also to weight gain and qualitative research shows that it is not the event per se that results in behavior change but the ways in which this event is appraised and interpreted by the individual. The clinical psychologist has thus the opportunity to discuss with the outpatients about the significant events reported in the "memo" space during the videoconference sessions and cognitively reconstruct dysfunctional appraisals in functional ways. Finally, outpatients are instructed to use the videoconference tool. Thanks to this medium, they receive nutritional and cognitive-behavioral tele-counseling with the dietitian and the clinical psychologist who attended the patients inside the hospital. In particular, just after discharge, participants have 6 videoconference contacts with both clinicians along 3 months. From the 3rd to the 6th month sessions are scheduled every 30 days and then even more spaced up to an interval of 60 days. During tele-sessions, clinicians (psychologist and dietitian) test the outpatients' progress, their mood, the maintenance of the "good alimentary and physical activity habits", the loss/increase of weight and ask about critical moments, especially those ones reported on the "memo" web-space. In particular, tele-sessions with the clinical psychologist aim to consolidate strategies and abilities acquired during the in-patient phase, to improve self-esteem and self-efficacy, to support motivation, to prevent relapse and to provide problem-solving and crisis counseling. On the other hand, dietitian assesses adherence and compliance to dietary therapy with a special focus on normal eating behavior, sufficient fluid intake, hunger and fullness regulation, appropriate eating/etiquette (pace and timing of meals), slow rate of eating, and addresses critical points such as plateau in weight loss or lack of readiness to improve dietary habits.

In addition to videoconference, outpatients can further contact clinicians by e-mail. Indeed, each patient is given the possibility to join his clinician beyond the established videoconference contacts in case of urgency or emergency. According to the e-message's content, clinicians choose the most appropriate format for delivering feedback among e-mail or telephone. In order to avoid excessive dependence and to contain costs, a maximum number of 1 non-scheduled contact per week is established a priori.

As described, in the outpatient phase of the TECNOB program great relevance is given to the clinicians-patient relationship as an important medium and vehicle of change. After discharge, out-patients begin to experience the autonomy and competence to change they develop during the in-patient phase and inevitably face resistances and barriers. Thanks to videoconferences, out-patients are supported by the clinicians who attended them during the in-hospital phase in

exploring resistances and barriers they experience and in finding functional pathways to cope. Furthermore, out-patients are helped to experience mastery in terms of the health behavior change that needs to be engaged.

Feedback (optional)

Description 10

Target behaviour/s: Consumption of oral nutritional supplements and food intake

Target population/s: Patients

Nutritional intervention

The nutritional intervention is a combination of dietetic counseling and oral nutritional supplements for three months. The intervention starts during hospital admission and continues after discharge during the stay at the rehabilitation clinic or at the patient's home. During hospitalization, the study dietician visits the patient twice. At the first visit, two to five days after surgery and immediately after baseline measurements, the dietician interviews the patient regarding medical and social status, and pre-fracture mobility. The dietician also performs a 24-hour recall and takes a general dietary history of the patients' diet before hospitalization. Next, the patient receives the nutritional supplement, a milk-based supplement providing 21 kJ (500 kcal) and 40 g of protein. The dietician advises the patient on the consumption of the supplement and arranges extra care or services to optimize the food intake if necessary. Before hospital discharge, the dietician visits the patient for the second time. During this visit, a 24-hour recall is performed and the consumption of the nutritional supplement is evaluated. Furthermore, arrangements are made to continue the dietetic advice and the consumption of the nutritional supplement at home or during the stay at the rehabilitation clinic. At home or during the stay in a rehabilitation clinic, the dietician visits the patient three times (one week, two weeks and six weeks after discharge) and makes five telephone calls with the patient (three, four, five, eight and ten weeks after discharge). During these visits, food intake and supplement use is assessed by a 24-hour dietary recall, and tailor-made dietetic advice is given to optimize the amount and composition of the diet. As soon as the patient meets nutritional requirements with a normal

diet, the use of the nutritional supplement is stopped. Compliance with the nutritional supplement is evaluated by the 24-hour dietary recalls, patients' registration of the consumption in a diary and by collecting the capsules of the cans of the nutritional supplement during the home visits.

Feedback (optional)

Description 11

Target behaviour/s: Smoking cessation

Target population/s: Patients

The Intervention and its key components

FIVE STEPS TO QUIT - The Intervention Model: This is based on the evidence-based recommendations for treatment of tobacco addiction published by WHO in 2001. The same approach is being advocated by IUATLD, National US guidelines and NICE in the UK. This model relies on assessing personal motivation to quit tobacco use and uses it as the basis for assessing suitability for the different therapeutic options for tobacco dependence. Thus, the approach maximizes the efficient use of nicotine replacement therapy (NRT) and bupropion.

Key Components: We would like to develop components of the "Five Steps to Quit" intervention model on the basis of the following principles:

• Based on best available evidence and following an approach recommended by international agencies such as WHO and IUATLD.

• Can be delivered in primary care setting by non-specialist health care staff (doctors or other non-medical personnel) integrated in their routine healthcare provision.

The intervention model consists of five key steps

1. Asking about the status of nicotine use;

2. Advising about the benefits of stopping nicotine use;

3. Assessing the motivation to stop its use;

4. Assisting in stop attempts through various therapeutic options; and

5. Arranging follow-up

Examples of the specific components for each step of the intervention are given in Appendix 1; this is a general guide only and modifications will be made during the development of the intervention.

Delivery of the intervention

We propose to use a systematic, standardised approach to deliver 'five steps to quit' to make it effective and equitable. It is envisaged that the intervention will be primary delivered by the TB DOTS facilitator based in the diagnostic centre with the help and under the supervision of the primary care doctor (Table 1). He will assess patients' eligibility for the study and send them to the TB DOTS facilitator for further assessment. All eligible patients will be provided with verbal and written information about the study and invited to participate. Patients who agree to take part will be taken through different components of the 'five steps to quit' programme in two appointments. Patients in intervention arm 1 will also be offered therapeutic option (Bupropion) and such patients will be referred to the primary care doctor for assessing suitability and prescribing Bupropion.

Table 1

Follow up and contacts with health professionals

Trial arms	First contact	FU at week 1	FU at week 5	FU at week 8	FU at week 25

Intervention 1 (brief psychological intervention + therapeutics)	Assess eligibility at the laboratory	TB DOTS facilitator	TB DOTS facilitator	TB DOTS facilitator	TB DOTS facilitator
	TB DOTS facilitator	Doctor	Doctor (if necessary)		
	Doctor				
Intervention 2 (brief psychological intervention only)	Recruitment at the laboratory	TB DOTS facilitator	TB DOTS facilitator		TB DOTS facilitator
	TB DOTS facilitator				

In the intervention arm 1, the primary care doctors, in addition to supervising TB DOTS facilitators, will be responsible for assessing and prescribing therapeutics (Bupropion) to patients who wish to quit and are being referred by the TB DOTS facilitators. All patients on treatment will have an additional follow up visit at week 8. In intervention arm 2, doctors will be only responsible for supervising TB DOTS facilitators. They will be provided with the appropriate training and relevant materials.

Apart from the relevant training and materials, health professionals will not be provided with any other incentive, financial or otherwise. However, treatments packs will be provided from the research budget. The research officer will also organise regular supervisory visits to oversee patient management and data collection procedures. Monthly cluster meetings of the health professionals involved will also be organised to discuss progress and potential problems.

Appendix 1

Steps of care	Objective	Key components	Components (examples)
1. Ask	To assess current status of nicotine use and record	Use of simple questions to ask about the form, quantities and duration of nicotine use	Tobacco use questionnaire/register
2. Advise	To provide evidence based advice to patients on the benefits of stopping nicotine use	Health professional explaining these benefits using patient education materials	A glossy desktop tool helping health professionals in explaining the benefits of quitting and an educational leaflets for patient to keep with professional's signature once the advice has been given
3. Assess	To assess the motivation to stop smoking (as well as dependence)	Health professional asking simple questions to assess patient's desire to quit	A simple scoring card for health professionals to assess this motivation. Fagerström Test for Nicotine Dependence or Hooked on Nicotine Checklist can be adapted
4. Assist	To offer a range of treatment options who wish to quit	Brief counseling, nicotine replacement therapy or bupropion*	A desk-guide explaining different treatment options e.g. full seven week course of bupropion i.e. six tablet 150 mg for six days first and then 150mg tablet twice a day for the next six weeks.
5. Arrange	To arrange a follow up to review smoking status and therapeutic options	Follow up visits arranged at regular intervals	For patients on TB treatment; during the treatment at week 1; during the treatment at week 5, on completion of the treatment at week 8; and after the treatment at week 25.

Feedback (optional)

Description 12

Target behaviour/s: Medication use/adherence to help prevent cardiovascular disease (CVD)

Target population/s: Patients

Intervention part two: community pharmacist facilitating patient change

Community pharmacists will be trained to deliver their interventions in accordance with the Health Action Process Approach (HAPA) to behaviour change over five counselling sessions conducted at monthly intervals. The emphasis in counselling progresses from change motivation initially (via improved self-efficacy, belief in the need for change and belief that change will generate positive outcomes), through to change maintenance and relapse prevention strategies. Written, achievable goals will be encouraged.

The first session with the patient will prioritise basic health education regarding individual CVD risk and the benefits of potential treatments. It also establishes acceptable goals for the treatment process through patient consultation, and how these might be achieved. Finally, the pharmacist will discuss with the patient any specific medication changes identified in the baseline report that are recommended to improve adherence to CVD guidelines. Community pharmacists will not be trained or asked to make interventions related specifically to diabetes or mental health issues, but will be alerted to any suboptimal assessment results in these areas and asked to discuss with the patient the potential need for GP input. Such issues will also be identified in the baseline assessment summary provided to the GP.

If a patient's overall 5-year CVD risk score is 5% or less (considered very low risk) they will be advised to discuss with their pharmacist whether they are likely to benefit from continuing with the intervention. The decision to continue will be left to the pharmacist and the patient. Pharmacists will be expected to assess and document patient motivation to undertake various medication and lifestyle changes. Following discussion with each patient, the pharmacist will then forward the clinical summary to the patient's GP with any additional comments considered relevant.

Subsequent sessions will involve: ensuring necessary changes to medicines have been made; monitoring of medicines adherence especially for new medicines; linking patients with local health and other services that provide relevant patient support; initiating lifestyle change and supporting maintenance and relapse prevention. Throughout these sessions, patient progress towards goals will be continually reassessed, as will be the goals themselves. GP input to patient treatment plans will also be invited.

Feedback (optional)

Description 13

Target behaviour/s: Medication and lifestyle adherence

Target population/s: Patients

Experimental arms

Intervention

Over and above usual care, our intervention will include intensive pharmacist case-management, consisting of monthly follow-up visits with the study pharmacist for six months that will be independent of any planned follow-up with the SPC or family physicians. At each visit, the study pharmacist will monitor the patient's BP and lipid levels and will initiate and/or titrate antihypertensive and/or hypo-lipidemic therapy as appropriate. The study pharmacist will follow treatment algorithms consistent with current Canadian national guidelines. The pharmacist will emphasize medication and lifestyle adherence with patients and their caregivers, using the cardiovascular risk profile as an educational aid as per prior studies by our group. The pharmacist will also send a fax to the primary care physician after each study visit outlining the status of that patient's atherosclerosis risk factors and any therapy adjustments made at that visit.

Feedback (optional)

Description 14

Target behaviour/s: Medication use/adherence

Target population/s: Patients

Pharmacist Care Group (PCG)

The PCG participants receive a package of interventions from the pharmacist for enhancing their antihypertensive medication adherence, which includes:

• A home BP monitor (Omron®T9IT) with the capacity to store and download BP readings to be used for discussion at three- and six-month follow-ups;

• Training by the pharmacist on self-monitoring of BP;

• Motivational interviewing and education by the pharmacist to help patients improve their medication adherence and achieve target BP;

• Pharmacist-initiated home medicines review (HMR), dose administration aid (DAA) and/or patient medication profile (PMP), where necessary;

• Medication use review (MUR) to identify and resolve possible medication-related hypertension (e. g. due to non-steroidal anti-inflammatory drugs, cold preparations, complementary medicines, etc.);

• Referral to a GP when needed (e.g. very high blood pressure); and

• Refill reminders (by either SMS, telephone or mail) from their pharmacist at a chosen number of days before their antihypertensive medication dispensing is due.

HMRs are designed to assist consumers living at home to maximise the benefits of their medication regimen and prevent medication related problems. The review involves the consumer's general practitioner (GP) and preferred community pharmacy, and in some cases other relevant members of the healthcare team. The GP refers the consumer to the community pharmacy and an accredited pharmacist visits the consumer at home, reviews their medication regimen, and provides the GP with a report. The GP and consumer then agree on a medication management plan. A DAA is a device developed to assist patients in better managing their medicines by arranging their medicines into individual doses according to the prescribed dose schedule throughout the day. The aim of the DAA Program is to reduce medication-related hospitalisation and adverse events through improving medication management and adherence for people in the community. A PMP is a comprehensive written summary of all regular medicines taken by a patient that assists them in understanding and managing their medicines by informing them how, when and why to take their medicines. The aim of the PMP Program is to reduce the risk of medication-related adverse events by assisting people to understand and manage their

medications, including prescription, over-the-counter and complementary medicines. A MUR usually takes place in the pharmacy and it involves the pharmacist checking the patient's medication, making sure that the patient knows how and why they should be taking their medication, as well as identifying any problems. It provides the patient with an opportunity to ask questions and the pharmacist an opportunity to improve the patient's medication understanding and adherence, as well as being able to highlight problems and provide appropriate solutions

Feedback (optional)

Description 15

Target behaviour/s: Improvement of quality of care delivered to patients with diabetes and/or ischemic heart disease (encompassing a range of behaviours)**.**

Target population/s: Physicians

Intervention

Participants in both arms of the trial will each receive an information package by courier every six months for two years with multiple components, including a one page cover letter, a one-page explanation of how the patient information was identified from EMRALD, a one-page handout reviewing generic clinical and quality improvement strategies for patients with diabetes and/or IHD (based in part on the chronic care model), and two separate feedback reports. The first report will describe the percentage of the participating physician's patients with diabetes who are meeting evidence-based quality targets. The second will present similar information regarding their patients with IHD. The quality targets used were chosen to be consistent with those used by concurrent quality improvement interventions in Ontario (Quality Improvement and Innovation Partnership) and with current guidelines (see Outcomes section below). The reports will present information comparing the performance achieved by the participating physician to the average achieved by the top 10% of participants for any given measure. This type of comparator is similar to the achievable benchmark of care previously shown to improve the effectiveness of feedback reports. See Additional File 1 for prototype feedback reports.

Participants randomized to the enhanced feedback arm will receive exactly the same materials as the simple feedback arm, plus a one-page worksheet. This theory informed worksheet is designed to facilitate participants in setting specific but challenging goals and help participants develop action-plans through the creation of implementation intentions (see Additional File 2 for prototype of worksheet). An evaluation to assess the theoretical validity of the intervention will be reported separately.

Based on our review of the literature, the largest effects from goal setting and action planning seem to come from actually developing the plan (and linking it to a specific context to carry it out). For this reason, we chose not to provide participants with a list of possible actions. The participants, not the investigators, decide how to improve upon a care gap that they identify as important. Important mediators of the success of implementation intentions seem to be participant adherence to instructions to develop an appropriate plan, participant self-efficacy, and the inclusion of 'coping plans' to help participants plan ahead for situations that could interrupt goal-oriented behaviours. These factors will be addressed explicitly in this trial by: offering six 'Main-Pro-C' continuing medical education credits to encourage full completion of the worksheet and to permit monitoring of plans by the investigators; allowing participants to set their own goals for improvement; and requiring participants to develop a coping plan in the intervention worksheet. The format in this aspect of the worksheet is similar to previous studies, although to our knowledge the application of this type of intervention to family physicians is novel.

The worksheet in this intervention is similar in concept to commitment-to-change procedures that are increasingly used in the continuing medical education field, based on multiple theories related to adult learning. Rigorous evaluations of such procedures are few, but one study indicated that commitment-to-change can mediate the effect of an educational intervention for prescriptions. Although a signature has not been proven to increase the effectiveness of the commitment-to-change procedure, it is included in the worksheet because it offers an opportunity to explicitly use the word 'commitment;' this is thought to be a necessary feature for the procedure to successfully generate behaviour change (see Additional File 2 for prototype of worksheet). We tested the worksheet design and all other intervention materials with a group of non-participating family physicians and they found it easy to use. Specifically, they reported that they found the instructions clear and advised no changes to the design. To our knowledge, the application of this type of worksheet as a means of 'enhancing' the effectiveness of audit and feedback is novel

PHYSICIAN ID#:

Approximately 12% of your rostered adult patients have diabetes, and 30% of these patients also have ischemic heart disease

Overall in this study, 7% of rostered adult patients have diabetes, and 19% of these patients also have ischemic heart disease

Your diabetic patients are 68 years old on average and are 57% male. All diabetic patients in the study average 63 years and are 55% male.

Targets	Your Practice	Top 10%
A1C ≤ 7.0 %	**62%**	67%
A1C test in 6M	**81%**	91%
BP < 130/80	**48%**	72%
BP test in 6M	**86%**	98%
Rx ACE / ARB	**77%**	88%
LDL ≤ 2.0	**38%**	55%
LDL test in 12M	**55%**	80%
Rx Statin	**72%**	83%
ACR test in 12M	**84%**	85%

"Top 10%" = the score achieved by 10% of physicians

with the best score for each target.

(This data is based on your most recent EMR data upload, May,2010)

ACR = urinary albumin creatinine ratio (microalbumin)

PHYSICIAN ID#:

Approximately 9% of your rostered adult patients have ischemic heart disease, and 41% of these patients also have diabetes

Overall in this study, 5% of rostered adult patients have ischemic heart disease, and 28% of these patients also have diabetes

Your IHD patients are 71 years old on average and are 74% male. All IHD patients in the study average 70 years and are 65% male.

Targets	Your Practice	Top 10%
Rx ASA	**33%**	69%
BP < 140/90	**75%**	89%
BP test in 6M	**83%**	95%
Rx ACE / ARB	**72%**	85%
Rx B-Blocker	**57%**	72%
LDL ≤ 2.0	**39%**	56%
LDL test 12M	**58%**	91%
Rx Statin	**77%**	89%

"Top 10%" = the score achieved by 10% of physicians

with the best score for each target.

(This data is based on your most recent EMR data upload, May,2010)

Additional file: Prototype of Theory-Informed Worksheet for Enhanced Feedback Group

1. Describe a goal that you will achieve *within the next 6 months* for your diabetic patients and for your IHD patients. Your goal must be challenging but achievable. Be very specific.

[Phrase your goal as follows: "I will improve _____ *(choose one of the outcomes in the practice profile e.g. % at target BP)*

to the goal of _____ *(state a target for your efforts e.g. by 20 percentage points)"*]

For Diabetes, I will improve: _____

To the goal of: _____

For Ischemic heart disease (IHD), I will improve: _____

To the goal of: _____

2. Complete the following statements by describing a specific action you will take to help you achieve your goal:

To identify on an ongoing basis the specific patients in my practice who are not meeting targets, I will:

If a patient with Diabetes and/or IHD comes to clinic (for any reason) and is not meeting targets, I will:

If I am too busy during an office visit to address all aspects of managing the patient's diabetes and/or IHD, I will:

If I'm not making progress with respect to implementing my plan for achieving my goals, I will:

In signing below, I confirm my commitment to achieve this goal and my intention to carry out this action plan.

_____

Signature

Feedback (optional)

Description 16

Target behaviour/s: Diagnoses and management of lower back pain (encompassing a range of behaviours**)**

Target populations/s: Practitioners (physiotherapists and chiropractors)

Intervention group

Both the findings of interviews and survey informed the design of the intervention, and will be published elsewhere.

The intervention consisted of: a full-day symposium-style event involving a combination of didactic lectures delivered by peer opinion leaders (identified in consultation with representatives from the physiotherapy and chiropractic associations), small group discussion led by trained clinical facilitators, and practical sessions; supporting written material; and a follow-up phone call. Separate symposia were held for physiotherapists and chiropractors. All practitioners in the intervention group, including those who were not able to attend the symposium, received a DVD including videos of the didactic sessions and printed resources about LBP management. A clinical member of the project team attempted to follow-up all practitioners with a telephone call to discuss difficulties encountered in implementing behaviours and strategies to overcome these. More detail on the intervention, including the development process, will be reported in a separate publication. Symposia details are available in Additional File 1 - 'ALIGN intervention content.'

Finally, while not formally a component of the intervention or control group, the practitioner data collection procedure involves completion of patient checklists about LBP management and may act as a prompt to change practitioner behaviour. The checklist includes a broad range of diagnostic procedures and interventions potentially used for patients with acute non-specific

LBP, irrespective of supporting evidence.

Timing of recruitment, intervention delivery, and follow-up

The physiotherapist and chiropractic symposia took place on 20 and 27 February 2010, respectively. Practitioners in the intervention group were mailed a DVD of material from the symposium for their professional group on 29 March 2010. Practitioners in the intervention group received a follow-up phone call two to four weeks after either attending the symposium or being sent the DVD.

Patient participant recruitment will take place over a five-week period, beginning at least three months post-symposium delivery (31 May 2010). Each practice will recruit patients for a period of two weeks (a longer period was judged to place too great a burden on practitioners). Practices will be randomly allocated to recruit patients in either the first (31 May to 11 June 2010) or second (21 June to 2 July 2010) data collection period. Practitioners who are not able to collect data in either of these periods (e.g., on holiday), will be invited to select an alternative fortnight of data collection between July and September 2010.

Additional file 1

ALIGN CRT Intervention Content

The intervention for the ALIGN CRT consisted of a full-day weekend symposium-style event (with program and written material supporting presentations/content covered). The first half of the symposium focused on awareness rising and address the following theoretical domains: beliefs about professional role, social influences, beliefs about consequences and knowledge. The second half of symposium included more small group/interactive activity to address beliefs about capabilities and to allow for skill development regarding both target behaviours.

A summary of the content delivered in each session of the symposium is outline below. **Time**	**Content**
9:00am	*Welcome and introductions (by study investigator)*
9:20am	*Audience straw poll #1 (lead by study investigator)* Using audience response system software, 10 questions measuring knowledge, attitudes, beliefs and intentions about acute low-back pain management were posed to the audience, who could respond anonymously using wireless keypads, and aggregated results of participants were presented in real time
9:35am	*Keynote speech by peer opinion leader* Speech given by high status person recognised within the profession to discuss professional standards, state-of-the-art in diagnosis and/or

	communicating with patients with acute low-back pain, including use of latest research evidence and clinical practice guidelines
10:20am	*Video recording by peer opinion leader* Pre-recorded video of well-respected clinician conveying confidence in diagnosis without plain x-ray, dispelling fears around missed pathology and/or litigation, and conveying importance of reassuring patients
10:30am	*Video recording by radiologist* Pre-recorded video of radiologist outlining the amount of radiation delivered by plain x-ray and its poor utility in acute uncomplicated low-back pain
10:35am	*Video recording by consumer advocate* Pre-recorded video or consumer advocate describing their expectation of a good health professional (those who are good listeners/ communicators, provide good explanations/ reassurance, and provide evidence-informed best care)
10:40am	Morning tea
11:00am	*Small group discussion* Discussion between six participants lead by a clinician table facilitator , to discuss how the participants currently manage people with acute low-back pain, what participants think of the guideline and its recommendations, any scenarios participants find difficult managing patients in a manner consistent with the guideline (i.e., less plain x-rays, giving advice to stay active) difficult, and strategies to overcome these
12:00pm	*Skills demonstration (managing acute LBP patients without x-ray)* Demonstration / modelling of skills needed to diagnose and manage patients without plain x-ray by an experienced clinician

12:15pm	*Skills demonstration (advising acute LBP patients to stay active)* Demonstration / modelling of relevant skills in a successful communication encounter (giving advice to stay active) with patient (e.g. strategies on how to develop rapport, convey empathy, confidence, reassure patient, give message that patient will improve over time etc) by experienced clinician
12:40pm	Lunch
1:45pm	*Small group practical: Simulated patients* Rehearsal of diagnostic and communication skills on trained simulated patients (x4) in groups of six participants, led by a clinician table facilitator
3:00pm	Afternoon Tea
3:15pm	*Reflection lead by peer opinion leader* Brief summary/reflection of the key messages presented throughout the day, with opportunity for questions from the audience
3:45pm	*Audience straw poll #2 (lead by study investigator)* Using audience response system software, 3 questions measuring beliefs about the extent to which participants believe their management of acute low-back pain patients will change were posed to the audience, who could respond anonymously using wireless keypads, and aggregated results of participants were presented in real time
4:00pm	*Summary and evaluation*
4:30pm	Close

Two-four weeks following the symposium, participants received a follow-up telephone call by a clinician member of project team to enquire about any difficulties encountered in implementing behaviours (and strategies to overcome these) and to discuss how practice has changed (academic detailing style).

Feedback (optional)

Description 17

Target behaviour/s: Management of osteoporosis (encompassing a range of behaviours)

Target population/s: Clinicians

Intervention

Given the characteristics of the ESOSVAL project linked to the Regional's Plan of Osteoporosis, both the Intervention and the Control Group will receive some form of intervention aimed at improving care. The Control Group will benefit from the improvements introduced by the ESOSVAL project in the ABUCASIS Electronic Clinical Records system, since they affect all the system's users, the doctors and nurses providing healthcare, including those in the Control Groups. These improvements consist in the incorporation of a new follow-up sheet for patients with osteoporosis or risk factors for osteoporosis, and a series of tables, scales and variables that can be monitored to improve the care and follow-up of these patients. The implementation of this change in the patients' clinical records will be done through the usual training process used by the Valencia Healthcare Agency to introduce any change in recordkeeping (an informational session, and the option to have any individual questions answered).

The intervention group, and apart from the above mentioned changes to the recordkeeping system, receive a multifaceted intervention: 1) The participating clinicians took a four-hour classroom course in the last quarter of 2009, held in each Department; 2) Next, they participated in recruiting and following-up on patients for the ESOSVAL-R study. This requires the healthcare providers to include relevant information in the clinical records of 18 patients, and involves a hands-on practicum in obtaining information about osteoporosis and its incorporation into the

clinical records; 3) participation in the study has been included as an "indicator" towards gaining points in the Valencia Health Agency's Management Contract, that will lead to economic incentives; 4) An on-line course on osteoporosis will be given during the first, third and fourth quarters of 2010. It is organized in modules prepared by recognized national experts; 5) During the first quarter of 2011, after all the participating healthcare providers have completed the on-line course, another classroom course will be given to reinforce training and to divulge the results collected so far during the intervention (Table 1). The courses will be given to the doctors and nurses in the Region's Healthcare Departments who volunteer for participation in the project and who work with the medical practices selected

Table 1

ESOSVAL-Formation Project chronogram

Year	**2009**				**2010**				**2011**	
Quarter	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**
Design of the Training Plan	►	►	►▌							
Design of the Research Project: ESOSVAL-F			►▌							
Presentation to Ethical Committee	►▌									
Changes to the electronic clinical history system to improve recordkeeping on osteoporosis	►	►	►▌							
In-class training courses in the Healthcare Departments				►▌				►▌		
"On-line" training					►	►		►▌		

Statistical analysis ►►▌

Issue of report on results ►►

Feedback (optional)

Description 18

Target behaviour/s: Communication strategies and skills for encouraging behaviour change among young people with diabetes including how to use a communication device (3T: Time to Talk)

Target population/s: Health care professionals

Trial procedures

Intervention

Members of clinical teams allocated to the intervention arm will undergo a blended training programme comprising web-based material and face-to-face seminars (The Talking Diabetes Programme). The training course aims to prepare practitioners for constructive behaviour change conversations with patients and to provide practitioners with strategies and skills for encouraging behaviour change. The training emphasises the importance of shared agenda-setting, and drawing upon the Motivational Interviewing approach, emphasises the importance of a guiding style when consulting with patients about behaviour change. Practitioners work their way

through a number of distinct programme parts with an approximate total duration of 1.5 hours (delivered via three main e-learning modules). In addition, more interactive web-based components of the course allow practitioners to record their thoughts and experiences as they proceed through the programme. Two face-to-face seminars (approximately 2 weeks apart) with combined clinical teams also form part of the training course. Time spent on off-line learning activities such as discussing the training content in pairs, is recorded online. Following the second face-to-face workshop, participants will be invited to submit reports of three consultations in which they use their newly acquired skills and feedback will be provided by pre-assigned trainers.

The training programme shows practitioners how to use a device (3T: TimeToTalk) for promoting shared agenda-setting during clinical encounters with patients. This consists of a rigid folder and an inserted paper agenda pad of tear-off sheets which can be completed in advance by patients and carers to record topics of importance to be raised within consultations. Practitioners have the option to complete a pro-forma on which general topics discussed at clinic visits can be recorded and kept with patient notes, to facilitate clinical record keeping and communication between healthcare professionals. Copies of the paper agenda-setting pad (without folder) have been made available to each clinic to refill or replace folders as required and for patients not otherwise recruited to the study.

Feedback (optional)

Description 19

Target behaviour/s: Management of depression in the workplace (encompassing a range of behaviours)

Target population/s: Employers

Intervention

The intervention consists of a presentation and technical assistance delivered to employer representatives at local meetings sponsored by regional coalitions. Employers randomized to the VB condition receive the Depression Management in the Workplace (DMW) presentation.. All interested employer representatives are offered condition-specific technical assistance free of charge during the 24 months after the presentation.

Presentations

The DMW presentations present the content summarized in Table 1 utilizing high quality graphic material recently awarded The Communicators Award of Excellence in an international competition.

DMW presentation

The two-hour DMW presentation educates employer representatives about DMW Care and its evidence based impact on clinical and work outcomes. Employer representatives receive a company-specific return on investment (ROI) estimate associated with DMW Care. This estimate is generated by a calculator the research team developed in its earlier studies by translating scientifically derived estimates of DMW Care's impact on absenteeism and productivity at work to a monetized savings in lost work days, varying pertinent employee, organizational, and vendor characteristics. During the presentation, employers are encouraged to explore purchasing a depression product for their company and to request free technical assistance to help them purchase a DMW Care quality product.

Technical assistance (TA)

TA is the provision of individualized consultation to enable employers to improve the depression care their employees receive. When an employer representative requests TA, the TA consultant schedules a two-hour phone call to conduct the initial consultation followed by a second call approximately one month later. In the VB condition, the TA assists employer representatives in building broad support within their organization for the purchase, in identifying DMW vendors, and in developing contracts for the program.

Research Design:

Table 1

Presentation Schematic

Sequence of Initial Activities	VB Presentation
PRESENTATION	Prevalence in the workplace
	Depression burden to
	Employer
	Employee
	Problems treating depression in usual care
	DMW as an indicator of high quality care
	Clinical effectiveness of DMW Care Organizational effectiveness of DMW

	DMW Calculator
	Description of Technical Assistance
DISCUSSION	Open discussion of value of DMW Care

Feedback (optional)

Description 20

Target behaviour/s: Delivery of the target adolescent community reinforcement approach (A-CRA) (encompassing a range of behaviours)

Target population/s: Therapists

Study intervention

Implementation as usual (IAU)

Both groups receive the same training and technical assistance model they have been receiving since the inception of the Assertive Adolescent Family Treatment (AAFT) initiative. This state-of-the-art training and technical assistance model consists of a 3.5-day workshop training, bi-weekly telephone coaching calls with model experts, and on-going monitoring and feedback (both quantitative and qualitative) as part of a standardized certification process.

Pay-for-performance (P4P)

In addition to the above, the P4P group has the opportunity to earn monetary bonuses for two sets of measurable behaviors related to quality implementation of the model. These two behaviors are: delivering Target Adolescent Community Reinforcement Approach (A-CRA) and demonstrating Monthly A-CRA. Descriptions of the rationale and reinforcement schedules for these two targeted behaviors are described in the sections below; however, detailed descriptions of Target A-CRA and Monthly A-CRA competency are provided in the study measures section.

Rationale and reinforcement schedule for target A-CRA

Research has suggested that the degree of implementation can be as important as the efficacy of the EBT, with the biggest effects coming from well-implemented, highly efficacious interventions. Similarly, our prior research has shown that adolescents who received a threshold exposure of A-CRA were significantly more likely to be in recovery at follow-up. Increasing the number of adolescents who receive Target A-CRA would be expected to result in a higher likelihood that adolescents would have more positive treatment outcomes. Thus, one of the questions the study was designed to examine is the extent to which monetary bonuses could increase the probability that an adolescent receives Target A-CRA. As part of the RTP, study therapists in the P4P condition receive a $200 bonus for each adolescent who receives Target A-CRA within the first 14 weeks of AAFT and in no fewer than seven A-CRA sessions. In order to attribute improvements in adolescent outcomes to the incentives, only outcome data from adolescents admitted to the AAFT project after sites were randomly assigned to the study conditions will be used in Target A-CRA-related analyses.

Rationale and reinforcement schedule for monthly A-CRA competency

In addition to reinforcing exposure to a threshold number of procedures, we believed it was important to reinforce the quality of delivery (*i.e.*, competence). Thus, P4P therapists also are provided the opportunity to earn a $50 bonus for each month that a randomly selected session recording has at least one core procedure rated at or above the minimum level of competence required for certification. Importantly, in order to ensure a representative sample of session

recordings, only those therapists who submit at least 80% or more of treatment session recordings are eligible to have a session rated for competence. Because it would take approximately three months after randomization before P4P participants would be eligible to begin receiving their first bonus associated with delivery of Target A-CRA, reinforcing Monthly A-CRA competency is important as it can be reinforced sooner and more frequently.

Therapist implementation measures

The two implementation measures being reinforced as part of the study are Target A-CRA and Monthly ACRA Competency. Developed using existing AAFT data, Target A-CRA is a dichotomous (1 = yes, 0 = no) measure. It is defined as the delivery of 10 or more of the following 12 A-CRA procedures: functional analysis of substance using behavior; functional analysis of pro-social behavior; happiness scale; treatment plan/goals of counseling; communication skills; problem solving skills; adolescent-caregiver relationship skills; caregiver overview, rapport building, and motivation; homework reviewed; drink/drug refusal skills; relapse prevention; and increasing pro-social recreation during the first 14 weeks of an adolescent's AAFT treatment experience (but in no fewer than seven sessions). See the A-CRA treatment manual for a description of these A-CRA procedures [76]. Additionally, because identifying, discussing, and reviewing the adolescent's re-enforcers is considered a central mechanism of change within the A-CRA philosophy, as part of Target A-CRA, therapists also must, demonstrate one of these three components in at least 50% or more of the sessions conducted during this time period. Therapist-reported data on more than 450 adolescents uploaded to AAFT's implementation tracking system (i.e., https://www.EBTx.org) indicated adolescents who received Target A-CRA had significantly ($p < 0.05$) greater reductions in days abstinent at both three- and six- month post-intake assessments. Importantly, although therapist reports are used to identify adolescents who appear to have received Target A-CRA, official achievement of Target A-CRA for the study requires independent verification (via listening to DSR) by a trained A-CRA coder. See Garner, Barnes, and Godley [77] for complete details regarding the training process for A-CRA coders. Monthly A-CRA Competency is a dichotomous (1 = yes, 0 = no) measure and indicates whether or not a randomly selected session recording was rated at or above the minimum level of competence required for ACRA certification (i.e., rating of 3 or higher on all components of the procedure). As described in the A-CRA coding manual [78], each component of an attempted A-CRA procedure is rated using the following categories: 1 = poor, 2 = needs improvement, 3 = satisfactory, 4 = very good, and 5 = excellent. To ensure a representative sample of session recordings, only those therapist participants who submitted at least 80% or more of treatment sessions (minimum of five sessions per month) are eligible to have a session randomly selected and rated for competence. This requirement was implemented in order to reduce the risk of therapists trying to manipulate the criterion being reinforced by only uploading those sessions they expected would pass the competency rating.

Feedback (optional)

Intervention

Participants were provided with liquid nicotine cigarettes (e.g., Smoke-Break product) which are plastic tubes containing a 1.5 milligram (mg) dose of nicotine in a naturally flavoured, artificially sweetened gel. All components are FDA-approved for use in food and pharmaceutical products. Subjects were advised on use of Smoke-Break liquid cigarette tubes based on their daily nicotine intake estimated using the published nicotine content (in milligrams, mg) of their usual cigarette

Description 21

Target behaviour/s: Use of a liquid nicotine product to promote smoking cessation

Target population/s: Participants

brand multiplied by the number of cigarettes smoked per day. This estimate of total daily nicotine intake was divided by 1.5 (the amount of nicotine (in mg) in each liquid cigarette tube to yield the total tubes of product to be used each day. Participants were advised not to exceed 4 tubes within a one hour period or 40 liquid cigarette tubes in a day. Subjects were provided a sufficient number of tubes to last 2 weeks. Participants returned at 2 week intervals for follow-up visits where vital signs, potential side effects, use of the liquid cigarette product and carbon monoxide levels were assessed; additional nicotine replacement product (a 2 week supply) was distributed at these visits for a total of 12 weeks of treatment. Subjects also rated the liquid cigarette product on taste and overall satisfaction, each based on a 10 point scale (1-worst, 10-best) at each follow-up visit.

Feedback (optional)

Description 22

Target behaviour/s: Smoking cessation

Target population/s: Participants

Smoking cessation intervention

All participants received an 8-week smoking cessation intervention including individual-based intervention combining replacement therapy and/or bupropion and 4 sessions of counseling. Counseling was based on national and international current guidelines, targeting increasing the motivation to quit smoking, the identification of barriers, and the prevention of relapse. A counseling session lasted thirty minutes in average. Participants received a combination of nicotine replacement therapy (transdermal patch 16-hour/day or 24-hour/day, 1-mg or 2-mg lozenge, 2-mg or 4-mg gum, 10-mg inhaler) and/or bupropion, according to the participant's past experiences and preferences. Four visits (at week # 1, 2, 4, and 8) were scheduled and participants were asked to plan a quit date from the inclusion day until the 4th visit at week 8. They were considered as smokers if they failed to quit or if they relapsed to smoking afterwards. Participants lost during follow-up were called and received a letter explaining the scientific implications and the need for follow-up, and were invited to contact us.

Dentist's Intervention

The dental intervention was provided by a dentist trained in periodontology (MA) and included two visits. At the first visit, the dentist performed an oro-dental exam to rule out oro-dental lesions, e.g. periodontitis, gingivitis, and other oral or dental lesions. At the end of this visit, the dentist orally explained the results of the oro-dental exam, i.e. detailed explanations of the lesion(s) related to smoking, and recommended treatment if necessary. He also provided standardized information about chronic effects of smoking on oral hygiene (e.g. bad breath, esthetic sequelae), chronic effects of smoking on oral health (e.g. increased risk of oral cancers or periodontitis), and a brief explanation about periodontitis (a chronic infection of periodontal tissues, beginning with gingivitis and gingival bleeding, that is often hidden by smoking). The dentist also provided oral and illustrated explanations of dental plaque and made a practical and individualized demonstration of oral hygiene techniques, e.g. correct teeth and tongue washing, correct dental floss/sticks use. The first visit lasted about one hour. At the second visit, one week later, the dentist performed a simple oral hygiene treatment - which was not a treatment of periodontitis - using the full mouth periodontal debridement technique with an ultrasound device (EMS®-Air Flow® S2). In terms of treatment and potential physical annoyances, results of full mouth disinfection and classic approach are similar for the patient. During this visit, a second verbal intervention reinforcing the importance and the correlation of potential periodontal and oral lesions and smoking was performed by the dentist.

Feedback (optional)

Description 23

Target behaviour/s: Screening attendance for diabetes

Target population/s: Participants

Intervention materials

Two invitations to attend for diabetes screening were developed for this study: a standard invitation (control group), and an invitation designed to facilitate informed choice (see additional files 1 and 2). Two versions of the informed choice invitation were developed. In the first, participants were asked to list "good things" and "bad things" about screening for diabetes. In the second, participants were asked to list "good feelings" and "bad feelings". There were no significant effects of this manipulation and the two groups were treated as a single group in the analysis reported here.

Standard invitation

The standard invitation, shown in additional file 1, was based upon invitations commonly used to invite people for diabetes and coronary heart disease screening. It presented a brief didactic argument, describing only benefits of attending for screening. It explained that the participant might have a higher chance of developing type 2 diabetes and that diabetes has serious long term consequences.

Informed choice invitation

The informed choice invitation, shown in additional file 2, contained the information described above, plus information which included the limited benefits and potential harms of attending for screening. The text of the invitation explained both absolute risks and relative risk using frequencies, e.g. "If 100 people had the test, about 63 would get this result". Previous studies have shown that risk information is most readily understood using frequencies in this way. Participants were encouraged to make a choice that reflected their values by prompting them to evaluate the consequences and asking them to record their decision to attend or not.

Providing information about diabetes risk and consequences of screening

This section was developed from the UK General Medical Council (GMC) guidelines for providing sufficient information when gaining patient consent. These guidelines include purpose of

screening, details of diagnosis and prognosis with and without treatment, probability of benefits and risks, and emphasis on patient choice. The invitation began with an emphasis on patient choice "*Screening for diabetes. It's your decision*", and a statement that the participant was being offered screening for type 2 diabetes because they might have a higher chance of developing the condition. An explanation of diabetes and the screening procedure followed, then an explanation of the expected results and what they mean for the patient. Finally, the benefits and harms of attending for screening were outlined, including likely prognosis of early treatment compared to standard treatment following clinical diagnosis and the potential for unnecessary worry following false positive results.

Encouraging participants to make a choice

At the end of the hypothetical invitation letter, participants were asked to consider the consequences of their attending diabetes screening and to indicate their decision as to whether to go for screening or not, or to think more about the decision.
The content and format of the informed choice invitation were refined through extensive piloting using "think aloud" techniques. Both invitations were designed to be comprehensible to those with a reading age of 11 or above (Flesch Reading Ease score was 71.52 and 72.88 for the standard and the informed choice invitations, respectively). Rates of informed choice were significantly higher after reading the informed choice invitation compared to the standard invitation

Feedback (optional)

Description 24

Target behaviour/s: Reduction in the use of methamphetamine

Target population/s: Participants

Study intervention and design

The study intervention was a 12-week contingency management (CM) program, adapted from previous studies, in which vouchers of escalating value were offered for consecutive urine samples that did not contain methamphetamine or crack or cocaine (herein referred to as cocaine) metabolites. Initially, the intervention consisted of thrice-weekly drop-in urine testing visits for a total of 36 visits. Vouchers started at $2.50 for the first stimulant-free sample and increased by $1.25 for every consecutive stimulant-free sample thereafter up to a maximum of $10.00. Participants submitting three stimulant-free urine samples in a row earned a $10.00 bonus. The maximum payout for this program was $453.75, similar to the payout in other programs. When participants submitted a stimulant-containing sample, or missed a visit, no vouchers were issued and the value of the voucher for the subsequent stimulant-free sample was reset to $2.50. If a participant submitted a week of stimulant-free samples after submitting a sample containing stimulant metabolites, he returned to the voucher value prior to the stimulant-containing sample ("rapid reset"). Vouchers were redeemable immediately upon accrual for pre-paid gift cards and goods and services; we never offered cash. All CM participants signed a contract delineating the expectations of the CM program. Study personnel administering the CM intervention followed a simple, scripted protocol for the reporting of results of urine testing and administering vouchers. Such a protocol was used to avoid the provision of counseling around the results of the urine testing. The protocol, which required no formal training, was developed by one of us (SS) who has extensive expertise in delivering CM interventions.

All seven participants enrolled in the study while the above procedures were in place reported difficulty adhering to the intervention schedule, and only two attended ≥12 of their 36 visits. In response, in September 2007, we reduced the number of weekly urine testing visits to two (24 visits over the 12-week intervention) and increased the value of vouchers for the first stimulant-free urine sample to $7.50; other studies have employed a similar schedule. As before these vouchers increased by $1.25 for each consecutive stimulant-free sample to a maximum of $10.00. Additionally, we gave participants a $20.00 bonus for two consecutive stimulant-free samples. The maximum pay-out for this program was $476.25. We continued to withhold vouchers and reset voucher values to baseline for urines containing stimulants and for missed visits; however, to encourage participants to attend visits, we gave men submitting stimulant-positive samples a voucher worth $2.50.

Under the initial CM intervention schedule, drop-in urine-testing visits were available from 10:00 am to 6:00 pm on Tuesdays, Thursdays, and Saturdays; we offered extended hours for working participants. After the enrollment visit, we sent postcards or e-mails to all participants encouraging participation in the intervention. We reminded participants who did not attend urine-testing visits for the first week by phone or e-mail. We sent postcards, phoned, or e-mailed all CM participants again at the midpoint of the intervention period. Under the revised CM intervention schedule, drop-in urine testing visits were available from 10:00 am to 6:00 pm on Tuesdays and Saturdays with flexible hours for working participants. Postcard, phone, and e-mail reminder strategies remained the same.

We tested urine samples with the QuickScreen Pro Multi-Drug Screening Test (Phamatech, Inc., San Diego, CA), a point-of-care test used to qualitatively detect stimulant metabolites. For this

assay, the estimated mean detection time in urine ranges from 43.6 to 66.9 hours for methamphetamine and is 88.4 hours for benzoylecgonine, a cocaine metabolite. We repeated 10% of all urine tests; none were discordant. Study staff monitored the collection of all urine samples and tested the samples immediately after their provision.
Participants randomized to both control and CM arms received a printed list of local counseling, treatment, and outreach services at baseline and at each study visit. Study staff offered all participants assistance accessing services. Control participants did not submit twice-weekly urine samples and did not receive vouchers during the first 12 weeks of the study.

Feedback (optional)

Description 25

Target behaviour/s: Health promotion and obesity prevention including physical activity (PA)

/ inactivity and healthy eating (encompassing a range of behaviors)

Target population/s: Junior girl scouts

Description of Intervention

Our intervention was based on core components of Social Cognitive Theory, including: Role modelling by peers, troop leaders, and parents; skill building through active mastery experiences; enhancement of self-efficacy and proxy efficacy through role playing and active mastery experiences; and reinforcement of behavior through verbal praise and merit badges. The intervention consisted of three main components: 1) An interactive educational curriculum delivered by troop leaders; 2) Troop meeting policies implemented by troop leaders; and 3) Badge assignments completed at home by Girl Scouts with parental assistance. The educational curriculum consisted of eight modules, delivered over the course of about four months. This intervention curriculum is an expanded version of our previously published work used in summer programs.
Each module consisted of a discussion of intervention target behaviors, worksheet for goal setting and self-monitoring, physically active recreation session (e.g., walking, dancing, yoga, and active games), FV (fruits and vegetables) snack recipe preparation, FM (family meals) role-playing, clean-up period, and description of the take-home assignment. The modules were designed to require 60-90 minutes to deliver, with flexibility allowed for specified program activities and module order. Troop leaders underwent two hours of training by the first author

prior to intervention commencement. Regular and ongoing email and phone support took place throughout the intervention time period.
Target behaviours of the intervention included: 1) Frequent FM; 2) Parent-child shared PA (physical activity); 3) Elimination of TV during mealtime; 4) Drinking water instead of SSB (sugar-sweetened beverages) at mealtime; 5) Including FV in FM; 6) Practicing good manners during FM; 7) Helping parents prepare FM and cleaning up afterwards.
Troop meeting policies included: 1) Providing 15 minutes per meeting for physically active recreation; 2) Troop leaders participating in physically active recreation with girls; 3) Provision of a FV snack prepared by girls; 4) Troop leaders eating FV snack with girls; 5) Troop leaders verbally promoting PA, FV consumption in troop meetings and for home, and verbally promoting FM for home; and 6) Prohibition of SSB, candy, and TV watching during meetings.

Feedback (optional)

Description 26

Target behaviour/s: Physical activity and dietary intake (encompassing a range of behaviours)

Target population/s: Participants

Intervention group

Five programme modules were provided to participants of the intervention group during the one year intervention period as shown in Figure 2. Participants could freely choose to make use of the modules or not. Modules 1 and 2 aimed to increase awareness of the energy balance concept and module 3 aimed to improve dietary and/or physical activity behaviour. Module 1 (sent within two weeks after the baseline measurement) was provided as a toolbox and included an information leaflet and several energy balance tools, e.g. a pedometer and a waist tape. Module 2 (sent 3 months after baseline) was a CD-ROM providing individually computer-tailored feedback on BMI, its health consequences and energy balance behaviour. In module 3 participants could receive computer-tailored feedback regarding: physical activity, fibre consumption, portion sizes of energy dense foods and fat consumption. This module was sent 6 months after baseline. Participants without access to a computer (n = 22) were interviewed and received printed feedback by mail. Modules 4 and 5 were accessible via the study website which

was available during the two-year study period. After login, participants could find more information about diet and physical activity behaviour, participate in a forum and use links to other websites (module 4). Module 5 was an interactive weight maintenance programme (Weight Co@ch) that provided a written tailored advice based on reported body weight, a food frequency questionnaire and a physical activity questionnaire. Finally, the intervention group received newsletters every 2-3 months that contained study information, information about diet and physical activity and encouragements to use the modules.

Overview of the one-year intervention programme. Note: +2w = 2 weeks from baseline, +3 of +6 m = 3 or 6 months from baseline. Solid bars represent intervention modules that were sent to the intervention group over the course of the 12 m intervention period. No additional information related to diet, exercise or a healthy weight was provided between 12 m - 24 m follow-up period. Both intervention and control group received general newsletters (NL) to increase compliance at 24 m follow up.

Feedback (optional)

Description 27

Target behaviour/s: Physical activity

Target population/s: Participants

Active U Description

To promote physical activity, Active U utilizes an online, self-reported physical activity-tracking log combined with goal setting, team competition, and weekly motivational emailed newsletters that support continued physical activity. The physical activity log and goal setting components of this program facilitate self-monitoring and self-regulation and are the main theoretically based intervention components. Experts in health promotion wrote the newsletter content, which was not limited to a single theoretical framework.
To authenticate eligible University of Michigan faculty, staff, and graduate students, participants registered online for the Active U program by logging on with their university ID and password and filling out a questionnaire assessing baseline levels of physical activity and weight, as well as height, age, employment type, health status, and gender. During the enrolment process,

participants had the opportunity to create a new team and to send out email invitations to others to join. Team competitions were introduced to the program to enhance social support and motivation. Those who did not want to start their own team could apply to join an existing team, which required the approval of the team captain. Teams tended to form around pre-existing affiliations such as departments, lab groups, or buildings. In some cases, department and school email lists were used to recruit team members, and it was not unusual for an individual to receive invitations from several different teams, but each participant was only allowed to join one team. Participants were able to track the collective goal attainment of each competitive team of five or more individuals. Competitive teams were ranked according to the average team percentage of goal met for each week. Each week, the teams with the highest percentage of team members meeting their goals were recognized, but no monetary incentives or prizes were given.

At the beginning of the program, participants were assigned an automated physical activity goal expressed as minutes per week of moderate- to vigorous-intensity physical activity. Individuals who self-reported less than 60 minutes of moderate to vigorous physical activity per week at baseline were assigned a physical activity goal of 60 minutes. Individuals who self-reported more than 60 minutes of moderate to vigorous physical activity per week at baseline were assigned a physical activity goal equal to their self-reported baseline amount. Participants had the option to decrease or increase their weekly goal whenever they wanted, as long as the goal was at least 60 minutes per week. During the Active U program, participants recorded each episode of physical activity into the activity log including the type of activity, as well as the minutes of activity. Participants selected activities from a dropdown list with 27 selections and included items such as running/jogging, aerobics, organized sports, cardio equipment, martial arts, dancing, or other moderate- or vigorous-intensity physical activity. Only bouts of activity that lasted for 10 minutes or longer, counted toward achieving weekly goals.

Finally, participants received a weekly email containing competitive team rankings, information about the health benefits of physical activity, tips about how to increase and maintain a physically active lifestyle, and a reminder to enter physical activity data.

Feedback (optional)

Description 28

Target behaviour/s: Physical activity (encompassing a range of behaviours)

Target population/s: Patients

Patients who were not classified as 'active' were eligible to receive the brief intervention (BI), and this could be provided either as an extension to the screening (recruitment) consultation or booked as a separate appointment.

The purpose of the BI was for the practitioner to utilise adapted motivational interviewing methods to enhance patients' willingness and confidence to change their physical activity behaviour. The BI involved discussing the importance and benefits of physical activity, goal setting and directing (or 'signposting') patients to local physical activity opportunities.

Practitioners used set criteria to assess the potential risk to each patient of taking part in physical activity based on their disease status. Protocols for patients identified as 'high risk' indicated supervised activity such as Exercise Referral schemes. 'Medium' and 'low risk' patients could be directed towards a variety of opportunities including structured (e.g., health walks, sports clubs, and local leisure facilities) and self-directed activities (e.g., pedometer loan schemes and 'green exercise'). Although 'high risk' patients were restricted to clinically supervised activity, the underlying principle of the 'signposting' was that decisions were made in collaboration with the patient.

All patients were given a resource booklet containing information on the benefits of physical activity, details of local physical activity opportunities, and a local area map. The Let's Get Moving protocols specified patient follow-up consultations at three and six months, however due to the timelines of the pilot study, practices were asked to undertake a three month follow-up only. The purpose of the follow-up consultation was to provide on-going support to facilitate sustained behaviour change

Feedback (optional)

Description 29

Target behaviour/s: Eating/food intake and physical activity to manage weight gain

Target population/s: Pregnant obese women

Intervention

The obesity intervention program for pregnant women was based on extra visits to a specially trained midwife. The women in the intervention group made an average of 22 visits during their pregnancy. The motivational interview/talk followed guidelines set forth by Miller and Rollnick; the goal of this interview was to motivate the obese pregnant woman to change their behavior and to obtain information useful in meeting their needs. The weight gain goal for the study was less than 7 kg and this target was only discussed once during the intervention and that was at the first visit to the midwife. The midwife worked throughout the whole program with assessing the pregnant woman's knowledge of obesity in general and as a risk factor for her pregnancy and delivery outcome as well as for the wellbeing of her child. If the woman lacked sufficient knowledge, she was offered information and given accurate facts. The woman was also informed about the potential consequences of different behaviors associated with eating and food intake; written information was supplied if needed.
All women were given the opportunity to attend an individual 30-min session every week. The session included weight control and counseling characterized by its collaborative structure i.e. counseling based on creating a partnership that honors the woman's expertise and perspectives and enables the counselor to provide an atmosphere that is conducive rather than coercive to change. The woman's own judgment of her motivation and the possibility of changing a behavior, the advantages and disadvantages of changing a behavior, the choice of strategies for adopting and maintaining a new behavior were all topics of the sessions. All women who attended the program were also invited to an aqua aerobics class (once or twice a week), especially designed for obese women. The obese women in the control group attended the routine antenatal care program.

Feedback (optional)

Description 30

Target behaviour/s: Reducing risk behaviors of developing allergies during pregnancy (encompassing a range of behaviours)

Target population/s: Women and infants

Interventional topics and strategies

All interventions were initiated at first scheduled consultation in pregnancy as soon as the informed consent form was signed. In Norway a daily supplement of cod-liver oil is very common and already recommended for children and adults alike. In the intervention program we aimed for a dietary intake of n3-PUFAs of at least two meals of oily fish a week and 5 ml cod-liver oil a day during pregnancy (5 ml cod liver oil = 1.2 g N-3 PUFA). Cod liver oil was to be introduced to the child from 4-6 weeks of age increasing to 5 ml/day, and oily fish at least twice a week from 6 months of age as dinner or sandwich spread. We did not intervene on intake of vegetables, breastfeeding, formula or other dietary factors. In the smoking cessation and SHS intervention the group adapted a clinic-based brief "5A" office intervention based on the "A Clinical Practice Guideline for Treating Tobacco Use and Dependence". The indoor dampness interventional strategy provided advice on how to detect and advice on how to reduce indoor dampness and its consequences. Simple advice regarding inspection of signs of dampness as damage due to moisture on walls and floors, mould and/or musty smell was given. Solutions such as simple ventilation by opening windows regularly and avoiding drying of clothes in living rooms were recommended.

Feedback (optional)

Description 31

Target behaviour/s: Smoking cessation

Target population/s: Smokers

Intervention

Three were conducted: intensive individual intervention (III), intensive group intervention (IGI) and minimal intervention (MI). In all three, pharmacological treatment with nicotine derivatives or bupropion was offered as an option at the physician's discretion. Both the III and the IGI consisted of six visits during which the following were provided: counseling, psychological support and standard follow-up. Counseling and psychological support were based on motivational interview techniques that sought to: (a) reinforce in the smoker the motivation to quit smoking before D day (the day fixed for quitting by the smoker) and (b) prevent relapses after smoking cessation. Intensive interventions followed clinical guidelines developed in the Balearic Islands.

Feedback (optional)

Description 32

Target behaviour/s: HIV Screening

Target population/s: Patients

The PITC intervention

This intervention is an adapted version of the 'ACTS' approach which includes four brief steps: assess, get consent, test, and provide supportive services. In this PITC intervention, the STI nurse offered HIV testing as a standard part of STI care for all STI clients, and the client had to decline or 'opt-out' of this testing. According to policy in South Africa, written consent was required (although the WHO guidelines for PITC allow for only verbal consent). Abbreviated pre-test counseling consisted of informing patients that HIV is an STI and recommending that they test for HIV at this consultation. If they agreed, the nurse would do a brief test readiness assessment,

obtain written informed consent, and perform the rapid test along with other routine blood tests such as those for syphilis.

Feedback (optional)

Description 33

Target behaviour/s: Communication with medication provider (in order to change provider prescribing behaviour)

Target population/s: Patients

The parent study involved a randomized controlled trial of a patient activation intervention to encourage hypertensive patients to speak with their provider about obtaining a prescription for a thiazide diuretic, first-line therapy for hypertension. The objective of the parent study was to change provider prescribing behavior and increase implementation of clinical practice guidelines. Patients were randomized to a control arm or one of three intervention arms who received: (arm A) an individualized letter discussing their latest blood pressure, their 10-year cardiovascular risk score, and education about the value of thiazides; (arm B) the same individualized letter plus an offer of a $20 financial incentive if they talked with their provider about a thiazide prescription, and, if applicable, a copayment reimbursement for six months ($48) if prescribed a thiazide; and (arm C) the individualized letter, the financial incentive, plus a phone call from a health educator to answer questions about the intervention. Patients were asked to return a postcard (themselves or by giving it to their provider to complete) indicating whether they talked with their provider about their hypertension, whether they were prescribed a thiazide diuretic, and, if not, their understanding of their provider's rationale for not initiating thiazide treatment.

Feedback (optional)

Description 34

Target behaviour/s: Treatment of Chlamydia (encompassing a range of behaviours)

Target population/s: General Practitioners (GPs)

Intervention and control

GPs in both the intervention and control groups were required to complete a pre-trial questionnaire, a clinical audit and an education session prior to the commencement of the trial. The self-completed pre-trial questionnaire collected information about GPs characteristics, knowledge, attitudes and practices regarding chlamydia testing and was conducted both pre and post-trial by all participating GPs. A clinical audit was undertaken at each practice to collect details about issues likely to have an impact on chlamydia testing in that clinic. Audit data were used to develop an ideal individualized chlamydia testing pathway for each clinic, which incorporated current best practice for testing in the primary care setting of annual chlamydia testing for sexually active women aged 16 to 24 years. GPs were advised to collect specimens for testing by first pass urine, self-collected vaginal swab or endocervical swab. Participating GPs were eligible to enrol in related chlamydia education activities accredited under the RACGP Quality Assurance and Continuing Professional Development Program (QA&CPD).
Following the audit, an education session was held at each practice to further inform GPs about chlamydia testing, management of test results and methods of introducing the subject of testing to patients. Practices were provided with waiting room chlamydia posters, pamphlets and chlamydia screening flow charts. A DVD recording of the education session was available for doctors unable to attend. At the request of GPs, tear off pads with brief information sheets for patients specifically about the reasons for testing and the simplicity of testing and treatment were produced and distributed to the practices.
Mid trial, GPs in the intervention group received a letter to remind them of the incentive offered for chlamydia testing. They were not provided with any information about the number of tests performed to date nor the amount of money they had accrued through testing. Payment was made to GPs at the end of the trial period. All practices received an honorarium amount of $AUD1000 in recognition of GPs time spent out of usual roles in participating in the trial.

Feedback (optional)

Description 35

Target behaviour/s: Administration of vaccinations

Target population/s: Staff at medical clinics

Intervention

In April and May 2008, a one-hour feedback session, led by a physician and a public health nurse, was carried out with the physicians, nurses and secretaries in each participating medical clinic. This feedback dealt with VD for infants at the clinic for the year 2007. Data on the proportion of doses administered without delay were presented for the first doses of three vaccines (DTaP-Polio-Hib, pneumococcal and meningococcal). Vaccination delays for each clinic were presented both in terms of the Quebec standard (one week) and the proposed Canadian standard (one month). Graphs showing the cumulative percentage of children vaccinated according to age were also presented for vaccines scheduled at 2 and 12 months, including measles, mumps and rubella vaccine (MMR). During preparation of the feedback, it became clear that certain clinics were not administering vaccines scheduled at one year during a single visit. Consequently, information on the importance of multiple injections was transmitted to these medical clinics.

Feedback (optional)

Description 36

Target behaviour/s: Implementation of Cognitive Behavioural Therapy (CBT)

Target population/s: Therapists

The facilitation intervention

In addition to training, 12 therapists at 10 sites received facilitation. The facilitator met with them in person or by telephone or email before and during the workshop and at least monthly (twice the first month) after the workshop for six months. The facilitator (TAT) had an education and public health background (DrPH), but by design was not an expert in cognitive behavioural therapy (CBT) or a clinician. The facilitator was trained by the first author, who is an experienced facilitator in multi-site, complex behavioral adoption projects. Although the facilitator was located at one site where facilitation took place, the individual was not in mental health and functioned as an external facilitator for all facilitated sites.

The facilitator's tasks and interventions varied by the phase of the project and by the needs of individual therapists (Table 1). We viewed application of CBT training and development of skill competency as complex, developmental tasks that would require the facilitator to employ a range of enabling strategies varying with the therapist's self-efficacy, skill competency, and situation. Prior to the workshop, the facilitator held two conference calls with the 12 therapists to introduce the concept of facilitation and begin to develop rapport. At the workshop, the facilitator met with the 12 therapists and addressed topics related to the facilitator's role (*e.g.*, will the facilitator evaluate my job performance?), benefits of facilitation, project expectations for therapists (*e.g.*, attend facilitation calls, conduct CBT after the workshop), and anticipated barriers to conducting CBT and potential solutions. Initial post-workshop facilitation calls focused on setting individual goals for CBT implementation, attempting CBT quickly, and reinforcing all efforts to get started. The facilitator solicited barriers to getting started and helped to generate possible solutions. Later calls focused on maintaining motivation and overcoming barriers to achieving individual goals, such as challenges to providing weekly therapy sessions. In addition to scheduled calls, the facilitator received and responded to individual queries via email or telephone and sent email announcements and reminders to the group. The facilitator maintained a detailed time-log of all facilitation activities, including contacting the therapists and responding to queries.

Table 1

Facilitator interventions by project phase

Interventions	Pre-Workshop	Workshop	Post-workshop Months:

			1	2	3	4	5	6
Develop rapport with therapists and answer questions	X	X	X					
Provide education about facilitation and its benefits	X	X	X	X				
Identify goals for participating in this training	X	X	X	X				
Anticipate obstacles in meeting goals		X	X	X	X	X	X	X
Provide general encouragement and praise		X	X	X	X	X	X	X
Review goals and assess progress			X	X	X	X	X	X
Provide feedback on goal attainment			X	X	X	X	X	X
Use email reminders of calls and study deadlines				X	X	X	X	X
Provide opportunities for social comparison and support		X	X	X	X	X	X	X
Employ motivational interviewing techniques to encourage rapid application of CBT		X	X	X	X	X	X	X

Feedback (optional)

Description 37

Target behaviour/s: Creating, finding, and implementing self-care support for people with long-term health conditions (encompassing a range of behaviours)

Target population/s: General practitioners, nurses, practice managers, clerical and reception staff

Development of the WISE training package
The aims of the training are outlined in Table 1.
Training session one

• Introduction to WISE

• **Exercise one: 'from reception to self-management'**

- **Task one: Can we map out the process?**

- **Task two: Where are the problems in the process?**

• Introduce self-management support options and tools

• Demonstration DVD

• Group one = GPs and nurses: Skills practice using difficult scenarios

• Group two = receptionists, practice manager, IT staff, and one clinician:

Begin to develop

- List of local resources practice staff can access

- Computer templates staff can access

• Homework: Agree priorities for practice to work on. Audit patients to come up with some case studies for the role play sessions

Training session two

• Feedback from session one- what has happened?

• Group one

- Skills practice using role play techniques to practice the consultation skills needed to provide motivation and support to patients to enable them to self-manage.

• Group two

- Reflect on the priorities the practice agreed to work on. Use problem-solving techniques

- Problem solve on barriers to making support options for patients and/or use of PRISMS forms work in the practice

• Summary

Table 1

The aims of training

Aim	Method	How
Understand the WISE approach and implications for practice	Presentation and discussion plus introduction of manual	Involving whole practice
Learn about people's roles in the practice and their impact on the way patients with long-term conditions participate in health care	Interactive exercise using simplified process mapping*	Small groups
For clinicians--learn:		
skills to encourage a structured approach to self-care support in consultations	Interactive role play	Small groups
techniques to help deal with difficult issues during consultations	Interactive role play	Small groups

how to use tools including:-		
PRISMS tool to encourage introduction of psychosocial agendas and shared decision making about patient priorities for management	Brief presentation with discussion. DVD exemplar of use plus manual	Involving whole group
Explanatory models to encourage discussion about the causes and consequences of long term conditions	Presentation with discussion. DVD exemplar of use plus manual	Involving whole group
A menu of options for self-care support linked to patient priorities and illness trajectory	Presentation with discussion. DVD exemplar of use plus manual	Involving whole group
Development of a negotiated plan of action or ongoing follow up care which builds on these earlier discussions	Presentation with discussion. DVD exemplar of use plus manual	Involving whole group
As a practice--develop:		
skills to solve problems that come up in the work of the practice	Problem-solving techniques	Involving whole practice
systems within practice to improve self-care support for patients	Problem-solving techniques	Involving whole practice

ways to engage patients with self-care support	Problem-solving techniques	Involving whole practice
a sustainable data base of local self-care support options for patients	Ongoing activity and support	With WISE leads in the practice

Feedback (optional)

Description 38

Target behaviour/s: Delivery of the 'Out-and-About Implementation Program' including medical record audits followed by feedback, barrier identification, and education to target known local barriers (encompassing a range of behaviours)

Target population/s: Rehabilitation therapists

The out-and-about implementation program

The intervention provided to help rehabilitation therapists implement the outdoor journeys was named the 'Out-and-About Implementation Program'. The program aimed to change practice and included three active components: medical record audits followed by feedback, barrier identification, and education to target known local barriers.

Medical record audits were conducted retrospectively by AM and two professionals from each team. We requested 100 consecutive records (20 records for each of the five teams) of people with stroke who had received therapy (for any reason) in the previous 12 months from a team occupational therapist, physiotherapist, or both. One exception was a new team that had been established six months earlier, and had only seen 10 people with stroke. In that case, we

requested all of their records for people with stroke seen since service commencement. Multiple auditors were used to raise professionals' awareness of their practice, and the practice of their team, by engaging them in audits. Each professional audited at least three medical records. Two medical files from the total sample were double coded by the first investigator to check for consistency. Differences were discussed and consensus reached when necessary. No formal study of coder agreement was conducted.

Audit criteria were rated using yes/no response options. Questions were asked about screening and assessments conducted, intervention provided, goals set and outcomes measured in relation to transport, outdoor mobility, and outings. Any occasions of service that focussed on improving outdoor journeys were counted. A written summary of each team's performance was provided to teams within eight weeks by AM.

Feedback of results from the first audit was provided to each team about their compliance with key criteria, with comparison to the overall compliance by the five teams. Each team then set targets for the next 12 months (*e.g.*, '50% of people with stroke will have written evidence that driving has been discussed').

A second retrospective audit of medical records was conducted 12 months later using identical tools and processes to the first audit. Medical files were requested of 100 people with stroke treated after the half-day implementation training workshop (20 consecutive records for each of the five teams). Nine rehabilitation professionals audited the medical records in addition to AM.

Barrier identification was conducted concurrently with the audit process. To identify barriers, we used two methods that have been recommended for implementation research. First, we conducted in-depth interviews (described elsewhere) with allied health professionals from two teams, and then transcribed and analysed the content. Interviewees were asked to describe what they knew about the outdoor journey intervention, including the published evidence, and factors that might help or hinder their team from implementing the outdoor journey intervention. Prompt questions were used to enquire about skills and knowledge, staffing, resources, assessment procedures, screening and report-writing systems, and treatment routines. Findings were then used to inform the content of a workshop.

Education

A half-day workshop was run in August 2007. The workshop was led by AM. First, we presented a critical appraisal of the original randomised trial by Logan and colleagues, and a description of the complex outdoor journey intervention. Therapists were alerted to the national clinical guideline recommendation about the intervention.

Second, baseline audit data were presented with the permission of the five teams. Based on the review by Grimshaw and colleagues, consensus was reached at the workshop that a 10% improvement in the target practice behaviours would be the goal for teams following the implementation program (*i.e.*, the pre-determined minimum clinically worthwhile difference).

Third, a written document was presented and discussed ('Increasing outdoor journeys after stroke: Protocols for use by rehabilitation professionals'). Protocols were provided for upgrading walking, bus and train travel training, trialling motorised scooters, addressing return to driving, and providing written information about transport options. These protocols had been prepared by the AM with advice from local team members.

Fourth, two case studies were presented by occupational therapists who had delivered escorted journeys to people with stroke. Each case study included goals of the person with stroke, treatment progression, and safety tips. A videotaped interview was also presented showing a person with stroke who described the benefits of being assisted to get out of the house. Participants then practiced writing sample goals related to outdoor journeys and community participation.
Finally, potential barriers and enablers to delivering the outdoor journeys were identified, then discussed by workshop participants in pairs or teams. Examples and quotes were presented from the earlier in-depth interviews conducted with team members. Participants identified strengths, weaknesses, opportunities, and threats affecting their team's ability to provide the evidence-based outdoor journey intervention. Solutions were proposed, discussed and documented by team leaders.

Feedback (optional)

Description 39

Target behaviour/s: Test requesting behavior

Target population/s: Primary care doctors

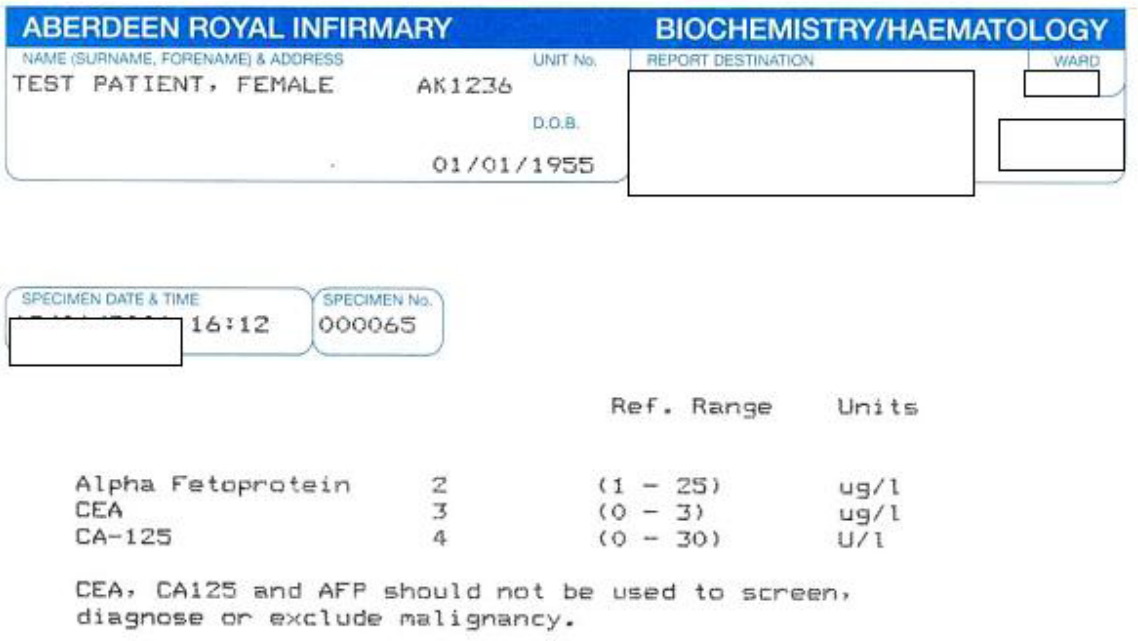
Methods

Description of the main trial interventions

Feedback consisted of a six-sided colour booklet (*e.g*., see Additional File 1) presenting graphs of practice level data for each of the nine targeted tests and for each laboratory discipline as a whole. Every graph showed rates of test requesting over the previous three years for the practice compared with the regional rates. The feedback was enhanced with brief educational messages that described specific clinical circumstances where it was inappropriate to request the test. These messages were included alongside the graphs for each of the targeted tests. The booklets were posted to each primary care doctor within each intervention group practice on four occasions (updated every three months from the start of the intervention period).
The brief educational messages were added as reminders to the test result reports sent to the requesting practice (*e.g*., see Additional File 2). The laboratory information system was programmed to recognise the relevant cues for each of the targeted tests and automatically add the brief educational reminder messages to the relevant printed and electronic test result reports. The messages were activated every time the cue occurred and were presented at the

same time as the test result. The reminder messages were intended to influence future requests for the targeted tests.

<u>Additional File 2</u>. Example of the reminders intervention.



ABERDEEN ROYAL INFIRMARY — BIOCHEMISTRY/HAEMATOLOGY

NAME (SURNAME, FORENAME) & ADDRESS: TEST PATIENT, FEMALE
UNIT No.: AK1236
D.O.B.: 01/01/1955
REPORT DESTINATION:
WARD:

SPECIMEN DATE & TIME: 16:12
SPECIMEN No.: 000065

		Ref. Range	Units
Alpha Fetoprotein	2	(1 - 25)	ug/l
CEA	3	(0 - 3)	ug/l
CA-125	4	(0 - 30)	U/l

CEA, CA125 and AFP should not be used to screen, diagnose or exclude malignancy.

Feedback (optional)

<u>Description 40</u>

Target behaviour/s:	Provision of smoking cessation assistance (encompassing a range of behaviours)
Target population/s:	Providers within ACRN Community Health Centers

Usual care

Prior to the study, as part of a quality improvement (QI) initiative to disseminate tobacco use treatment guidelines, all CHCs (Community Health Centers) within the ACRN (Ambulatory Care Research Network implemented an expanded vital sign chart stamp that prompted providers to ask patients about tobacco use, advise them to quit, assess readiness to quit and offer assistance (4As) (Additional file 1). The prompt to provide assistance was divided into two components on the chart stamp: prescription given and referral made. This approach was meant to simplify the documentation process and operationalize the 4th A, Assist, to make it clear that referral and prescription were the two primary options available to the provider and patient. After implementation of the new chart system, all providers attended a 60 minute physician led presentation on current evidence based practice guidelines for treating tobacco dependence and systems level changes to support identification and referral of smokers for cessation treatment. At the conclusion of this visit, each practice received a tool kit consisting of patient education materials and provider materials (e.g. pharmacotherapy guide) and wallet cards with the Quitline number.

Intervention

The intervention was comprised of four components: 1) usual care plus the fax referral system that linked smokers to the New York State Quitline for proactive tailored counseling, 2) a 30 minute training for physicians, nurses and medical assistants on how to use the Fax-to-Quit program, 3) two site visits from research staff that involved meeting with clinic staff to elicit any barriers to implementation, provide additional materials and offer further educational information as needed, and 4) provider feedback on their adherence to the 4As and use of the Fax-to-Quit program compared with other providers in their clinical site. Feedback data was embedded in two separate emails sent during the four month intervention period.

The New York State Quitline service includes proactive telephone calls with mailing of self-help material, free nicotine replacement therapy for those who qualify and referrals to local treatment programs. The Quitline faxes a report back to the provider describing the treatment plan. Providers are also notified if the patient cannot be reached. The Quitline makes up to five attempts to contact patients.

Additional file 1. Figure S1. Expanded vital sign chart stamp.

BP: _____ Weight: _____			
Ht: _____ BMI:_____			
Tobacco Use:	Yes	No	Former
Advise to quit:	Yes	No	
Ready to quit?	Yes	No	
Rx given:	Yes	No	
Referral made:		Yes	No

Feedback (optional)