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VARIANCE AND DISSENT

Changing the behavior of healthcare professionals: the use of theory in promoting the uptake of research findings

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Abstract

Objective: The uptake of research findings into routine health care is a haphazard and unpredictable process. The usefulness of the results of implementation studies is limited, due in part to the lack of an underlying framework of the important dimensions of research studies in this area and the healthcare settings within which they are conducted and may subsequently be used.

Study Design and Setting: We explore the role for a theory-based framework and suggest some of the methods that would be needed to operationalize the framework in the context of designing and conducting interventions aimed at improving the use of research findings by individual healthcare professionals or teams.

Conclusions: This research offers a framework for those who would seek to use the results of such studies in routine healthcare settings.

Keywords: Implementation research; Behavior change; Theory

Clinical and health services research is continually producing new findings that may contribute to effective and efficient patient care. Despite the considerable resources devoted to such research, a consistent finding is that the transfer of research findings into practice is unpredictable and can be a slow and haphazard process. Studies in the United States and the Netherlands suggest that about 30% to 40% of the patients do not receive care according to current scientific evidence and that about 20% to 25% of care provided is not needed or is potentially harmful [1]. There are a number of areas of uncertainty in this situation. There are the methodologic problems in producing clear guidance [2,3] and the applicability of guidance to clinical areas [4]. More problematically, there are problems in the concepts underlying attempts to change professional behavior [5].

Implementation research is the scientific study of methods to promote the uptake of research findings and hence to reduce inappropriate care [6]. It includes the study of influences on healthcare professionals' behavior and methods to enable them to use research findings more effectively.

There have been a number of reviews of implementation research [7–10] that have consistently shown that the majority of interventions can achieve moderate improvements in care with considerable variation in the observed effects within and across interventions. Because few studies provided any rationale for their choice of intervention and only limited contextual data, there may be important differences in the context and barriers between studies that assessed supposedly homogenous interventions; for example, the characteristics of behavior (a simple behavior or a complex one, increasing a desirable behavior or decreasing an undesirable one) may be an effect modifier as may the attributes of recommendations [11–13].

The UK Medical Research Council has proposed a framework for the development and evaluation of complex interventions [14], such as interventions designed to enhance the uptake of research findings. This framework recognizes the need to establish the theoretical basis of interventions and undertake exploratory studies to choose and refine interventions. This optimizes interventions to be evaluated in definitive trials and increase understanding of the generalizability

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Table 1
Stages in evaluation

Evaluation of drugs	Pre-clinical	Phase I	Phase II	Phase III	Phase IV
Evaluation of implementation strategies	Theory	Modeling	Exploratory trial	Definitive randomized control trial	Long-term implementation

of the findings of such studies. Using this framework, Table 1 compares the stages in the evaluation of complex interventions to stages of drug evaluation.

Although it provides an idealistic framework for evaluating complex interventions, reviews of implementation studies [10] suggest that the "Definitive RCTs" reviewed have not undergone preclinical/theory, modeling/phase I, and exploratory/phase II phases, building instead on investigator interpretation of other empirical studies. Thus, the current position in implementation research is akin to exploring the clinical role of an antihypertensive drug (1) without any understanding of the pharmacology of the drug, the physiology of blood pressure control, or the pathophysiology of hypertension and (2) without phase I trials of the pharmacodynamics of the drug in animal models or healthy human volunteers. This is an expensive version of trial-and-error, with no a priori reason to expect success or to have confidence of being able to replicate success if it is achieved.

Generalizing from the findings of these studies to routine healthcare settings is problematic because of our limited understanding of the characteristics of the targeted behavior, professionals, and environment that might influence the effectiveness of different interventions. Thus, for those working in a service delivery setting, they provide little information to guide the choice or optimize the components of such complex interventions in practice. This is problematic because all healthcare systems have limited resources for their activities, including implementation, and they need to understand what will best achieve their intended effect, how this will happen, over what time period, and at what cost.

1. Toward a theoretical framework

The assumption that clinical practice is a form of human behavior and can be described in terms of general theories relating to human behavior offers the basis for a generalizable model. Factors mediating the effectiveness of interventions could include the attitudes of the healthcare professional or their perceived ability to control generalizable concepts that can be used across different interventions, settings, and individuals.

A theory is "a coherent and non-contradictory set of statements, concepts or ideas that organises, predicts and explains phenomena, events, behavior, etc." [15]. Theories are prominent in the social sciences (psychology, sociology) and are commonly used in clinical medicine to organize understanding of basic and clinical sciences. For instance, in the field of general medicine, phase I and II drug trials are the definitive test of a number of inter-related theories from physiology (enzymatic function), pathology (disease pathways), and pharmacology.

2. Description or explanation?

There are many theories from a range of disciplines that describe behavior and behavior change [16–19]. However, there are few that explain behavior change. Although descriptive theories can be helpful in anticipating situations and processes, such theories may not explain what determines change or may identify determinants that are not modifiable (e.g., age, intelligence). When one needs to reliably produce change, it is important to work with theories that explain change and how it can be effected. Therefore, theories that identify modifiable predictors or explain how to change behavior are most likely to be useful in implementation research.

3. Current use of theory in implementation research

Within the most recent review of guideline implementation [10], the authors of included studies provided an explicit theoretical rationale for their intervention in less than 10% of studies [20]. Given this absence of a theoretical underpinning and interventions attempting to explicitly and prospectively modify theoretical constructs, it is difficult to interpret why interventions have had positive or negative effects. For example, social cognition theories [19] suggest that audit and feedback is an effective behavior change intervention only in motivated populations who have agreed that the change in behavior is desirable; its application as a one-size-fits-all intervention has produced only a limited effect [21].

4. Choosing theories

Ferlie and Shortell [22] have suggested four levels at which interventions to improve the quality of health care might operate: (1) the individual health professional, (2) health care groups or teams, (3) organizations providing health care (e.g., NHS trusts), and [4] the larger health care system or environment in which individual organizations are embedded. Different theories may be relevant to interventions at different levels; for example, theories of individual behavior are more relevant to interventions directed at individuals and teams, whereas theories of organizational change may 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.

Given the large number of potentially relevant theories [16], it is helpful to have a rationale for choosing between them. In Box 1 we suggest a number of desirable attributes of theories explaining behavior change at the level of the individual healthcare professional or healthcare groups or teams.

4.1. How to use theories

Although there are a number of methods for using theory in designing and understanding the impact of implementation interventions, we offer an illustration of how we have approached using theory when looking at individual or team behaviors. There are two possible ways to use theory that are inter-related and build on each other. One is to develop an understanding of the theory-based factors that underlie clinical practice to identify the processes, or theoretical constructs, that are important in current patterns of care and therefore should be the appropriate target of an implementation intervention. The second follows on from this and is to develop and test interventions knowing what theoretical constructs are being targeted and design interventions to enhance the processes supporting change in them.

4.2. Theory-based factors underlying clinical practice

When working to change individual behavior, relevant theories can be drawn from health psychology and may be categorized in groupings such as motivational theories (which explain how individuals come to wish/intend/decide to change behavior), action theories (which explain how individuals move from intention to actual behavior change), and stage theories (which propose an orderly progression through discrete stages toward behavior change). Having identified theories to work with, there are a series of steps to apply them to healthcare settings. For some theories, there are standard methods of measuring constructs and developing measurement scales [23]. To identify which theoretical constructs predict clinical practice, these variables have to be used to predict motivational or behavioral outcomes. Examples of how theories could be developed in this way are shown in Table 2, and the sort of information that it produces is shown in Box 2.

In some circumstances it may be possible only to measure dependent variables that are theoretically proposed to mediate between predictor variables and actual behavior (e.g., behavioral intention). Given the current limited state of empirical testing of any theory with healthcare professionals, it is more informative to measure actual behavior whenever this is possible.

In an ideal situation, the sequence of stages in the development and evaluation of an intervention would follow those in Table 1. There are exceptions to this, such as the need to evaluate a preformed intervention that is going to be disseminated and would not otherwise be rigorously evaluated. In this situation, a trial can be conducted but with theory-based measures forming an integrated evaluation of the process to allow a better understanding of the main trial results. For example, in a trial of the implementation of guidelines for third molar extractions, theory-based measures offered an explanation of the lack of success of the interventions [24]. On the one hand, the interventions had enhanced knowledge, but knowledge did not predict evidence-based practice; on the other, the interventions had not changed the beliefs that actually did predict evidence-based practice. If such methods are routinely used before and after the delivery of interventions in implementation trials, they allow an understanding of whether or not the interventions have changed the underlying theoretical constructs, providing a view into

Box 1. Desirable attributes of theories explaining behavior change at the level of the individual healthcare professional or healthcare groups or teams

1. They should have demonstrated effectiveness in predicting and explaining behavior change in other settings (e.g., health promotion in community populations).
2. They should explain behavior in terms of factors that are changeable (e.g., knowledge, beliefs, attitudes, motivation, actual or perceived external constraints). Some factors are difficult or impossible to change (e.g., age, personality, and intelligence), even though they may be important modifiers of behavior.
3. They should include nonvolitional components (i.e., they should assume that individuals working in healthcare do not always have complete control over their actions and allow an examination of the influence of individuals' perceptions of external factors, such as patient preferences or organizational barriers and facilitators, on their behavior).

Table 2
Example of using theory

Theory of planned behavior	
Theoretical constructs	Behavioral intention, perceived behavioral control, attitude toward the behavior and subjective norm
Measures	The strength of behavioral intention, perceived behavioral control, attitude toward the behavior and subjective norm (plus the subcomponents of these constructs)
Example questions (scored on Likert scale agree to disagree)	"I feel under social pressure from NHS colleagues to use dental sealants in the next month" (subjective norm); "I would like to avoid prescribing norethisterone for patients, but I don't really know if I can" (perceived behavioral control)
Behavior	Rates of use of dental sealants Rates of prescription of norethisterone

Box 2. A study using the theory of planned behavior to investigate factors associated with prescribing antibiotics for patients with uncomplicated sore throat among general practitioners

Literature reviews, nonparticipant observation, and interviews with general practitioners were used to develop a questionnaire that was distributed to a 1 in 2 random sample of general practitioners in Grampian. Using the Theory of Planned Behavior, we explored the relationships between GPs' beliefs and the strength of their intention to prescribe antibiotics for adult patients presenting with an uncomplicated sore throat. This allowed us to:

- Identify whether GPs intended to prescribe antibiotics for these patients or not. The majority indicated that they intended to prescribe for less than half of patients presenting with uncomplicated sore throat in the next 2 weeks.
- Estimate the overall impact of individual beliefs and perceptions on the strength of their intention to prescribe. Potentially modifiable beliefs accounted for 48% of the variance in GPs' intentions to prescribe.
- Identify the beliefs that had the strongest relationship with behavioral intention
- Identify the beliefs that distinguished GPs who intended to prescribe from those who did not.

(*From* Walker AE, Grimshaw JM, Armstrong EM. Salient beliefs and intentions to prescribe antibiotics for patients with a sore throat. Br J Health Psychol 2001;6:347–60.)

the "black box" of understanding why a trial intervention has or has not worked.

4.3. Designing interventions

Having identified the relevant components of a behavior that should be targeted, the next step is to develop an appropriate intervention. This involves choosing a technology and a method of delivery. There are a number of technologies that have been demonstrated to change behavior (or its antecedents) in other settings and that therefore have a reliable record of effective behavior change, which one can reasonably expect to generalize. Thus, if we are trying to change the underlying process of "beliefs," we could use the technology of reinforcement delivered using audit and feedback. The most consistently successful behavioral methods involve contingent consequences (normally reward) with a subject being rewarded if the behavior is performed appropriately. Other methods that 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 behavior being performed. Most of the behavioral technologies have been developed for use with individuals who have been motivated to seek help with a specific problem and may require some adaptation for use with healthcare professionals who may be unmotivated or even unaware of the desired behavior change.

There are three additional characteristics that are important to consider in addition to the theoretical considerations: (1) plausibility (of the technology and the method of delivery), (2) feasibility (in a development experiment and in service settings), and (3) the efficiency of the method of delivery. Consideration of plausibility may mean that more recognizable methods of delivery (e.g., audit and feedback) are used but that the range of relevant theoretical constructs (e.g., beliefs, social norms) are studied alongside to allow an understanding of what constructs are mediating any effect. Feasibility and efficiency could be explored through considerations such as method of delivery of an intervention (e.g., written materials, interactive DVD) and methods of delivery of the experiment (e.g., postal questionnaire survey, face-to-face interview).

Issues such as these can be systematically explored in modeling experiments where elements of an intervention are manipulated, within a randomized controlled design, in a manner that simulates a real situation as much as possible. In these experiments, interim endpoints (e.g., behavioral intention) are measured rather than changes in professional behavior or healthcare outcome. This offers experimental control and the opportunity to vary elements of an intervention to understand better intervening variables and the effect on different outcomes and to maximize the impact of an intervention before trialling. An example is shown in Box 3.

For the method to be useful, interim endpoints must be predictive of real-world outcomes. This is the case for behavioral intention, self-efficacy, recall, and understanding of information. Behavioral intention and self efficacy have been incorporated into virtually all social cognition models of health behavior as the two best predictors of subsequent

Box 3. Can psychologic models bridge the gap between clinical guidelines and clinicians' behavior? A randomized controlled trial of an intervention to influence dentists' intention to implement evidence-based practice

This study examined the effect of an intervention (rehearsing alternative actions) to change dentists' intention to implement evidence-based practice for third molar (TM) management; evidence-based practice is weighted against TM extraction. Based on behavioral techniques for reducing the frequency of a behavior, increasing the likelihood of an incompatible behavior is a potentially effective method. Rehearsing alternative actions should increase the availability of alternatives to extraction and thus decrease extraction intention.

Community dentists were randomly selected (from the Scottish Dental Practice Board Register), allocated to intervention or control groups, and sent a postal questionnaire within a randomized controlled trial design. The intervention group was asked to list management alternatives to TM extraction before recording their TM extraction intention, and the control group was not.

Dentists in the intervention group had significantly weaker intention to extract third molars than did those in the control group despite similar knowledge of management alternatives.

(From Bonetti D, Johnston M, Pitts N, Deery C, Ricketts I, Bahrami M, Ramsay C, Johnston J. Can psychological models bridge the gap between clinical guidelines and clinicians' behavior? A randomised controlled trial of an intervention to influence dentists' intention to implement evidence-based practice. BDJ, in press.)

health behavior [25]. In interventions providing information, recall of that information has been shown to be important in achieving behavior change [26].

5. Conclusions

We have suggested that the science of implementation research could be significantly improved by a more systematic approach to the use of theory. Although we have illustrated our arguments with examples from psychology, this is not an attempt to deny the importance of other disciplinary perspectives. These arguments form a useful structure for others to elaborate on or to argue against. It is possible that some or all of the steps we have suggested will turn out to be unhelpful or ineffective, but this is a position that should be reached from a process of scientific scrutiny, not scientific neglect.

Once the elements of a framework for study design are in place, it also offers the prospect of a checklist that potential users of the results of such studies can work with to match the important characteristics of their situation and needs (e.g., trying to change hand washing practices in a 200-bed district general hospital) against available evidence. Such a checklist could require knowledge of the nature and complexity of the behavior(s) (hand washing by nurses and doctors), important moderators (the ready availability of soap and towels), the important modifiable mediators of the behavior (e.g., knowledge, attitudes), and the impact of interventions to change these.

Our current level of knowledge and experience of the application of theory in implementation research is limited, and it is important not to underestimate the time and investment that is required to raise implementation research to the level of other clinical sciences. The cycle of development of cognitive behavioral therapy from theory to routine clinical intervention took somewhere between 20 and 80 years, depending on where you draw the start line. The development of a new drug from identifying a novel chemical to launching the drug on the market can take up to 10 years. Because implementation research lives in a policy-relevant context where clinicians, managers, and policy makers may erroneously believe that they already know what is best to do, it will always be prey to the demands for a quick fix and the political solution. Without a coherent attempt to address the issues raised in this article, we can look forward to reaching 2020 knowing little more than we do today.

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