

## **Title**

Translating clinicians' beliefs into implementation interventions (TRACII): an intervention modeling experiment to change clinicians' intentions to implement evidence-based practice.

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## **Abstract**

*Background:* Biomedical research constantly produces new findings but these are not routinely taken up into health care practice. Currently a range of interventions to promote the uptake of emerging evidence are available. Whilst their effectiveness has been tested in pragmatic trials, these do not form a basis from which to generalise to routine care settings. Implementation research is the scientific study of methods to promote the uptake of research findings, and hence to reduce inappropriate care. As clinical practice is a form of human behaviour, theories of human behaviour that have proved to be useful in other settings offer a basis for developing a scientific rationale for the choice of interventions. The aim of this study is to provide a scientific rationale and develop methods, based on theories of behaviour and behavioural change technologies, for the choice of interventions to translate research findings into clinical practice. The objectives are (i) to develop interventions to change beliefs that have already been identified as antecedents to antibiotic prescribing for sore throats and (ii) to experimentally evaluate these interventions to identify those which have the largest impact on behavioural intention and behavioural simulation.

*Methods:* The clinical focus for this work will be the management of uncomplicated sore throat in general practice. Symptoms of upper respiratory tract infections are common presenting features in primary care. They are frequently treated with antibiotics and research evidence is clear that antibiotic treatment offers little or no benefit to otherwise healthy adult patients. Participants will be general medical practitioners. Two interventions will be selected and designed to address the discriminant beliefs in the prescribing of antibiotics for sore throat, using empirically derived resources. The interventions will be evaluated in a 2x2 factorial randomised controlled trial delivered in a postal questionnaire survey. Two outcome measures will be assessed, behavioural intention and behavioural simulation.

## Background

### The problem

Clinical and health services research is continually producing new findings that may contribute to effective and efficient patient care. However, despite the considerable resources devoted to this area, a consistent finding is that the transfer of research findings into practice is unpredictable and can be a slow and haphazard process.

Reports of the uneven uptake of research findings are an international phenomenon occurring across different healthcare settings, countries and specialties, including the UK,[1-3] Europe [4] and the USA.[5-7] Studies have been unable to explain this variation in terms of either patient or resource factors.[5;6] Accepting that variation alone does not necessarily represent inappropriate care a small number of studies have gone on to assess appropriateness [7] and conclude that inappropriate care delivery was occurring.

### The need for a taxonomy

Implementation research is the scientific study of methods to promote the uptake of research findings, and hence to reduce inappropriate care. It includes the study of influences on healthcare professionals' behaviour, and methods to enable them to use research findings more effectively. Over the last decade a considerable body of implementation research has been reviewed.[8-10] This research demonstrates that a range of interventions (e.g. reminder systems, interactive educational sessions) can be effective in changing health care professionals' behaviour. These studies have substantial heterogeneity within interventions used, targeted behaviours, and study settings that make generalising their findings to routine healthcare settings problematic, largely due to the absence of any underlying taxonomy for both research studies and service settings by which to characterise individuals, settings and interventions.

The interventions used are usually complex. The framework for phases of investigation of complex interventions suggested by the MRC [11] illustrates the current problems with implementation research. Table 1 compares the stages in the evaluation of complex interventions to stages of drug evaluation.

To date, most implementation research studies have involved exploratory trials (Phase II) or, more usually, definitive randomized controlled trials (RCTs) (Phase III) with little evidence of preceding theoretical or modeling research. The current position in the evaluation of implementation strategies is akin to exploring the anti-anginal use of an antihypertensive drug a) without any understanding of the pharmacodynamics of the drug or the pathophysiology of angina or hypertension and b) without Phase I trials of the pharmacodynamics of the drug. This is thus an expensive version of trial-and-error, with no *a priori* reason to expect success, nor confidence in replicating success if achieved. To argue against the need for a better theoretical basis for choosing implementation interventions one would have to suggest that every combination of setting, individual(s) and intervention is unique and must be examined individually – this would mean needing to conduct thousands of evaluations and would incur prohibitive costs. The assumption that clinical practice is a form of human behaviour and can be described in terms of general theories relating to human behaviour offers the basis for a taxonomy. Therefore, factors influencing the effectiveness of interventions could include the beliefs of the healthcare professional, or their perceived ability to control – generalisable concepts that can be used across different interventions, settings and individuals.

### Selecting interventions

Ferlie and Shortell [12] have suggested four levels at which interventions to improve the quality of health care might operate: the individual health professional; health care groups or teams; organisations providing health care (e.g., NHS trusts); and the larger health care system or environment in which individual organizations are embedded. Different theories will be relevant to interventions at different levels, for example, psychological theories will be more relevant to interventions directed at individuals and teams while theories of organisational change will be more relevant to interventions directed at hospitals or trusts. A full scientific rationale for interventions to translate research findings into clinical practice

requires exploration of theories relevant to interventions directed at each of these four levels. However, interventions aimed at the healthcare group organisation or system ultimately operate through the actions and behaviours of individuals. This study will focus on the level of the individual health professional and investigate interventions developed from psychological theories in order to explore factors that are associated with adherence to evidence-based health care. There are several possible bases for selecting interventions to change individual clinicians' behaviour within implementation studies.

*Intuitive/non-theory analytical* - Here the investigator follows a gut feeling about what might work informed to a greater or lesser extent by knowledge or (non-theory based) analysis of the context. This is the basis for many implementation studies to date and is arguably the reason, for example, for the overuse of interventions solely directed at increasing knowledge/information.

*Empirically successful* - This method is linked to the intuitive/non-theory analytical approach but here the method is chosen on the basis of its previous performance as an intervention in implementation trials. However, the investigator attempts to repeat a successful intervention without understanding the "active ingredients" and what factors may modify its success. For example, there may be a tendency to confuse the type of intervention (e.g. audit and feedback) with the content of an intervention (e.g. feedback of performance at practice level together with explicit comparison with hypothetical guideline-compliant performance) and to assume that it is the type, rather than content, of intervention that is effective.

*Behavioural change technologies* - This method uses *theory based techniques* which have been demonstrated to change behaviour in other settings and which therefore have a reliable record of effective behaviour change which one can reasonably expect to generalize to the current implementation behaviour. Using behavioural technologies, knowledge of the behaviour is used to guide the selection of intervention. Alternatively, the intervention can be directed at changing antecedents of the behaviour as a means of changing the causal pathway. The most consistently successful methods involve contingent consequences (normally reward) with a subject being rewarded if, and only if, the behaviour is performed appropriately. Other methods which increase the ease of performance (e.g. developing an action plan, creating environmental triggers) have been developed and can be used to increase the likelihood of a behaviour being performed.

*Targeting theoretical antecedents* - Here an intervention would be targeting cognitions or environmental antecedents of the behaviour, based on general theoretical understanding of behavioural process, using theoretical models, such as Social Cognitive Theory (SCT), Theory of Planned Behaviour (TPB), Precaution Adoption Process (PAP) or Operant learning model. So, for example, SCT would suggest that an intervention should be designed to enhance self-efficacy, while PAP might suggest targeting the decision process.

*Targeting empirical antecedents* - Here an intervention would be targeting cognitions or environmental antecedents of the behaviour, based on specific evidence of precursors of the behaviour. For example, Walker et al. have demonstrated that GPs with strong intentions of antibiotic prescribing for sore throats have significantly different beliefs about using antibiotics from GPs with weaker intentions. Common methods under this heading are persuasive communications which have been intensively researched in the field of social psychology where they have been used to change beliefs of large groups as well as at an individual level.[13;14]

### **Using theory to develop implementation interventions: conducting Modeling Experiments**

In order to optimise the number of 'Definitive RCTs' (that will be costly and time consuming) that need to be conducted, and ensure their generalisability, it is necessary to understand and optimise the 'active ingredients' in professional behaviour change strategies and the characteristics of the settings, targeted professionals and behaviours that might modify the effectiveness of interventions. This should be well advanced before conducting exploratory trials and definitely achieved before definitive RCTs. Two approaches are necessary to achieve this. One is to develop an understanding of the factors underlying professional behaviour in order to identify what sorts of empirical antecedents should be targeted in implementation interventions (equivalent to the theoretical phase of the MRC Framework, and the subject of our previous work [15]). The other is to develop an understanding of how the

elements of the interventions work and can therefore be optimised (the modeling and exploratory trial phases of the MRC Framework).

Almost all of the implementation interventions conducted to date have selected interventions using intuitive/non-theory analytical or empirically successful methods. The other 3 methods (behavioural change technologies, targeting theoretical antecedents, targeting empirical antecedents) have been much less developed in implementation research. However, if psychological theory is going to contribute to effective implementation then targeting empirical antecedents and using behavioural technologies should be the optimum methods of selecting interventions. There are three additional issues that it is also important to consider: plausibility and feasibility (both in a development experiment and in service settings) and the method of delivery to maximise efficiency.

### **Work leading up to this proposal**

#### *Using psychological theory to identify beliefs that precede the behaviour (empirical antecedents)*

We have conducted a number of preliminary studies to investigate the feasibility of using psychological theories in implementation research, and their ability to identify variables that might be targets for interventions.[16] One of these will form the basis of this proposal - a study using the theory of planned behaviour to investigate factors associated with prescribing antibiotics for patients with uncomplicated sore throat amongst general practitioners (GPs) in Grampian.[16] Literature reviews, non participant observation and interviews with general practitioners were used to develop questionnaires that were distributed to a 1 in 2 random sample of GPs in the region, achieving a 70% response rate. Using the theory, we explored the relationships between GPs' perceptions and the strength of their intention to prescribe antibiotics. This allowed us to:

- identify whether GPs intended to prescribe antibiotics or not. The majority indicated that they intended to prescribe for less than half of patients presenting with uncomplicated sore throat in the next two weeks.
- estimate the overall impact of individual beliefs and perceptions on the strength of their motivation to prescribe; potentially modifiable beliefs accounted for 48% of the variance in GPs' intentions to prescribe.
- identify which beliefs had the biggest impact on motivation.
- identify discriminant beliefs distinguishing GPs who intended to prescribe from those who did not.

Intenders were more likely to agree with three behavioural beliefs (e.g. prescribing an antibiotic for these patients is efficient), one outcome evaluation (the problem of increasing antibiotic resistance for these patients does not concern me greatly) and four control beliefs (e.g. if a patient asks for an antibiotic then I will prescribe one whether it is medically indicated or not).

#### *Using behavioural technologies to change theoretically salient beliefs*

In a study [17] we tested an intervention to reduce the frequency of extraction of third molar teeth - the method of generating alternative behaviours. General dental practitioners (GDPs) were randomly selected from the Scottish Dental Practice Board Register and allocated to control or intervention groups, the latter receiving a postal behavioural manipulation, and both groups responding to a postal questionnaire. Subjects in the intervention group were asked to generate a list of management alternatives to third molar extraction prior to being asked to record their third molar extraction intention, and subjects in the control group were not. The intervention group had statistically significantly less intention to extract third molars than the control group, despite similar knowledge of management alternatives.

#### *Developing a methodology for selecting and refining interventions*

We have piloted a methodology for selecting and refining interventions. In these intervention modeling experiments (IMEs), elements of an intervention are manipulated, within a randomised controlled design, in a manner that simulates a real situation as much as possible and interim endpoints (stated behavioural intention) are measured rather than changes in professional behaviour or healthcare outcome. As such these studies sit within Modeling and Exploratory Trial Phases of the MRC Framework (Table 1). They offer experimental control

and the opportunity to vary elements of an intervention in order better to understand intervening variables and the effect on different outcomes. Compared to large-scale trials such experiments have potential strengths in terms of their smaller size and shorter timescales.

For the method to be useful, interim endpoints must be predictive of real world outcomes. This is the case for behavioural intention, self-efficacy, and recall and understanding of information. Behavioural intention has been incorporated into virtually all models of health behaviour as the single best predictor of subsequent health behaviour.[18] Self-efficacy has also been widely incorporated into models predicting behaviour because of its reliable predictive effect.[19] In interventions providing information, recall of that information has been shown to be important to achieve behaviour change.[20]

We have undertaken two pilot studies that demonstrate the feasibility of the method - Bonetti et al.[17] and a recent study based on simulating an empirically successful intervention.[21] In the latter we investigated the effectiveness of audit and feedback and educational reminder messages in changing simulated x-ray test ordering by general practitioners. Baseline rates of x-ray test ordering were established in a postal survey based upon general practitioners' intentions to request x-rays based upon patient vignettes. GPs were then sent simulated results of any x-rays that they had requested. In addition, they were randomised (within a 2x2 factorial design) to receive or not 'audit & feedback' (comparative group feedback generated from the first round responses) or 'educational messages' on their x-ray result forms. Both interventions were effective in changing behavioural intentions.

#### *Identifying theoretical antecedents to EBP behaviour*

Psychological theories suggest a large number of constructs which might be important in predicting and determining behaviour. In a related study [15] we investigated the value of five constructs derived from three theoretical models (two motivational theories (social cognitive theory and theory of planned behaviour), three action theories (operant conditioning, implementation intentions and self-regulation model) and stage theories) in predicting five prescribing and test ordering behaviours in GPs and GPs.

#### **Aims and objectives of this study**

The aim is to provide a scientific rationale and develop methods, based on theories of behaviour and behavioural change technologies, for the choice of interventions to translate research findings into clinical practice. The objectives are [i] To develop interventions to change beliefs that have already been identified as antecedents to antibiotic prescribing for sore throats and [ii] to experimentally evaluate these interventions to identify those which have the largest impact on behavioural intention and behavioural simulation.

## **Methods**

### **Clinical activity and Setting**

We will use the management of uncomplicated sore throat in general practice as the clinical focus for this work. Symptoms of upper respiratory tract infections are common presenting features in primary care. They are frequently treated with antibiotics and research evidence is clear that antibiotic treatment offers little or no benefit to otherwise healthy adult patients. Prudent use of antimicrobials in humans has been identified by the Department of Health as a key factor in the control of antimicrobial resistance. We have information on the salient beliefs of general practitioners that distinguish those who intend to prescribe from those who do not. [16]

### **Participants**

Participants will be general medical practitioners. We will develop a sampling frame from lists of general practitioners (GPs) supplied by Primary Care Groups in the North East of England. We will then sample to recruit sufficient general practitioners for the sample size of the experiments.

### **Design**

We will select and develop two interventions designed to address the discriminant beliefs in the prescribing of antibiotics for sore throat. These will be evaluated in a 2x2 factorial randomised controlled trial delivered in a postal questionnaire survey.

## **Interventions**

Our previous work [16] has identified eight discriminant beliefs that distinguish between GPs who do (intenders) and do not intend (non-intenders) to prescribe antibiotics for patients with uncomplicated sore throat (Table 2); these will be the target of the interventions. The interventions will be chosen by identifying behaviour change technologies that target these theoretical antecedents.

### *Outcome measurement*

Two outcome measures will be assessed, behavioural intention and behavioural simulation.

*Behavioural intention:* We will measure behavioural intention using the standard methods used in investigations based on the theory of planned behaviour i.e. using rating scales of likelihood, frequency or agreement with statements or questions about intention (e.g. Out of the next 10 patients you see with acute sore throat, how many do you intend to prescribe antibiotics for? Score 0 – 10).

*Behavioural simulation:* Participants will be asked to respond to written scenarios describing patients presenting with sore throat in general practice. The scenarios will reflect the range of patients and clinical features that present in general practice informed by qualitative work conducted in our previous work.[16] Participants will be asked to write on a simulated set of notes the relevant management they would use.

### *Process measurement*

We will examine whether the interventions affect the discriminant antecedents (Table 2) identified in the previous theory of planned behaviour study. We have piloted these methods successfully.[16, 21] The results will be explored using mediational analyses[22] to ascertain the extent to which these antecedent beliefs mediated effects on outcomes within these experiments. Where possible the measurement will be made on two occasions, with these process measures assessed both before and following the intervention.

### *Delivering the modeling experiment*

The experimental materials will be delivered by post. The experiment will be embedded within a questionnaire survey which will be administered on two occasions, once before the intervention and once immediately following the intervention. Based on our previous experience, we plan that subjects will receive a letter of invitation, a set of instructions, and individually packaged set of materials for measuring behavioural simulation and intention which they will be asked to read in this order. On the second occasion they will also receive the intervention which they will be asked to open prior to completing the process and outcome measures. Two reminders will be mailed to non-responding clinicians. In the light of our experience of the response rate in our previous study [21] we plan to offer a £10 incentive to each subject to increase response rates.[23;24]

### *Sample size and Analysis*

In a “Definitive Trial” there is inherent variability in the number of patients who consult with each condition and the characteristics of these patients vary from doctor to doctor and from year to year. By giving all subjects in the experiment the same context in which to examine behavioural intention we have eliminated these two sources of variation. Therefore if we use the same outcome in both the trial and in the intervention modeling experiment we would expect its standard deviation to be smaller in the IME than in the trial. Thus a given shift in outcome (difference between two groups) represents a much larger effect size (difference in outcome divided by the standard deviation) in the IME than in the trial. Thus if a trial were to produce a moderate effect size we might expect a large effect size in the IME. The IME will be powered to detect difference between each of the active intervention groups and the control group. Using standard methods for a continuous outcome, we need 50 subjects per group to have 80% power of detecting an effect size of 0.8 using a significance level of 2.5% giving a total sample size of 200 for the experiment. We will over-sample to ensure achieving this final sample size, using an initial sample of 800. This will be adjusted in the light of the impact of the incentive. Groups will be compared using methods appropriate for comparing

independent samples (t-tests to compare two groups, analysis of covariance to compare groups adjusting for differences in baseline performance).

### **Ethics approval**

The study has ethical approval from the Northern and Yorkshire Multi-Centre Research Ethics committee. (REC Reference: 05/MRE03/11).

### **Competing interests**

None declared.

### **Authors' contributions**

All authors contributed to the conception and design of the study and approved the submitted draft.

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## Reference List

- [1] Smith WCS, Lee AJ, Crombie IK, Tunstall-Pedoe H. Control of blood pressure in Scotland: the rule of halves. *BMJ* 1990;300:981-3.
- [2] Eccles M, Bradshaw C. Use of secondary prophylaxis against myocardial infarction in the North of England. *BMJ* 1991;302:91-2.
- [3] Ketley D, Woods KL. Impact of clinical trials on clinical practice: example of thrombolysis for acute myocardial infarction. *Lancet* 1993;342:891-4.
- [4] Woods KL, Ketley D, Lowy A, Agusti A, Hagn C, Kala R, et al. Beta-blockers and antithrombotic treatment for secondary prevention after acute myocardial infarction. *Eur Heart J* 1998;19:74-9.
- [5] Chassin MR, Brook RH, Park RE, Keeseey J, Fink A, Kosecoff J, et al. Variations in the use of medical and surgical services by the Medicare population. *N Engl J Med* 1986;314(5):285-90.
- [6] Lee AJ, Huber JH, Stason WB. Factors contributing to practice variation in post-stroke rehabilitation. *Health Serv Res* 1997;32(2):197-221.
- [7] Winslow CM, Solomon DH, Chassin MR, Kosecoff J, Merrick NJ, Brook RH. The appropriateness of carotid endarterectomy. *N Engl J Med* 1998;318(12):721-7.
- [8] Bero L, Grilli R, Grimshaw JM, Harvey E, Oxman AD, Thomson MA. Closing the gap between research and practice: an overview of systematic reviews of interventions to promote implementation of research findings by health care professionals. *BMJ* 1998;317:465-8.
- [9] Oxman AD, Thomson MA, Davis DA, Haynes B. No magic bullets: a systematic review of 102 trials of interventions to improve professional practice. *Can Med Assoc J* 1995;153(10):1423-31.
- [10] Grimshaw JM, Shirran L, Thomas RE, Mowatt G, Fraser C, Bero L, et al. Changing provider behaviour: an overview of systematic reviews of interventions. *Med Care* 2001;39(Suppl 2):II-2-II-45.
- [11] Medical Research Council. A framework for development and evaluation of RCTs for complex interventions to improve health. 2000.
- [12] Ferlie EB, Shortell SM. Improving the quality of health care in the United Kingdom and the United States: a framework for change. *The Milbank Quarterly* 2001;79(2):281-315.
- [13] Petty RE, Wegener DT, Fabrigar LR. Attitudes and attitude change. *Annu Rev Psychol* 1997;48:609-47.
- [14] Wood W. Attitude change: persuasion and social influence. *Annu Rev Psychol* 2000;51:539-70.
- [15] Walker A, Grimshaw JM, Johnston M, Pitts N, Steen N, Eccles MP. PProcess modelling in ImpleMEntation research: selecting a theoretical basis for interventions to change clinical practice. *BMC Health Services Research* 2003;3:22.
- [16] Walker AE, Grimshaw JM, Armstrong EM. Salient beliefs and intentions to prescribe antibiotics for patients with a sore throat. *British Journal of Health Psychology* 2001;6:347-60.

- [17] Bonetti D, Johnston M, Pitts N, Deery C, Ricketts I, Bahrami M, et al. Can psychological models bridge the gap between clinical guidelines and clinicians' behaviour? A randomised controlled trial of an intervention to influence dentists' intention to implement evidence-based practice. *British Journal of Dentistry* 2003;195:602-6.
- [18] Predicting health behaviour. Buckingham: Open University Press; 1996.
- [19] Bandura A. Self-efficacy: the exercise of control. New York: Freeman; 1997.
- [20] Ley P. Communicating with patients: improving communication, satisfaction and compliance. London: Chapman Hall; 1988.
- [21] Bonetti D, Eccles M, Johnston M, Steen IN, Grimshaw J, Baker R, et al. Guiding the design and selection of interventions to influence the implementation of evidence-based practice: an experimental simulation of a complex intervention trial. *Soc Sci Med* 2005;60:2135-47.
- [22] Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol* 1986;51(6):1173-82.
- [23] McColl EM, Jacoby A, Thomas L, Soutter J, Bamford C, Steen IN, et al. Design and use of questionnaires: a review of best practice applicable to surveys of health service staff and patients. *Health Technol Assess* 2001;5(31).
- [24] Halpern SD, Ubel PA, Berlin JA, Asch DA. Randomized trial of \$5 versus \$10 monetary incentives, envelope size, and candy to increase physician response rates to mailed questionnaires. *Med Care* 2002;40:834-9.

**Table 1:** Comparison of the stages in an evaluation of complex interventions to stages of drug evaluation.

<b>Evaluation of drugs</b>	Pre-clinical	Phase I	Phase II	Phase III	Phase IV
<b>Evaluation of implementation strategies</b>	Theory	Modelling	Exploratory trial	Definitive RCT	Long term implementation

**Table 2:** Discriminant beliefs that distinguish between GPs who do (intenders) and do not intend (non-intenders) to prescribe antibiotics for patients with uncomplicated sore throat.

<p><b>Behavioural beliefs</b></p> <ul style="list-style-type: none"> <li>Prescribing an antibiotic for these patients will reduce their risk of developing minor complications such as otitis media and sinusitis</li> <li>Prescribing an antibiotic for these patients is cost efficient</li> <li>Prescribing an antibiotic for these patients will reduce the time taken for their sore throat to resolve</li> </ul> <p><b>Outcome evaluation</b></p> <ul style="list-style-type: none"> <li>The problems of antibiotic resistance for these patients does not concern me greatly</li> </ul> <p><b>Control beliefs</b></p> <ul style="list-style-type: none"> <li>If a patient asks for an antibiotic then I will prescribe one whether it is medically indicated or not</li> <li>I am more inclined to prescribe an antibiotic for patients of a lower social class</li> <li>Because I don't know the cause of these patients' sore throats, I will prescribe an antibiotic so that I don't miss something</li> <li>In most cases, the patient will finish the course of antibiotics I prescribe</li> </ul>
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**Additional files provided with this submission:**

Additional file 1 : TRACII AWARD LETTERS.doc : 321Kb

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