

Effective Dissemination

An Examination of the Costs of

Implementation Strategies for the AOD Field



Petra Bywood, Belinda Lunnay, Ann Roche
National Centre for Education and Training on Addiction



NCETA
Australia's National Research Centre
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This report is the second part of a 3-part series.

Part One: Effective Dissemination: A Systematic Review of Implementation Strategies for the AOD Field

Part Two: Effective Dissemination: An Examination of the Costs of Implementation Strategies for the AOD Field

Part Three: Effective Dissemination: An Examination of the Theories and Models of Change for Research Dissemination

Reports can be downloaded from the NCETA website or hard copies are available on request.



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Related Publications

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Bywood PT. (2006) Judging the research: Tools for best practice. *Of Substance*, 4 (3): 28-29.





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1. Executive Summary

The most cost-effective option is not necessarily the cheapest; but neither is the most effective option always the most cost-effective. It depends on the balance of costs and consequences (NHMRC, 2001).

This document is Part Two of a 3-part series by the National Centre for Education and Training on Addiction (NCETA) examining the effectiveness, costs and theories related to dissemination and implementation of research into practice. Part One is a systematic literature review that evaluated the effectiveness of 16 different dissemination strategies for facilitating the implementation of new research, programs and treatments to improve outcomes for clients with alcohol- and other drug-related problems. Part Two involves an examination of the costs associated with using such strategies, and Part Three is an examination of the theories and models of change underlying the use of strategies.

In this Part, the costs of implementing innovations and the implications of using dissemination strategies for the alcohol and other drug (AOD) field are examined. Part One in this series is a systematic review of the effectiveness of dissemination and implementation strategies (Bywood, Lunnay, & Roche, 2008). However, evidence related to economic considerations was not based on a systematic search using relevant terms associated with economic analysis. Rather, it is a summary of the evidence from the systematic review on effectiveness that also contained data on costs of using an implementation strategy.

All studies in Part One that showed evidence that a particular strategy was effective in changing practitioners' behaviour or improving organisational efficiency were scrutinised to determine whether an economic analysis had also been undertaken. These studies then formed the evidence base for the present report.

An implementation strategy can be effective, without being cost-effective. Thus, from an economic perspective, the key question is whether certain dissemination and implementation activities involve a more efficient use of limited resources compared to other activities.

The key research questions for this study were:

1. What are the economic considerations for the use of effective dissemination and implementation strategies?
2. Which implementation strategies provide an efficient and cost-effective means by which to facilitate uptake of innovations by the AOD field?

From the 25 systematic literature reviews and 85 additional primary studies that were included in Part One, only two reviews and 14 primary studies contained

details on costs of using dissemination strategies. Overall, the methodological quality of economic analyses was poor, with limited detail provided and little justification for the type of analyses conducted.

The effectiveness of the 16 strategies examined (see Table 1a) varied substantially in terms of their ability to influence practitioner behaviour or patient / client outcomes. The strategies that were consistently effective were:

- Educational meetings (interactive)
- Educational outreach
- Prompts and reminders
- Audit and feedback.

Others demonstrated mixed effects or no significant improvements. The magnitude of effect also varied substantially across studies and thus it is increasingly important to determine the costs involved in their implementation.

Table 1a. Dissemination and implementation strategies

Professional interventions: to change knowledge / behaviour of individual health care professionals
<ol style="list-style-type: none"> 1. Educational materials 2. Local consensus processes 3. Educational meetings (CME) 4. Educational outreach (academic detailing) 5. Local opinion leaders 6. Patient-mediated interventions 7. Prompts and reminders 8. Audit and feedback 9. Financial incentives 10. Electronic educational sources
Organisational interventions: to change the setting or systems in which health care professionals work
<ol style="list-style-type: none"> 11. Record and office systems 12. Multi-disciplinary collaborative approaches 13. Alternative care approaches 14. Continuous quality improvement
Other interventions
<ol style="list-style-type: none"> 15. Mass media 16. Multi-faceted interventions

The majority of studies evaluated multi-faceted interventions from the perspective of the health service, hospital or health care professional. Multi-faceted interventions were highly variable in content (number and type of dissemination strategies used) and context (setting, population, targeted behaviour), making it impossible to identify which specific strategies were efficient or cost-effective.

One additional review compared costs and cost-effectiveness of four single strategies (educational outreach visits, interactive continuing medical education (CME), computerised reminders and financial incentives) for improving practitioners' alcohol screening practice (Shanahan, Shakeshaft, Fawcett, Doran, & Mattick, 2005). Using a decision-modelling approach, results showed that outreach visits were the most cost-effective strategy for reducing alcohol consumption in risky drinkers, whereas financial incentives were the least cost-effective.

Strategies that contained interactive elements, and additional materials and support, tended to be more effective at facilitating implementation (Bywood et al., 2008). However, strategies with these elements are also more resource-intensive. One way to minimise costs of implementing innovations may be to use a 'stepwise' approach so that simple and inexpensive strategies are used broadly in the first instance, followed by more interactive and targeted strategies aimed at smaller groups with more specific needs. Thus, scarce resources may be allocated more judiciously to maximise the use of available resources and the impact of effective dissemination and implementation strategies.

In summary, the key findings from this review are:

- CME was generally effective and cost-effective, although formats differed substantially
- Educational outreach showed mixed results on cost-effectiveness
- Educational materials were relatively cheap, but had little effectiveness
- Multi-faceted approaches differed substantially in context and content, making it difficult to make meaningful comparisons on the basis of cost
- The evidence base of studies containing good quality economic analyses was limited (only 9 of the 16 strategies were evaluated for costs)
- Studies that reported on costs of implementation strategies were heterogeneous, reporting of details and quality of methodology was poor, and data collection was incomplete
- Few studies evaluated costs of implementation strategies in the AOD field
- There is a need for future evaluation studies to examine efficiency through use of economic evaluation.



2. Introduction

As health care resources will always be constrained by competing demands, the allocation of these scarce resources is increasingly dependent not only on evidence of effectiveness of innovations and interventions to maximise best practice and minimise ineffective practice, but also on the associated costs. Economic evaluations of health care options help decision-makers to optimise the benefits of good practice within a specified budget.

Even when practitioners are aware of the need to change their behaviour or the systems they work in, it is often difficult to make the necessary changes in the context of established patterns of practice and / or an environment that may not be receptive to change. In addition, simple distribution of innovations does not automatically induce practitioners or organisations to implement innovations into practice. Dedicated strategies are needed to facilitate uptake of innovations, such as new treatments, interventions, programs, devices and procedures. Sixteen such dissemination and implementation strategies (Table 1b) have been described in detail in the associated systematic review (Bywood et al., 2008), which evaluated the effectiveness of these strategies and the implications of their use in the AOD field.

Table 1b. Dissemination and implementation strategies

Professional interventions: to change knowledge / behaviour of individual health care professionals
<ol style="list-style-type: none">1. Educational materials2. Local consensus processes3. Educational meetings (CME)4. Educational outreach (academic detailing)5. Local opinion leaders6. Patient-mediated interventions7. Prompts and reminders8. Audit and feedback9. Financial incentives10. Electronic educational sources
Organisational interventions: to change the setting or systems in which health care professionals work
<ol style="list-style-type: none">11. Record and office systems12. Multi-disciplinary collaborative approaches13. Alternative care approaches14. Continuous quality improvement
Other interventions
<ol style="list-style-type: none">15. Mass media16. Multi-faceted interventions

The use of such implementation strategies to increase the uptake of innovations into practice will most often add to the cost of providing best care. That is, any changes in behaviour and / or organisational systems are likely to incur additional costs. However, this needs to be considered in the face of improved practice patterns and / or reductions in downstream costs.

The effectiveness of the 16 strategies examined varied substantially in terms of their ability to influence practitioner behaviour or patient / client outcomes. The strategies that were consistently effective included educational meetings, educational outreach, prompts and reminders and audit and feedback. Others demonstrated mixed effects or no significant improvements. The magnitude of effect also varied substantially across studies and thus it is increasingly important to determine the costs involved in their implementation.

Examining the costs of implementing innovations involves determining two important considerations:

1. Whether the innovation itself is effective and cost-effective
2. Whether a particular strategy is effective for facilitating implementation of the innovation into practice and that it represents an efficient use of resources.

This report addresses the latter consideration by examining whether using a strategy to implement an innovation is worthwhile.

Figure 1 illustrates the stages from development and evaluation of an innovation (e.g. AOD treatment program) through to evaluation of effectiveness and cost-effectiveness of using a strategy to facilitate implementation into practice, and that incorporates an economic evaluation of both the innovation and the dissemination strategy.

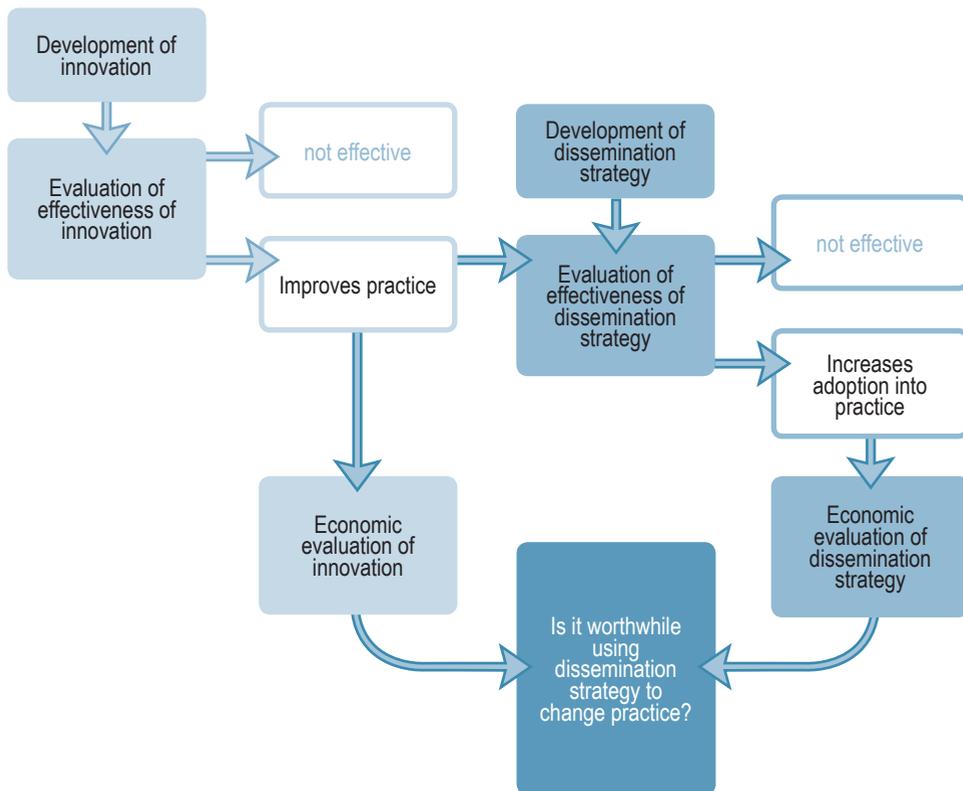


Figure 1. Stages involved from development through to implementing a dissemination strategy

2.1. Burden of disease

Harms associated with the use of alcohol and other drugs place a continual burden on a strained health care system, resulting in excessive use of health care resources, as well as other public resources associated with road accidents, criminal justice system, social welfare, unemployment and lost productivity. Costs associated with AOD use in 2004-2005 are estimated at over \$AUD55 billion (Collins & Lapsley, 2008). In addition, the annual cost of alcohol-related absenteeism in 2001 has been estimated at over \$AUD1 billion (Pidd, Berry, Roche, & Harrison, 2006).

2.2. Terms and definitions

For this report, **costs** generally refer to costs of the resources involved in implementing an innovation and / or using an implementation strategy (see Figure 1). Examples of costs include labour input (salaries / wages),

consumables, capital equipment, venue costs, overheads, services and travel. Determining the costs of a strategy requires at least two types of data:

1. Amount of resources used in the strategy (e.g. number of hours labour to deliver one educational outreach visit)
2. Unit cost of each resource required (e.g. hourly rate for trainer delivering educational outreach).

Consequences refer to the outcomes (e.g. client health, practitioner skills / knowledge, organisational productivity), both positive and negative, resulting from actions taken for the intervention and the comparator (e.g. usual care).

Efficiency is evaluated by comparing alternative courses of action to identify those that are likely to maximise benefits (e.g. improved quality of life) or minimise costs associated with a given level of benefit (NHMRC, 2001).

Sensitivity analysis, which is a useful component of economic evaluation, systematically explores the influence that different variables and assumptions have on the findings, giving an indication of the robustness of the economic evaluation (NHMRC, 2001).

2.3. Components of an economic evaluation

The key components of an economic evaluation of implementation strategies are:

1. Identification of all main dissemination and implementation activities and associated costs and consequences
2. Estimate of the likelihood that activities / events will occur
3. Identification and measurement of resource use associated with each activity
4. Identification and measurement of key consequences.

For valid economic analyses, there needs to be a comparison of one or more alternative strategies to determine the incremental costs of the competing strategies (Stone, Curran, & Bakken, 2002). There is a range of different approaches to examining the economic aspects of implementing research into practice. For example, an economic evaluation generally examines the evidence on costs as well as the end-points for effectiveness or benefits. In contrast, a simple cost analysis examines the costs without relating them to effectiveness or benefits.

The different analytic tools commonly used to assess the economic effects of innovations in health care are shown in Table 2.

Table 2. Economic analyses

Type of economic analysis	Description	Outcome measure
Cost-minimisation analysis (CMA)	Costs are compared between alternatives only when outcomes have been measured and statistically identical effects have been demonstrated.	
Cost-consequence analysis (CCA)	Costs and effects are listed separately. Effects between alternatives may have different measures.	\$ and separate list of outcomes
Cost-effectiveness analysis (CEA)	Consequences are measured in the same units between alternatives.	Incremental cost-effectiveness ratio such as \$/outcome or \$/LY gained
Cost-utility analysis (CUA)	Effects include both quantity and quality measures.	\$QALY gained
Cost-benefit analysis (CBA)	Effects are measured as a single dollar measure.	\$

\$ = dollars; LY = life year; QALY = quality-adjusted life year. (Modified from Stone et al., 2002)

Cost-minimisation analysis: Only the costs of two or more alternative strategies are calculated and compared, excluding differences in adherence rates or other potential outcomes of interest. That is, this method is used only when clinical outcomes are statistically equivalent and the least costly alternative is sought. This may be useful where different implementation strategies have equivalent effectiveness and the cheaper method is sought.

Cost-consequence analysis: The costs and consequences of a particular strategy are listed separately, providing a matrix of outcomes. Thus decision-makers can examine the findings and select a strategy according to their own criteria of what is important in specific circumstances.

Cost-effectiveness analysis: Outcomes are measured in the same units between alternatives (e.g. dollars per number of practitioners utilising an innovation). A cost-effectiveness ratio is determined using the following equation:

$$\text{Cost-effectiveness ratio} = (C1 - C2)/(E1 - E2)$$

C1 = cost of new strategy; C2 = cost of usual strategy
 E1 = Effect of new strategy; E2 = effect of usual strategy

Cost-utility analysis: This analysis measures the quantity and quality of life gained in one intervention compared to another. This method quantifies both the value of days of life saved and changes in quality of life. For example, a qualitative measure may include individual preferences for a particular strategy based on individual values and beliefs or the culture of an organisation.

Cost-benefit analysis: Outcomes are measured according to a particular monetary unit that represents costs minus benefits. However, financial quantification may be difficult to determine in some situations (e.g. cost of a human life).

2.4. Scope of economic analyses

The scope of an economic evaluation may vary depending on circumstances. If an innovation is well-accepted, has known benefits and represents efficient practice, then an economic evaluation may be limited to costs and consequences of using a strategy to increase implementation of the innovation, without a full evaluation of the costs and consequences of the innovation itself (Mason et al., 2001).

Perspective may also influence the scope of analyses. For example, taking a societal perspective will include patient costs, as well as practitioner costs and long-term health system costs. Assigning a value to costs may vary depending on whether the analysis is conducted from the perspective of the individual client, the practitioner, the health care organisation, the health care system or the community. For example, while clients' costs primarily include money and time, practitioners' costs will also include equipment, administrative and staffing costs and time.

2.5. Economic evaluation of implementation strategies

Change in individual behaviour and at the organisational level does not occur without some cost. Increasingly, it is recognised that the effectiveness of an implementation strategy must be weighed against the costs of using such a strategy (Grimshaw, Eccles, Campbell, & Elbourne, 2005). Evaluations that incorporate concurrent economic evaluations of the relative efficiency as well as relative effectiveness of different strategies are most useful for informing policy (Grimshaw, Eccles, Campbell, & Elbourne, 2002). Potential savings from the use of such strategies may outweigh the costs if an innovation reduces inappropriate and costly practices.

A implementation strategy can be effective, without being cost-effective. Figure 2 illustrates four possible outcomes from using an implementation strategy according to the level of costs involved.

		Consequences	
		Significant improvement in practice	Minimal improvement in practice
Costs	Low	✓	?
	High	?	✗

Figure 2. Costs and consequences of using an implementation strategy

There are three outcomes pertaining to the use of implementation strategies that warrant consideration:

1. Improved outcomes for lower cost
2. Equivalent outcomes for lower cost
3. Improved outcomes for an additional cost that is worth paying (e.g. longer-term social benefit).

The decision to use an implementation strategy is easy when the costs are low and the strategy is likely to result in significant improvement in practice (upper left cell, Figure 2). Similarly, the decision *not* to use a strategy is easy when costs are high and there is little evidence of improvement (lower right cell, Figure 2). However, a more considered analysis is required for the remaining potential outcomes. In such circumstances, the decision to use a particular implementation strategy may be influenced by a range of factors. These include:

- The cost-effectiveness of the innovation
- The utilisation rate of the innovation, without use of an implementation strategy (e.g. high performing professionals may show little improvement in practice, whereas targeting strategies to poor performers may be more cost-effective)
- Potential adverse outcomes if the innovation failed to be adopted into practice
- The effectiveness of the implementation strategy
- Available financial resources for implementation
- The extent to which the implementation strategy will enhance improvement in client outcomes
- Effectiveness and feasibility of using an alternative, less effective and / or less costly strategy.

The use of an implementation strategy to change practice would add to the existing cost of implementing an innovation. Therefore the question is whether the additional cost can generate sufficient additional benefits in professional practice and / or client outcomes compared with not using the implementation strategy.



3. Objectives and Research Questions

3.1. Aim of the project

The primary aim of this project was to examine the evidence on the costs of using dissemination and implementation strategies to encourage the uptake of innovations into practice in the alcohol and drugs (AOD) field.

To do this, the National Centre for Education and Training on Addiction (NCETA) aimed to examine the available data from a systematic literature review of the effectiveness of 16 different dissemination and implementation strategies for the AOD field (Bywood et al., 2008) and summarise the existing evidence pertaining to the costs of using different dissemination and implementation strategies and their relative efficiency.

3.2. Research Questions

From an economic perspective, the key question is whether proposed dissemination and implementation activities lead to a more efficient allocation of limited resources.

1. What are the economic considerations for the use of effective dissemination and implementation strategies?
2. Which implementation strategies provide an efficient and cost-effective means to facilitating uptake of innovations into the AOD field?



4. Methods

NCETA undertook a systematic review of the effectiveness of dissemination and implementation strategies for the AOD field (Bywood et al., 2008). A list of the dissemination and implementation strategies assessed is shown in Table 3. The associated report on the systematic review provides full details of the methods (search strategy, inclusion criteria, critical appraisal, statistical considerations).

This report pertains to an economic evaluation of the implementation strategies that demonstrated evidence of effectiveness. It must be noted that the evidence related to economic considerations is not based on a systematic search using relevant terms associated with economic analysis. Rather, it is a summary of the evidence from the systematic review on effectiveness that also contained data on costs of using an implementation strategy.

All studies included in the systematic review and that evaluated the effectiveness of an implementation strategy were also examined for any reference to costs associated with using such a strategy. Only studies that showed evidence of effectiveness of an implementation strategy were included for an examination of cost-effectiveness.

Where comparisons were provided between alternative strategies, data on costs and consequences were extracted and are presented in summary tables.

Table 3. List of interventions for dissemination and implementation (modified from EPOC taxonomy)^a

Type of strategy	Description
1. Professional Interventions - oriented to changes in professional practice	
1. Educational materials	Distribution of published / printed recommendations for care, including clinical practice guidelines, audiovisual materials and electronic publications. Materials are delivered personally or through mass mailings.
2. Local consensus processes	Inclusion of participating providers in discussion to ensure that they agree that the chosen clinical problem is important and the approach to managing the problem is appropriate. E.g., modification of clinical practice guidelines to local setting
3. Educational meetings (continuing medical education)	Healthcare providers participate in conferences, lectures, workshops or traineeships <i>Didactic</i> – minimal participant interactions (lectures, seminars) <i>Interactive</i> – participation with discussion or practice (workshops)
4. Educational outreach visits (academic detailing)	Use of a trained person who meets with providers in their practice setting to give information with the intent of changing the provider's practice.

table continued overleaf

5. Local opinion leaders (includes product champions)	Use of providers nominated by their colleagues as 'educationally influential'. The investigators explicitly state that their colleagues identified the opinion leaders.
6. Patient-mediated interventions	New clinical information (not previously available) collected directly from patients and given to the provider.
7. Prompts and reminders (including decision support)	Patient- or encounter-specific information, provided verbally, on paper, or on electronically, which is designed to prompt a health professional to recall information. This usually occurs through general education, in medical records or by interactions with peers, reminding them to perform or avoid some action to aid individual patient care. Computer-aided decision support and drugs dosage are included.
8. Audit and feedback	Any summary of clinical performance of healthcare over a specified period. The summary may also include recommendations for clinical action. The information may be obtained from medical records, computerised databases or observations from patients.
9. Financial incentives	Any payment system that rewards health care providers for specified clinical actions. Examples include fee-for-service, target payments, and capitation.
10. Electronic educational sources	Healthcare providers use electronic, internet, or on-line databases to access information relevant to all levels of health care for patients.
2. Organisational interventions - oriented to changes in organisational practice	
11. Record and office systems	Any structured or unstructured system used for storage and exchange of information. Examples include electronic medical records, care plans, flow charts.
12. Multi-disciplinary collaborative approaches (integrated care)	Use of complementary inter-professional collaborations (nurses, physicians, psychologists, pharmacists, dieticians) to plan care for patients. Examples include integrated care, collaborative care, continuity of care.
13. Alternative care approaches	Use of alternative health professionals, such as nurse practitioners, or alternative settings, such as specialist clinics, to deliver specialised program of care. Examples include revision of professional roles; chronic care clinics; and therapeutic communities.
14. Continuous quality improvement	Any iterative process for improving the quality of health care that involves repeated cycles of 'plan-do-check-act'.
3. Other interventions	
15. Mass media	1. Varied use of communication that reaches great numbers of people including television, radio, newspapers, posters, leaflets and booklets, alone or in conjunction with other interventions. 2. Targeted at the population level.
16. Multi-faceted interventions	Use of more than one strategy in combination or sequentially.

^a This table has been modified from the EPOC taxonomy (EPOC, 2002). Some strategies, which were described by EPOC, were not included here as no studies or existing reviews met the inclusion criteria for evaluation.

5. Results

Results from the full systematic literature review of the effectiveness of dissemination and implementation strategies are provided in the associated report (Bywood et al., 2008). The review provides a summary of the evidence of effectiveness for each strategy, the key elements of successful strategies, and a discussion of the relevance of each strategy as it relates to the AOD field.

The current report synthesises the available information pertaining to the economic considerations of effective dissemination and implementation strategies and, where possible, the implications of costs associated with using such strategies in the AOD field are discussed.

Results from the existing systematic reviews and additional primary studies are summarised in two sections below.

Of the 25 existing systematic literature reviews and 85 additional primary studies that were included in the systematic review (Bywood et al., 2008), only two systematic reviews (Balas et al., 2000; Grimshaw et al., 2004) and 14 primary studies (Bahrami et al., 2004; Boekeloo et al., 2003; Cranney, Barton, & Walley, 1999; Di Noia, Schwinn, Dastur, & Schinke, 2003; Dormuth et al., 2004; Fallowfield et al., 2002; Hogg, Baskerville, & Lemelin, 2005; Katz, Muehlenbruch, Brown, Fiore, & Baker, 2004; Lemelin, Hogg, & Baskerville, 2001; Ockene et al., 1999; Santoso, Suryawati, & Prawaitasari, 1996; Silagy et al., 2002; Suggs et al., 1998; Weller et al., 2003) provided details on concurrent economic analyses. In addition, one non-systematic review (Shanahan et al., 2005) used a decision-modelling approach to compare four different strategies for improving alcohol screening among general practitioners. The Appendix provides a list of the 25 systematic reviews and 85 additional primary studies that were included.

No primary studies gave full details on the estimation of costs that could be extracted for comparison across studies and strategies.

5.1. Summary of results from systematic reviews

One good quality systematic review (Grimshaw et al., 2004) assessed the economic evaluations and cost analyses of 63 of 235 (29.4%) studies that assessed the effectiveness of implementation strategies. Of the 63 studies that included cost analyses, most (74%) evaluated multi-faceted interventions and the majority of these were from the perspective of the health service, hospital or health care professional. Thirty-seven studies (59%) conducted cost-consequence analyses, 14 (22%) conducted cost-minimisation analyses, 11 (18%) conducted cost-effectiveness analyses and one study conducted a cost-benefit analysis.

Implementation strategies demonstrated efficiency in 27 (of 37) cost-consequence analyses (71%), whereas five (13%) were more costly but no more effective and the remaining studies showed equivalent costs for similar outcomes (Grimshaw et al., 2004).

Overall, economic evaluations were of poor methodological quality, with poor reporting of details a major issue. This finding is consistent with results from an earlier study of economic evaluations in health care (Jefferson, Demicheli, & Vale, 2002). Evaluation of studies in these reviews showed consistent flaws in methodology, lack of clear descriptions of methods used, lack of standardisation of evaluation instruments, and lack of justification or explanation of the economic framework used.

Since most of the effective strategies combined a diverse array of strategies (multi-faceted interventions), it was not possible to identify which individual strategies consistently demonstrated cost-effectiveness. Only one multi-faceted study showed cost savings. That study comprised both professional interventions (reminders, financial incentive, CME and revision of professional roles) and an organisational intervention (record system) (Morrissey et al, 1995 in Grimshaw et al., 2004).

One good quality (non-systematic) review used a decision-modelling approach to compare the costs and cost-effectiveness of four implementation strategies for improving general practitioners' alcohol screening behaviours (Shanahan et al., 2005; Shanahan, Shakeshaft, & Mattick, 2006). Randomised controlled trials (RMTs) consistently showed that screening for alcohol problems and providing brief interventions resulted in significant reductions in alcohol use (e.g. WHO Brief Intervention Study Group, 1996 in Shanahan et al., 2005) and that this intervention was cost effective (Wutzke, Shiell, Gomel, & Conigrave, 2001). However, despite a financial incentive to implement the intervention (\$17 for each eligible patient), only 40% of general practitioners (GPs) participated. Four implementation strategies were compared: 1) educational outreach visits; 2) interactive CME; 3) computerised reminders; and 4) target payments. Given that there were insufficient empirical data on costs for all four strategies, the decision-modelling approach provided a method for combining relevant data about the effectiveness of the strategies for changing practitioners' behaviour and the resources needed to implement them. The model involved establishing a 'base case', which comprised a range of assumptions (% of population visiting a GP; % patients with risky drinking behaviour, % patients screened, % GPs changing their behaviour etc), so that strategies could be compared. This is a unique and valuable review in that it compared more than one strategy applied in an AOD-related area (screening for risky drinking), in an Australian population.

The model incorporated data from a range of variables including rates of alcohol screening, rates of delivering brief interventions and alcohol consumption, as well as the effectiveness and cost of implementing the strategies of interest. Results showed that computerised reminder systems and educational outreach visits were most effective for decreasing alcohol consumption among risky drinkers

(Table 4). The additional cost to implementation of an innovation due to use of an implementation strategy ranged from \$4.0 million (AUD 2004) for educational outreach visits to \$31 million for financial incentives. Applying the incremental cost-effectiveness ratio¹ (ICER = difference in costs/difference in outcomes), the most cost-effective strategy was educational outreach visits (\$50 per drink avoided), whereas the least cost-effective strategy was financial incentives (\$691 per drink avoided). These differential outcomes remained following sensitivity analyses to determine uncertainty in the assumptions of the model.

Table 4. Costs and outcomes for four implementation strategies to change GP behaviours (Shanahan et al., 2005)

Strategy	Total standard drinks before	Total standard drinks after	Difference in standard drinks from baseline	Total costs for each strategy (AUD 2004)	Difference in costs	ICER (cost per standard drink avoided)
Baseline	16,713,703	15,878,215		1,463,275		
Educational Outreach		15,798,843	-79,371	5,462,211	3,998,936	\$50
CME (interactive)		15,819,313	-58,902	6,503,436	5,040,188	\$86
Reminders		15,792,844	-85,370	9,219,313	7,756,038	\$91
Financial incentive		15,832,597	-45,618	32,984,330	31,521,055	\$691

5.2. Summary of results from additional primary studies

Only studies that evaluated the effectiveness of an implementation strategy and also reported on costs associated with implementation were reviewed. Evidence on costs, which was only available for nine of 16 strategies, is summarised below. Potential factors that may influence costs and consequences associated with use of implementation strategies have also been included where possible.

1. Incremental Cost Effectiveness Ratio (ICER) is the ratio of change in costs of the strategy to the effects of using the strategy compared to control. While “incremental” implies increasing change in an intervention, in this case it involves analysis of the effect of using the intervention (compared to control).

5.2.1 Educational materials

Factors that may influence costs and consequences associated with the distribution of educational materials are:

- Format of materials (printed, laminated, electronic, audiovisual)
- Mode of distribution (standard mail, electronic, personal delivery)
- Quantity, size and frequency of distribution.

Economic analyses were not included in the studies assessed. However, some studies suggested that the dissemination of printed educational materials has the potential to be a cost-effective method of education (Dormuth et al., 2004; Grimshaw et al., 2004). Although one economic evaluation of educational materials provided some data on costs generated by preparing and publishing educational materials (Grimshaw et al., 2004), this data was derived from studies conducted over a decade ago, making it somewhat out-of-date.

No formal economic evaluation was undertaken in either of the primary studies assessed. However, in comparison to conventional printed materials, electronic sources are speculated to be a low-cost mode of dissemination by some authors (Di Noia et al., 2003). Given that a large number of information recipients may be accessed electronically, this may be an efficient distribution method.

5.2.2. Local consensus processes

Costs associated with developing, disseminating and implementing the clinical practice guidelines (CPGs) were considered in one poor quality randomised controlled trial (RCT) (Silagy et al., 2002). However, since no formal economic evaluation was undertaken, no data could be extracted and findings could not be evaluated.

5.2.3. Educational meetings (CME)

Factors that may influence costs and consequences associated with educational meetings are:

- Location, frequency and duration of meetings (e.g. cost of venue, accommodation, refreshments, travel)
- Format of meetings (didactic vs interactive).

One good quality cluster randomised controlled trial (RCT) (Katz et al., 2004) provided cost data relating to the delivery of tutorials, including the time required to train clinicians (to disseminate the intervention) and time required for identification and brief counselling of smokers (to implement the intervention). The incremental cost of the intervention per self-reported 'quitter' (at 6-months follow-up) was US\$1822. The cost-effectiveness ratio was based on the total cost of the intervention divided by the difference in the number of test-site patients who reported quitting at 6-month follow-up (n=99) minus the number of intervention patients expected to report having quit at the 6-month follow-up (n=63) based on the 6-month quit rate observed in control sites.

While a formal cost-effectiveness analysis was not undertaken in this study, it was noted that “the incremental cost per quitter associated with the study intervention compared favourably with that computed in a formal cost-effectiveness analysis, which demonstrated that implementation of the AHRQ² Guideline was highly cost-effective relative to other preventive care interventions (US\$1822 versus US\$3779)” (Katz et al., 2004, p 601). The costs of implementing educational interventions were considered in several primary studies (Santoso et al., 1996; Suggs et al., 1998), yet no formal economic analysis was undertaken.

Studies showed that the format of educational interventions also impacted on both effectiveness and costs. Two studies examined the costs associated with providing an educational intervention in different formats to determine whether a ‘cheaper’ alternative may be as beneficial to educational outcomes as the more resource-intensive intervention. One average quality quasi-RCT (Fallowfield et al., 2002) recognised the resource-intensive nature of training courses and compared a less resource-intensive educational intervention in the form of comprehensive, written feedback with training to determine which intervention represented the greatest educational value for increasing physicians’ skills and competence in communicating with patients. While course attendance significantly improved process outcomes, there was little evidence that written feedback changed physicians’ behaviour, indicating that the investment in the more costly training course was worthwhile given the positive outcome.

In contrast, another average quality quasi-RCT (Santoso et al., 1996) compared a less costly small group, face-to-face interactive education session with a formal didactic seminar and concluded that both were equally effective in improving physicians’ knowledge and practice. As neither intervention was more effective than the other (equal educational value) the use of the less costly training (unit cost = US\$0.77 per participant) was recommended for use before the more resource-intensive seminar (unit cost = US\$3.30 per participant). Similarly, an average quality before and after study (Suggs et al., 1998) examined the effectiveness and costs of traditional CME compared to a self-instruction learning package. While both versions demonstrated equivalent improvement for increasing practitioners’ knowledge, initial costs for the self-instruction package were higher (\$US79 vs \$US45). However, no costs were included for travel, accommodation, meals or backfilling positions for those attending the traditional CME workshops. In addition, participants could continue to access the self-learning package for ongoing reference at a later date. A more detailed economic analysis is required to determine whether this may be a more efficient method over a long period.

2. Agency for Healthcare Research and Quality.

5.2.4. Educational outreach

Factors that may influence costs and consequences associated with educational outreach visits (in addition to costs of educational materials described above) are:

- Location, frequency and duration of visits
- Number of outreach workers (hourly rate, costs of accommodation, meals, travel).

Outreach visits differ in complexity and intensity as well as effectiveness as discussed in the related systematic literature review (Bywood et al., 2008). Therefore, it is important to determine the most appropriate level of intensity / complexity for a particular level of outcome in order to assess the efficiency of such a strategy. While outreach is considered a costly strategy, if it is effective, it may be preferred to a cheaper strategy that demonstrates little sustainable effect (Hogg et al., 2005).

While no formal economic evaluation was undertaken, several studies made reference to the cost of their educational outreach intervention (e.g. Cranney et al., 1999). In a British study, Cranney et al. estimated the fixed cost of preparing the educational package was £120, with variable costs for travel (£5), staff time (£60), administration (£8) and sundries (£10) totalling £83 per visit.

The costs associated with an outreach visit, as with any educational strategy, are highly variable depending on the characteristics / components of the visit. Educational outreach visits that contain evidence-based content and are tailored to specific contexts and targets are more effective. However, these characteristics also make them more resource-intensive. A study comparing educational outreach visits with mailouts of evidence-based materials (Weller et al., 2003) found equivalent results and recommended mailouts, which were the less expensive strategy.

Given this information, it is important to know which aspects of an intervention are particularly costly and whether they are essential to bringing about a positive effect, thus directing resources to those aspects of the intervention (cost-effectiveness).

5.2.5. Local opinion leaders

Factors that may influence costs and consequences associated with use of local opinion leaders are:

- Activities undertaken by opinion leaders (training, workshops, visits)
- Number of opinion leaders (hourly rate, travel).

While opinion leaders were used in some multi-faceted interventions, no available studies examined the costs of using opinion leaders alone to implement innovations.

5.2.6. Prompts and reminders

Factors that may influence costs and consequences associated with prompts and reminders are:

- Frequency and number of reminders
- Format and mode of delivery (manual / computerised, automatic).

One good quality systematic review evaluated the effectiveness of using prompts and reminders for a range of preventive care and disease management activities (Balas et al., 2000). Of 33 studies included in this review, seven calculated the costs of using reminders, but none included the start-up costs of the computer system and there was insufficient detail provided to compare costs to an alternative strategy.

5.2.7. Audit and feedback

Factors that may influence costs and consequences associated with audit and feedback are:

- Frequency of audit and feedback (e.g. every 3, 6, 12 months)
- Mode of audit (e.g. manual vs computerised)
- Format of feedback (e.g. printed, electronic)
- Target of feedback (e.g. individual professional, organisation).

Several studies examining costs of strategies used audit and feedback as part of a multi-faceted intervention to facilitate implementation. Others were included in a non-systematic review (Shanahan et al., 2005) (see 5.1 above).

5.2.8. Record systems

Factors that may influence costs and consequences associated with record systems are:

- Establishment of systems (equipment, software)
- Format of records (manual, electronic)
- Complexity of links to other devices or systems (upgrade and maintenance requirements)
- Staff time and training.

No formal economic evaluations were undertaken in the primary studies reviewed. However, investigators in one study (Boekeloo et al., 2003) noted that creation of the audio program used to 'prime' patients was time- and resource-intensive as well as financially costly.

In another US study (Ockene et al., 1999 p. 10) where the intervention demonstrated a positive effect on the patient population (patient outcomes), the cost of an office-system was estimated and a break-down was provided, but no formal cost-effectiveness calculations were undertaken.

As with other forms of dissemination and implementation, the costs associated with record and/or office systems are highly variable depending on the characteristics and components of the system implemented.

5.2.9. Multi-faceted interventions

Since multi-faceted interventions comprise two or more implementation strategies, their costs are likely to be greater than using a single strategy. Determining the effectiveness of individual components of a multi-faceted strategy is crucial where budgetary restrictions are likely.

One Canadian RCT conducted a cost-consequences analysis to determine the cost savings associated with improving preventive care using a multi-faceted intensive educational outreach strategy (Hogg et al., 2005; Lemelin et al., 2001). This study aimed to reduce inappropriate screening and increase appropriate screening tests in a primary care setting. Nurse facilitators delivered three implementation strategies (audit and feedback, reminders and educational consensus building) to improve preventive care. Costs were based on an average of 33 visits per year to each practice. Strategies were tailored to the practice needs and preferences.

Using a cost-consequences analysis³, costs included the cost of the implementation intervention plus the additional costs associated with performing an increased number of appropriate screening tests as a result of the intervention. The cost savings were estimated by calculating the number of inappropriate screening tests not performed, the number of false positive tests avoided and the treatment costs avoided due to the intervention (e.g. fewer hospitalisations, shorter hospital stay and less invasive treatment options in patients with early diagnosis). The significant reduction in inappropriate testing and increase in appropriate testing resulted in a 40% return on investment for the Canadian government (\$191,733 per year savings – Canadian dollars, 2003).

One good quality RCT (Bahrami et al., 2004) examined the effectiveness of using audit and feedback and/or a computerised educational package to improve dentists' compliance with guidelines for management of impacted molars. With high compliance rates from dentists at baseline (ceiling effect), there was no significant difference in effectiveness between the strategies. Using a cost-minimisation analysis, results showed that the computerised learning package was more expensive than the audit and feedback strategy (£482 per dentist vs £217 per dentist).

3. Cost-consequence analysis that is taken from the Canadian Government perspective does not include patient costs or other downstream costs, such as specialist treatment or visits to allied health professionals.

6. Discussion

The economic value or cost-effectiveness of public health interventions has been termed 'the fourth hurdle' by the pharmaceutical field. It follows safety, efficacy and quality in assessing whether an innovation that has clinical merit can be delivered within budgetary constraints. Similarly, the use of implementation strategies that have demonstrated effectiveness for improving individual practice and organisational systems may also be assessed on the basis of their capacity to facilitate adoption of best practice in an economically feasible and responsible manner.

While a standard health technology assessment is limited to consideration of the costs and benefits of an innovation and the consequences of implementing that innovation, determining whether an implementation strategy is worthwhile may also involve determining costs and benefits at different stages of the dissemination and implementation process.

The present report synthesised the existing evidence on the costs of different dissemination and implementation strategies and their relative efficiency. However, this synthesis was limited by the paucity of good quality economic analyses and lack of detail on costs and consequences. Estimating costs of a strategy may be easier said than done and sometimes estimates are difficult to determine, data is often missing, and the sample size is too small (Patel et al., 2005).

Few studies assessed the direct costs of changing professional behaviour, let alone the indirect effects on health services following use of implementation strategies. In addition, the data on costs and use of resources was relatively sparse and highly variable between studies, with most studies including only selected examples of costs and few assessing economic benefits or consequences of implementing strategies. Societal costs and benefits, which are germane to AOD-related problems, and costs and consequences for patients were not addressed in the available studies. Of the few studies that considered a wider scope of costs and consequences, evaluations were limited to the specific context and lacked generalisability.

Decisions about resource allocation are often made on the basis of findings from a single controlled trial (Sculpher, 2000). This may be problematic if the trial is of poor quality and has limited validity and generalisability. Moreover, where there are divergent findings across research, there is often inconsistency in a range of factors, including:

- Types of outcome measures (direct, indirect, short-term, long-term)
- Perspective taken (patient, practitioner, organisation)
- Completeness of relevant data on all costs and all consequences used in analyses

- Lack of alternative options (the full range of existing options is not analysed)
- Adequate follow-up to capture relevant consequences.

Findings from the full systematic review evaluating the effectiveness of implementation strategies indicated that those with more interactive elements and containing repeated messages, with additional materials and support, were more effective for improving practice. However, they also tended to be more resource-intensive. In contrast, strategies that are relatively brief and less intensive may also be less costly to use. While they are less effective than the more complex, costly and more intensive interventions, they may also have a reasonable impact at the population level due to their broad reach (Abrams, Mills, & Bulger, 1999).

It is possible that a 'stepwise' approach could be considered for implementation of innovations (Abrams et al., 1999). For example, the first step may be a brief, simple and inexpensive strategy for the 'whole population' (e.g. health care professionals in a variety of AOD settings). The second step may involve a more interactive and more intensive strategy targeted at those who failed to respond at the first level. Further steps may involve tailored strategies with increased intensity, duration and complexity aimed at a smaller group with more specific needs. Thus, resources can be more judiciously allocated to achieve optimal impact by reserving the strategies with higher associated costs to a smaller group with greater need. Note that detecting those requiring further interventions may incur additional costs and these costs would need to be taken into account.

In summary, the key findings from this review are:

Strategy effectiveness

- *CME*: overall this strategy was effective and cost-effective. However, formats differed markedly between the available studies. In terms of effectiveness and cost-effectiveness, educational training was better than providing written material alone (Fallowfield et al., 2002) and small interactive group sessions were better than a formal seminar (Santoso et al., 1996).
- *Educational outreach*: there were mixed results from this group of heterogeneous studies. However, Weller et al. (2003) found mailouts were as effective as outreach for a lower cost.
- *Multi-faceted approach*: These studies varied substantially in context and content, and there was insufficient detail in reporting to make meaningful comparisons on the basis of cost.
- *Educational Materials*: while costs were generally low, effectiveness was also low.

- Using an economic modelling approach on four different strategies (CME, educational outreach, reminders, financial incentives), Shanahan et al. (2005, 2006) found that financial incentives were the least cost-effective, outreach was most cost-effective, and CME and reminders were moderately cost-effective.

Methodological issues

- The evidence base of studies containing good quality economic analyses was sparse.
- Only nine of 16 strategies were evaluated on the basis of costs.
- Studies that reported on costs of implementation strategies used widely diverse methods, which were not comparable across studies for the same strategy.
- Reporting of details and quality of methodology was poor.
- Collection of data on costs was incomplete, with only partial costs and consequences included.
- Few studies evaluated costs for implementation strategies in the AOD field.

In conclusion, while there was some evidence to indicate that CME is both an effective and cost-effective strategy for facilitating implementation of innovations into practice, these findings were not robust. Overall, the evidence is limited and it is not clear whether these findings are generalisable to other settings.

There is a critical need for studies that evaluate the effectiveness of implementation strategies to include an economic analysis, using appropriate analytic tools to determine whether an effective strategy is also an efficient use of resources. Although there are ongoing methodological debates on economic evaluations, in order to permit meaningful comparisons across studies and make the results more relevant to practice, there is a need for some standardisation of methods. At the very least, this should include transparency in methods used, resource inputs, prices and outcomes.



7. References

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8. Appendix

Studies included in systematic review (Bywood et al., 2008)

Existing systematic reviews (**includes data on costs)

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Additional primary studies (**includes data on costs)

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NB. Although a total of 85 additional studies are reported in the text, 88 additional studies are listed here. This is due to multiple papers reporting on the same data. Three studies reported data in multiple papers. They are: Young et al. (CME, Young et al., 1998; Young & Ward, 2002); Hogg et al. (Multi-faceted approach, Hogg et al., 2005; Lemelin et al., 2001); and Boekeloo et al. (Office systems, Boekeloo et al., 2003; Boekeloo et al., 2004).