Changing attitudes to infection management in primary care: a controlled trial of active versus passive guideline implementation strategies

CWR Onion and CA Bartzokas*


Background and objectives. When attempting to implement evidence-based medicine, such as through clinical guidelines, we often rely on passive educational tactics, for example didactic lectures and bulletins. These methods involve the recipient in relatively superficial processing of information, and any consequent attitude changes can be expected to be short-lived. However, active methods, such as practice-based discussion, should involve recipients in deep processing, with more enduring attitude changes. In this experiment, the aim was to assess the efficacy of an active strategy at promoting deep processing and its effectiveness, relative to a typical passive method, at changing attitudes between groups of GPs over 12 months across an English Health District.

Methods. All 191 GPs operating from 69 practices in the Wirral Health District of North-west England were assigned, with minimization of known confounding variables, to three experimental groups: active, passive and control. The groups were shown to have similar learning styles. The objective of the study was to impart knowledge of best management of infections as captured in a series of locally developed clinical guidelines. The passive group GPs were given a copy of the guidelines and were invited to an hour-long lecture event. The GPs in the deep group were given a copy of the guidelines and were invited to engage in an hour-long discussion about the guideline content at their own premises. The control group received neither the guidelines nor any educational contact regarding them. Three months before and 12 months after the interventions, all GPs were sent a postal questionnaire on their preferred empirical antibiotic for 10 common bacterial infections. The responses were compared in order to ascertain whether increased knowledge of best clinical practice was evident in each group.

Results. Seventy-five per cent (144/191) of GPs responded to the pre-intervention questionnaire, 62% (119/191) post-intervention. Thirty-four per cent (22/64) of GPs in the passive group attended the lecture; 91% (60/66) of the active group engaged in discussion at meetings with the authors. A significantly higher proportion of the active group participants’ speaking time, during a sample of four visits, was devoted to verbal indicators of active processing than the passive group lecture attenders (difference = 55%, Fisher’s exact test \( P = 0.002, \ OR = 11.5, \ 95\% \ CI \ 2.1–113.4 \)). Inter-observer agreement on the classification of the verbal evidence was highly statistically significant for all classes (Pearson’s product moment correlation, \( P < 0.0005, r = +0.893 \) to +0.999) except repetition (\( P > 0.05, r = +0.407 \)). Median compliance of responses with the guidelines improved by 2.5% within the control group and 4% within the passive, but by 23% within the active. The difference between the changes in the active and control groups was highly statistically significant at 17.5% (Mann–Whitney test, \( P = 0.004, \ 95\% \ CI \ 6–29\% \)). However, for the 10 infections, the median difference between the changes in the passive and control groups was not significant at 3% (\( P = 0.75, \ 95\% \ CI \ -8 \) to +12). The median difference between changes in the active and passive groups was significant at 17% (\( P = 0.015, \ 95\% \ CI \ 7–24\% \)) in favour of the active.

Received 20 August 1997; Accepted 3 November 1997. Wirral Health Authority, St Catherines Hospital, Church Road, Tranmere, Birkenhead, Wirral, L62 0LQ and *Wirral Hospital NHS Trust, Clatterbridge Hospital, Bebington, Wirral, L63 4JY.
Discussion. An active educational strategy attracted more participation and was more effective at generating deep cognitive processing than a passive strategy. A large improvement, lasting for at least 12 months, in attitude-compliance with guidelines on the optimal treatment of infections was imparted by the active processing method. A typical passive method was much less popular and had an insignificant impact on attitudes. The findings suggest that initiatives aiming to implement evidence-based guidelines must employ active educational strategies if enduring changes in attitude are to result.

Keywords. Clinical guidelines, general practice, implementation, infection, medical education.

Introduction

When attempting to implement improvements in medical practice in a district we tend to employ educational strategies that rely almost exclusively on passive transmission of information. These are associated with superficial cognitive processing of the information by the recipients (shallow, sensory appraisal). Publication of clinical guidelines, bulletins and didactic lectures for example, aims at educating recipients who tend to remain uninvolved with the process. Superficial persuasion of this sort is followed by attitudes that are short-lived, susceptible to change and unlikely to be followed by consistent changes in practice. However, passive educational methods are relatively familiar, inexpensive and effortless to participate in and organize—they therefore remain popular.

An alternative strategy relies upon active education entailing deep processing of the information (where messages are related to previous knowledge and experience). Tactics such as ‘small group work’, ‘problem-based learning’ and academic detailing actively involve participants in elaborating on issues, for example to develop their own novel thoughts and re-organization of knowledge. Deep appraisal is followed by attitudes that endure, are resistant to counter-persuasion and are more likely to be followed by consistent changes in practice. However, active educational methods are relatively challenging and expensive, and require greater effort to participate in and organize—they therefore tend to be popular only with more enthusiastic practitioners.

Practice-based educational introductions of guidelines have been shown to improve diabetic care, and practice-based initiatives have been shown to be more effective than conferences at changing primary care physicians’ behaviour. We contend that it is the effortful thinking of the participant, rather than the effort of the educationalist, that brings about a clearer understanding in these situations. ‘Involvement’ of intended users in guideline development is known to improve compliance, though it is recognized that effective educational guideline implementation strategies are poorly understood in the UK and more research into this area is required.

Infection, being a complex and diverse set of conditions that pervades every aspect of clinical practice, was selected as a field to test the effectiveness of two educational strategies at implementing scientific recommendations in primary care.

We were interested to see if implementing clinical guidelines by an active educational method would result in deeper cognitive processing and more enduring attitudes than would the more usual passive approach. This paper summarizes a year-long controlled study comparing the relative effectiveness of a reproducible active and a typical passive educational strategy for guideline implementation across an English Health District.

Method

(i) GPs

In 1993 in Wirral, a North-western English health district, 191 primary care physicians, GPs, operated from 69 practices. The latter were randomly assigned to three experimental groups: control, active and passive. With many factors likely to affect attitudes to learning and prescribing behaviour—including organizational, local morbidity and social deprivation, and prior prescribing behaviour—stratification and randomization were not feasible; therefore a process of minimization was employed. In minimization, each individual was allocated in turn to the group that tended to result in the best marginal balance of factors. One practice, that of the local clinical tutor, was excluded because of his involvement in the design of this study. The final distribution of practitioners and practices is shown in Table 1.

Minimization would distribute any unknown confounding factors haphazardly; so to confirm that the resulting groups had similar educational characteristics, a standard ‘learning styles’ questionnaire that explored educational preferences in terms of context and content was distributed to all GPs in the district. The response rate was 63% and confirmed that the group mean learning style characteristics were similar, as displayed in Figure 1.
TABLE 1 Distribution of likely confounding variables amongst general medical practitioners and practices in the three experimental groups, following randomization with minimization

<table>
<thead>
<tr>
<th>Variable</th>
<th>Experimental groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
</tr>
<tr>
<td>(GPs) Number of practices</td>
<td>(61)</td>
</tr>
<tr>
<td>Practice organization factors (differing internal and external pressures)</td>
<td></td>
</tr>
<tr>
<td>Single-handed practice</td>
<td>6</td>
</tr>
<tr>
<td>Fund-holding practice*</td>
<td>7</td>
</tr>
<tr>
<td>Training practice</td>
<td>5</td>
</tr>
<tr>
<td>Geographical factors (differing local social deprivation and morbidity)</td>
<td></td>
</tr>
<tr>
<td>Locality A</td>
<td>3</td>
</tr>
<tr>
<td>Locality B</td>
<td>3</td>
</tr>
<tr>
<td>Locality C</td>
<td>4</td>
</tr>
<tr>
<td>Locality D</td>
<td>4</td>
</tr>
<tr>
<td>Locality E</td>
<td>3</td>
</tr>
<tr>
<td>Locality F</td>
<td>5</td>
</tr>
<tr>
<td>Historical factors (prior prescribing tendency of practices, relative to the District mean prescribing rate and mean prescription net ingredient cost)</td>
<td></td>
</tr>
<tr>
<td>Low volume, high cost</td>
<td>7</td>
</tr>
<tr>
<td>Low volume, low cost</td>
<td>6</td>
</tr>
<tr>
<td>High volume, high cost</td>
<td>3</td>
</tr>
<tr>
<td>High volume, low cost</td>
<td>6</td>
</tr>
</tbody>
</table>

* In 'fund-holding' practices the practitioners are responsible for the financial management of health care budgets allocated to them by the Health Authority.

An intrinsic assumption was that the higher the knowledge of the guidelines, the better was the standard of clinical practice.

(ii) Experimental design and interventions

Passive group. Each of the 64 practitioners received a copy of the guidelines and was invited to attend lectures by a Senior Lecturer in Medical Microbiology and a Senior Lecturer in Clinical Pharmacology from the University of Liverpool. The lectures took place 1 month after the distribution of the guidelines.

Two 20-minute-long didactic lectures were delivered sequentially, followed by 20 minutes' opportunity for questions and answers. This intervention did not exceed 60 minutes. The intention was to provide a realistic and typical passive educational event.

Active group. Each of the 66 practitioners in this group also received a copy of the guidelines. However, rather than being invited to attend lectures, they were instead offered visits by the authors at their own premises. The visits were completed within 12 weeks of the guidelines distribution.

During a 60-minute face-to-face discussion, rather than promoting two or three specific therapeutic changes, as described in classical academic detailing methods, the educators encouraged the participants to:

- examine the relevance of the guidelines to their daily practice;
- recognize their personal responsibility to pursue best practice;
- and then to direct discussion toward relevant infection topics.

This intervention was designed to motivate practitioners to engage in an effortful appraisal of the guidelines, in the light of their experience and knowledge. The intention was to provide a reproducible active educational event with full participation.

Control group. The 61 practitioners in this group were neither furnished with the guidelines, nor invited to any lecture, nor were they visited, or contacted in any way, by the investigators during the period of study. This group would establish background changes to which any effect of the interventions would be superimposed.

![Figure 1 Preferred learning styles in the three groups; the patterns are similar](image)
TABLE 2 Percentage of GPs giving responses to questionnaires on the treatment of common infections, compliant with the Wirral guidelines, 3 months before and 12 months after the passive and active educational interventions

<table>
<thead>
<tr>
<th>GP group</th>
<th>Treatment</th>
<th>Control</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before</td>
<td>After</td>
<td>Change</td>
<td>Before</td>
<td>After</td>
<td>Change</td>
<td>Before</td>
<td>After</td>
<td>Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bronchopneumonia</td>
<td>Co-amoxiclav</td>
<td>51</td>
<td>67</td>
<td>16</td>
<td>52</td>
<td>60</td>
<td>8</td>
<td>31</td>
<td>71</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lobar pneumonia</td>
<td>Co-amoxiclav</td>
<td>51</td>
<td>50</td>
<td>-1</td>
<td>48</td>
<td>58</td>
<td>10</td>
<td>38</td>
<td>66</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cellulitis</td>
<td>Flucloxacillin</td>
<td>20</td>
<td>42</td>
<td>22</td>
<td>40</td>
<td>44</td>
<td>4</td>
<td>49</td>
<td>77</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinusitis</td>
<td>Co-amoxiclav</td>
<td>27</td>
<td>14</td>
<td>-13</td>
<td>18</td>
<td>36</td>
<td>18</td>
<td>6</td>
<td>31</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute otitis media</td>
<td>Aminopenicillin</td>
<td>55</td>
<td>50</td>
<td>-5</td>
<td>58</td>
<td>62</td>
<td>4</td>
<td>51</td>
<td>74</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cystitis</td>
<td>Trimethoprim</td>
<td>69</td>
<td>81</td>
<td>12</td>
<td>76</td>
<td>87</td>
<td>11</td>
<td>71</td>
<td>94</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bronchitis</td>
<td>Co-amoxiclav</td>
<td>20</td>
<td>28</td>
<td>8</td>
<td>36</td>
<td>38</td>
<td>2</td>
<td>33</td>
<td>54</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tonsillitis</td>
<td>Penicillin V</td>
<td>80</td>
<td>86</td>
<td>6</td>
<td>80</td>
<td>84</td>
<td>4</td>
<td>69</td>
<td>86</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastro-enteritis</td>
<td>No antibiotic</td>
<td>92</td>
<td>86</td>
<td>-6</td>
<td>90</td>
<td>73</td>
<td>-17</td>
<td>89</td>
<td>91</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impetigo</td>
<td>Mupirocin +/- Flucloxacillin</td>
<td>18</td>
<td>14</td>
<td>-4</td>
<td>12</td>
<td>16</td>
<td>4</td>
<td>27</td>
<td>23</td>
<td>-4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Median change

2.5        4        23

(iii) Assessment of depth of processing
Examinations of recordings of remarks during a sample of four of the visits and of the lecture event were examined for verbal evidence of depth of processing among the recipients. ‘Novel statements’, expressing thoughts beyond the content of messages received, and ‘rephrasing’ of received information both suggested that examination of the deeper and wider meaning of the issues had taken place—this required deep cognitive processing. Conversely, simple ‘repetition’, and other simple ‘relevant’ or ‘irrelevant’ statements suggested that only the superficial characteristics of messages had been considered. The proportion of participants’ statements that were novel or rephrasings was measured for both groups by two independent research psychologists.

(iv) Attitude assessment
Three months prior to distribution of the guidelines to the two intervention groups, for all the GPs, the preferred empirical antibiotic treatment for 10 common bacterial infections was ascertained by questionnaire. Twelve months post-intervention, the same questionnaire was forwarded again to practitioners in all groups, to ascertain whether increased compliance of attitudes with the guidelines practice was evident.

The first-line empirical treatment recommended in the guidelines for each of 10 common infections is shown in Table 2.

Results
The following analyses take a collective, supra-practice perspective and examine changes in the experimental groups rather than in individual practices or practitioners.

Most GPs in the active group [91% (60/66)] responded to written and telephoned offers of a visit to engage in discussion with the authors about the guidelines. However, only a minority of the passive group GPs [34% (22/64)] responded to similar written and telephoned invitations to attend an hour’s lecture meeting.

Depth of processing during intervention
In the sample of four active group practices visits recorded, 70% (46/66 minutes) of the time during which participants spoke during visits was devoted to verbal indicators of deep processing (novel statements or rephrasing of statements). In the passive group’s lecture intervention 15% (2/12 minutes) of the participants’ time spent speaking was devoted to verbal indicators of deep processing. The difference in proportion statements indicating deep processing was significant (55%; Fisher’s exact test; P = 0.002, OR = 11.5, 95% CI 2.1–113.4).

Inter-observer agreement on the classification of the verbal evidence was highly statistically significant for all classes (Pearson’s product moment correlation,
Changing attitudes to infection management

103

\[ P < 0.0005, r = +0.893 \text{ to } +0.999 \text{) except repetition (} P > 0.05, r = +0.407 \].

ii) Attitude changes
Seventy-five per cent of all GPs (144/191) responded to the pre-intervention questionnaire—3 months before; and 62% (119/191) post-intervention—12 months after.

Twelve months following the interventions, the questionnaire responses of all GPs were compared with those before the interventions in order to ascertain any increased knowledge of best practice in the management of 10 common infections (Table 2).

The median change in the active group was statistically highly significantly higher than that of the control (20.5%, Mann–Whitney U test; two-tailed \( P = 0.004 \); 95% CI 6–29). Median change in the passive group however, was not significantly different from that of the control (1.5%, \( P = 0.75 \); 95% CI −8 to +12), but was significantly less than the active group change (19%, \( P = 0.02 \); 95% CI 7–24).

The study was designed to examine group effects and had insufficient power to study the effects of subgroups. However, for the sake of curiosity, the change in the subset of the passive group who attended the lecture and had completed both questionnaires was examined (eight individuals) and at a median 5% [inter-quartile (IQ) range −10 to +30] was similar to that experienced in the group as a whole (median 4%, IQ range −3.5 to +10.25), although no statistical significance can be ascribed.

When the active group was compared with the control and passive groups to ascertain response compliance with the guidelines for specific infections, the greatest improvement in knowledge was displayed in the treatment of lower respiratory infections, cellulitis, sinusitis, acute otitis media, cystitis and urinary tract infections (Table 2).

Discussion
We have demonstrated that if, during an hour’s discussion, GPs are motivated to participate in an active and thoughtful comparison of proposed guidelines with their own experience, and, during this process, they can satisfy themselves of the validity of the guidance, they are more likely to hold guideline-compliant opinions about relevant issues for at least a year—in this study, the management of infections. In contrast, recollection of the guidance by GPs in the passive group, who attended a lecture, was indistinguishable from that of their colleagues in the control group, who had the benefit of neither discussion nor lecture.

There are many confounding factors operating in general practice and it was crucial to balance these factors between the groups; with the use of a larger population of practices, randomization with stratification would have achieved this. However, with only 69 subjects and 15 stratification categories, stratification was impractical, and pure randomization was likely to create imbalances between the groups. Minimization, an allocation method often employed in small clinical trials, was a practical method of marginal assignment of practices so as to achieve an ultimate balance between the groups for each level of each practice factor.\(^\text{12}\) As the interventions were educational it was also important to ensure that the groups had similar learning styles, and this was confirmed.

Discussions in the active group were attended by the majority of GPs (90%). This high turn-out was probably owing to GPs’ being invited by familiar colleagues (the authors), at their own premises, and at a time convenient to them. During these meetings they were not presented with a private lecture: they were motivated to scrutinize relevant and interesting issues raised by the guidelines in the light of their own experience.

In spite of intensive publicity and prestigious speakers, only a third of GPs in the passive group (33%) attended the lecture, a typical turn-out for such an event and perhaps indicative of a falling popularity of this type of event. Because GPs in this group had received a personal copy of the guidelines before the lecture, the lack of any subsequent improvement in knowledge demonstrated the ineffectiveness of this approach. Superficial processing is a shallow sensory type of appraisal;\(^\text{14}\) it corresponds to the peripheral route of persuasion of the Elaboration Likelihood model.\(^\text{6}\) The latter postulates that, when information is passively appraised, resulting attitudes are short-lived and easily changed.

The verbal evidence of deep processing was considerably higher in the active group than the passive groups, suggesting that polarization of depth of processing had been achieved as intended. In the absence of an existing research tool, we designed our own method. Given that the tool was untested, the very high degree of inter-observer correlation was reassuring. Refinement of this kind of tool for exploration of depth of cognitive processing in differing medical education methods seems worthy of further work.

The lower response rate to the second attitude survey probably represents the general questionnaire-fatigue among UK GPs, rather than an effect of the study, as the process was identical on both occasions.\(^\text{15}\)

An implicit aim of education is to impart changes in attitude effectively. Formal lectures are still central to postgraduate education. When the impact of educational lectures or bulletins has been measured, the intended benefit has not endured for longer than a few weeks\(^\text{16}\)—a characteristic of passive processing.\(^\text{5}\) In order to demonstrate the long-lasting benefit of active processing we extended the measurement of knowledge to 12 months so as to allow short-term effects to wane.
In an educational experiment on communicable infections, superior memory recall amongst prescribing advisers has highlighted the advantages of active over passive processing. Elsewhere, the ineffectiveness of passive educational approaches to prevent hospital-acquired infections has been exposed. The treatment of asthma and diabetes in primary care greatly improved following a practice-based educational programme. The effectiveness of active processing in the teaching of pharmacotherapy was so compelling that the abandonment of conventional educational methods in favour of a problem-based approach was advocated. More recently, significantly increased prescribing of 2.5 mg bendroflumazide was ascribed to the participation of GPs in the development of a protocol for the treatment of hypertension in the elderly, and this effect endured for at least 2 years.

Influential educational initiatives tend to be associated with group activities, variously described as involvement, participation, discussion, ‘ownership’, etc. The difference between such activities and conventional lectures is that in the latter the audience listens to what a lecturer thinks; in the former individuals have to think for themselves. This is the essential difference between active and passive thinking.

The superior power and effectiveness of deep cognitive processing is such that medical education should no longer rely on passive methods, typified by the didactic lecture. If listening to someone else’s thoughts is intended to be a knowledge transfusion, we shouldn’t pretend to be surprised when the rejection rate is high. The practice of medicine can only be improved when recipients of education become participants and are, therefore, stimulated to develop their own understanding.

The attitudes in the active group, represented by knowledge of how to treat infections, were gained through active processing. These attitudes had lasted for over a year and, according to the Elaboration Likelihood Model, should have resulted in consistent changes in behaviour. We are currently examining changes in infection management behaviour amongst the GPs in the study.

Conclusion

The findings suggest that initiatives aimed at the implementation of evidence-based guidelines must employ active educational strategies if enduring changes in attitudes are to result.

References

9 Implementing clinical practice guidelines: can guidelines be used to improve clinical practice. Effective Health Care. Leeds: Nuffield Institute for Health, University of Leeds; Centre for Health Economics and the NHS Centre for Reviews and Dissemination, University of York; and the Research Unit of the Royal College of Physicians; 1994; No. 8, 1–11.