

Systematic review of the effectiveness of stage based interventions to promote smoking cessation

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Abstract

Objective To evaluate the effectiveness of interventions using a stage based approach in bringing about positive changes in smoking behaviour.

Design Systematic review.

Data sources 35 electronic databases, catalogues, and internet resources (from inception to July 2002). Bibliographies of retrieved references were scanned for other relevant publications, and authors were contacted if necessary.

Results 23 randomised controlled trials were reviewed; two reported details of an economic evaluation. Eight trials reported effects in favour of stage based interventions, three trials showed mixed results, and 12 trials found no statistically significant differences between a stage based intervention and a non-stage based intervention or no intervention. Eleven trials compared a stage based intervention with a non-stage based intervention, and one reported statistically significant effects in favour of the stage based intervention. Two studies reported mixed effects, and eight trials reported no statistically significant differences between groups. The methodological quality of the trials was mixed, and few reported any validation of the instrument used to assess participants' stage of change. Overall, the evidence suggests that stage based interventions are no more effective than non-stage based interventions or no intervention in changing smoking behaviour.

Conclusions Limited evidence exists for the effectiveness of stage based interventions in changing smoking behaviour.

Introduction

In the United Kingdom in 1997, more than 11 million adults—about 27% of the adult population—were regular smokers. Over the past five years, the proportion of smokers in the population has stabilised or may even be increasing, as about 25% of 15 year olds are regular smokers.^{1 2}

The risk of disease is reduced after smoking cessation. After only one year of abstinence the excess risk of death related to myocardial infarction and cerebral arterial disease is decreased by one half as is the risk of dying from smoking related disease in those who stop

before the age of 50.³ Treatment for smoking related disease costs the NHS around £1500m (\$2414m; €2095m) annually.¹

Several methods are currently used for smoking cessation, including pharmacological methods, such as nicotine replacement therapy or antidepressants (bupropion), hypnotherapy, and exercise based interventions. Behavioural approaches include stage based interventions, which largely use the transtheoretical model.⁴ This model separates individuals into five different stages: precontemplation, contemplation, preparation, action, and maintenance. Progression through the stages is sequential, although relapse to an earlier stage can occur. The model also recognises 10 processes of change, the theory being that the effectiveness of the different processes of change will vary according to the patient's stage, although this has not always been supported in empirical studies.⁵⁻⁷

Interventions derived from stage theories of behaviour change usually incorporate several key elements. It is necessary to identify accurately an individual's stage of change (or readiness to change), so that an intervention based on stage specific processes of change can be applied. Stage of change needs to be reassessed frequently, and the intervention should reflect changes in the individual's readiness to change. These elements of the intervention are repeated until the individual achieves and maintains the change in behaviour. In this way, stage based interventions evolve and adapt in response to the individual's movement through the stages of change.^{4 8}

Stage based models propose that interventions that take into account the current stage of the individual will be more effective and efficient than "one size fits all" interventions. Services aimed at smoking cessation have made extensive use of the approach. A recent survey on training in smoking cessation in England found that the stages of change model and motivational interviewing were the main topics covered in training courses, as well as the primary theory used to explain behaviour change.⁹ Between April 2001 and March 2002 the UK government's expenditure on smoking cessation services in England was £24.7m.¹⁰

Despite the widespread use of stage based models, evidence on the effectiveness of this approach may be limited. We assessed the available evidence.

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A table of the included studies and references appear on bmj.com

Methods

We searched 35 electronic databases from inception to July 2002 and the internet using several search engines. The bibliographies of retrieved references were scanned for further relevant publications. The authors of abstracts in conference proceedings were contacted for further information.

Eligible for inclusion were randomised controlled trials evaluating the effectiveness of stage based interventions in influencing smoking behaviour, such as actual behaviour change or movement through different stages. No restrictions were applied to participants other than they had to be smokers, and there were no restrictions on language or publication date.

Two reviewers independently assessed the titles and abstracts and then assessed papers against predetermined selection criteria. Data were extracted by one reviewer into structured summary tables and checked by a second reviewer. Extracted data included smoking behaviour, movement through stages, adverse effects, and cost effectiveness. Each included trial was assessed for methodological quality and the quality of the implementation of the intervention.¹¹ Quality assessment was performed by one reviewer and checked by a second reviewer. Disagreements were resolved by discussion. We were unable to carry out pooling because the studies were too heterogeneous for interventions, participants, settings, and outcomes; therefore we present a qualitative synthesis.

Results

We identified 23 randomised controlled trials meeting our inclusion criteria (see bmj.com); two included an

economic evaluation. The methodological quality of the trials varied. We assessed 13 criteria for quality; the number present ranged from two to 12. The main problem with the quality of the implementation was the lack of information about the validity of the instruments used to assess stage of change. This is important because stage based interventions depend on accurate assessment of the stages.

Effectiveness

In eight trials we found statistically significant differences in cessation rate in favour of the intervention group (table). In seven of these the comparator was usual care and in one a non-stage based intervention. In 12 trials we found no statistically significant differences between groups in smoking behaviour after the intervention. In five of these the comparator was usual care, and in eight a non-stage based intervention. In three studies the findings were inconclusive, either because of multiple outcomes, multiple interventions, or multiple assessments.

Only 10 trials reported movement through stages as an outcome. In five trials the comparator was a non-stage based intervention: one trial showed statistically significant effects in favour of the stage based intervention, in one the findings were inconclusive, and in three no statistically significant differences were found between groups. In six trials the comparator was usual care: the findings were inconclusive in two, and in four, no statistically significant differences were found between groups.

The trials reporting positive effects for the stage based interventions were compared in a qualitative way with the remaining trials on several dimensions that could have influenced the findings. These included

Summary results of included studies with interventions aimed at smoking cessation

| Reference | Methodological quality* | Stage based versus non-stage based | | | Stage based versus no intervention | | |
|---------------------------------------|-------------------------|------------------------------------|-----------------|---------------------------|------------------------------------|-----------------|---------------------------|
| | | Mainly significant† | Mixed outcomes‡ | No significant difference | Mainly significant† | Mixed outcomes‡ | No significant difference |
| All interventions | | 1 | 2 | 8 | 7 | 2 | 6 |
| Berman et al 1995 ^{w1} | 4/13 | — | — | Yes | — | — | — |
| Butler et al 1999 ^{w2} | 9/13 | — | Yes | — | — | — | — |
| Cornuz et al 2002 ^{w3} | 12/13 | — | — | — | Yes | — | — |
| DiClemente et al 1991 ^{w4} | 5/13 | Yes | — | — | — | — | — |
| Dijkstra et al 1999 ^{w5} | 6/11 | — | — | Yes | — | — | Yes |
| Emmons et al 2001 ^{w6} | 9/13 | — | — | Yes | — | — | — |
| Etter and Perneger 2001 ^{w7} | 9/13 | — | — | — | Yes | — | — |
| Gritz et al 1993 ^{w8} | 3/13 | — | — | — | — | — | Yes |
| Lennox et al 1998 ^{w9} | 8/13 | — | — | Yes | — | — | — |
| Lennox et al 2001 ^{w10} | 7/13 | — | — | Yes | — | — | Yes |
| Morgan et al 1996 ^{w11} | 5/13 | — | — | — | Yes | — | — |
| Pallonen et al 1994 ^{w12} | 2/12 | — | — | — | Yes | — | — |
| Pallonen et al 1998 ^{w13} | 6/12 | — | — | Yes | — | — | — |
| Pieterse et al 2001 ^{w14} | 8/13 | — | — | — | Yes | — | — |
| Pletsch 2002 ^{w15} | 6/13 | — | — | — | — | — | Yes |
| Prochaska et al 2001 ^{w16} | 5/13 | — | — | — | Yes | — | — |
| Prochaska et al 2001 ^{w17} | 5/13 | — | — | — | — | Yes | — |
| Reeve et al 2000 ^{w18} | 3/13 | — | — | Yes | — | — | — |
| Resnicow et al 1997 ^{w19} | 7/13 | — | — | Yes | — | — | — |
| Sinclair et al 1999 ^{w20} | 3/13 | — | — | — | — | — | Yes |
| Stotts et al 2002 ^{w21} | 6/13 | — | — | — | — | Yes | — |
| Tappin et al 2000 ^{w22 w24} | 8/13 | — | — | — | — | — | Yes |
| Wang 1994 ^{w23} | 6/13 | — | Yes | — | Yes | — | — |

*Maximum score for the 13 items is 11 or 12 if blinding of care providers, participants, or both, not applicable.

†Mainly significant outcomes in favour of stage based intervention.

‡Either one stage based intervention showed significant effects and another stage based intervention did not; some behavioural outcomes showed significant effects in favour of stage based intervention and others did not; or analyses were not conclusive.

methodological quality, number, mean age and sex of respondents, type of respondents, year of publication, setting, and type of outcome measures. Larger studies and studies that relied on smoking status being self reported tended to report more positive outcomes of the stage based interventions. For studies that compared a stage based intervention with a non-stage based intervention, more recent studies were less likely to report positive outcomes. None of the other factors differed between studies that reported positive outcomes of stage based interventions and studies that failed to find positive effects. Studies that compared a stage based intervention with usual care, studies of a higher quality, studies that were set in the community, or studies where participants were male, volunteers, or aged between 30 and 60 years tended to report more positive effects in favour of stage based interventions. The usefulness of this information is not clear, however, as these findings may have resulted from chance, because of the small number of studies in each group.

Cost effectiveness and stage assessment

Two trials included an economic evaluation. In a 1999 study evaluating the effects of motivational consulting delivered by general practitioners, the marginal cost per person who quit was estimated at £450.65, which could fall to an extreme of £265.00 with increased use. In another 1999 study, in which pharmacists provided tailored advice on smoking cessation, the incremental cost effectiveness ratio for the intervention was estimated at £300.00 per person who quit.

Only two trials evaluating stage based interventions reported information on the validation of the instrument used to assess stage of change. The level of validation of the instruments was limited both for internal reliability and construct validity.

Discussion

Despite the widespread and uncritical use of stage based interventions in smoking cessation, we found only limited evidence for their effectiveness.^{12 13} This could be due in part to problems with the way in which stage based interventions have been used or implemented in practice rather than to problems with the model. Studies with positive outcomes may have utilised more fully the processes of change within their design. However, the studies included in our review provided little evidence to support this assumption. Similarly, participants' degree of exposure to the intervention did not seem to be related to the effectiveness of the intervention either.

From a theoretical perspective, the effectiveness of any stage based intervention depends on accurate classification of a participant's particular stage of change. However, only two of the 23 included trials used a previously validated instrument, and the level of validation was limited.

Many of the included studies provided only a limited description of the content of the intervention, making it difficult for us to determine if, how, and to what extent stages of change were used in tailoring the intervention. In particular, it was unclear whether the intervention was tailored to a participant's particular stage of change.

What is already known on this topic

The health hazards of smoking are significant and well established

It costs the NHS around £1500m a year to treat patients with smoking related disease

Stage based interventions are widely used in smoking cessation in England

What this study adds

Limited evidence exists for the effectiveness of stage based interventions when compared with non-stage based or no interventions in changing smoking behaviour

Finally, the duration of follow up may have been inadequate to assess changes in movement through stages or smoking behaviour. Twelve of the studies lasted between three and nine months, whereas the action stage was often defined as having quit smoking within the past six months and the maintenance stage as having quit smoking more than six months previously.

Conclusion

Although there is a substantial volume of research focusing on stages of change, much of it does not address the effectiveness of the approach in changing smoking behaviour. Studies that have evaluated effectiveness have often used designs that are not optimal for establishing evidence of effect. There is a need for methodologically sound and theoretically consistent intervention studies to assess adequately the efficacy of stage based approaches to changing smoking behaviour.

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