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A systematic grounded approach to the development of complex interventions: The Australian WorkHealth Program – Arthritis as a case study☆

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ABSTRACT

Despite demands for evidence-based research and practice, little attention has been given to systematic approaches to the development of complex interventions to tackle workplace health problems. This paper outlines an approach to the initial stages of a workplace program development which integrates health promotion and disease management. The approach commences with systematic and genuine processes of obtaining information from key stakeholders with broad experience of these interventions. This information is constructed into a program framework in which practice-based and research-informed elements are both valued. We used this approach to develop a workplace education program to reduce the onset and impact of a common chronic disease – osteoarthritis.

To gain information systematically at a national level, a structured concept mapping workshop with 47 participants from across Australia was undertaken. Participants were selected to maximise the whole-of-workplace perspective and included health education providers, academics, clinicians and policymakers. Participants generated statements in response to a seeding statement: *Thinking as broadly as possible, what changes in education and support should occur in the workplace to help in the prevention and management of arthritis?* Participants grouped the resulting statements into conceptually coherent groups and a computer program was used to generate a 'cluster map' along with a list of statements sorted according to cluster membership.

In combination with research-based evidence, the concept map informed the development of a program logic model incorporating the program's guiding principles, possible service providers, services, training modes, program elements and the causal processes by which participants might benefit. The program logic model components were further validated through research findings from diverse fields, including health education, coaching, organisational learning, workplace interventions, workforce development and osteoarthritis disability prevention.

In summary, wide and genuine consultation, concept mapping, and evidence-based program logic development were integrated to develop a whole-of-system complex intervention in which potential effectiveness and assimilation into the workplace for which optimised.

Introduction

There are sound reasons for developing interventions to tackle the problem of arthritis in the workplace. Arthritis and related musculoskeletal disorders (MSDs) are the leading causes of disability and chronic pain in developed countries (Badley, Rasooly, & Webster, 1994; Felts & Yelin, 1989), with osteoarthritis (OA) estimated to be second only to heart disease in the number of

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working days lost through disability (CDC, 1994; Muchmore, Lynch, Gardner, Williamson, & Burke, 2003). In 2007, there were an estimated 2.4 million Australians of working age with OA, with approximately 5% of the total workforce unable to work permanently and many others experiencing restrictions due to the effects of OA on wellbeing, quality of life and functional status (Access Economics Pty Ltd, 2007; Lacaille, 2005). In the context of an ageing workforce and increasing prevalence of risk factors, it is anticipated that the number of people with OA disability will nearly double by 2020, with half of this increase occurring among those in their highest earning years (45–65 years old) (Gignac et al., 2004). OA is a significant contributor to lost productivity and premature exit from the workforce (Lacaille & Hogg, 2001), with the economic impact of OA in the workplace typically considered in terms of employee productivity and health care costs. Labour force participation among men with OA is estimated to be approximately 20% lower than among those without the disorder and approximately 25% lower in women.

The combined effects of work loss and OA have a profound effect on both individuals and society (Yelin et al., 2004). A recent report estimated productivity costs of all forms of arthritis in Australia to be over $4.1 billion in 2007 (Access Economics Pty Ltd, 2007). While the cost of absenteeism is relatively easy to quantify where missed workdays are recorded, it is more difficult to assess the costs of presenteeism (being unproductive at work), which may in fact be considerably greater (Collins et al., 2005; Stewart, Ricci, Chee, Morganstein, & Lipton, 2003). Two recent studies estimated that presenteeism may reduce total work hours by one-fifth (Goetzel, Guindon, Turshen, & Ozminkowski, 2001; Stewart, Ricci, Chee, Hahn, & Morganstein, 2003), although this may vary significantly by worker characteristics (Stewart, Ricci, Chee, & Morganstein, 2003).

Modifiable risk factors for OA include injury, obesity, occupational factors, sports participation, joint malalignment, muscle weakness, nutritional factors and hormonal influences (Cimmino & Parodi, 2005; Felson & Zhang, 1998; Hunter, March, & Sambrook, 2002; Macnicol & Thomas, 2000; March & Bagga, 2004; Sharma, 2001; Spector et al., 1996). Some of these risk factors are directly related to occupational activities while others are not.

In recent years, the workplace has increasingly been recognised as a good setting for health education initiatives that address both occupational and non-occupational modifiable risk factors. the workplace offers easy and regular access to a large number of people and may offer the opportunity for sustained peer support and positive peer pressure (Sanders & Crowe, 1996). Over the past 30–40 years many employers have devoted resources to health promotion programs in an effort to achieve a healthier workforce, increase productivity and morale, and reduce costs associated with these health problems. A recent US survey estimated that approximately 90% of workplaces with 50 or more employees have some form of health promotion program (Association for Worksite Health Promotion, & William M Mercer Inc, 2000). Such programs often focus on reducing risk factors such as tobacco use, obesity, sedentary lifestyle, poor nutrition, high blood pressure and high blood cholesterol levels. Comparable data on the availability of workplace health education programs in Australia is not currently available.

In the context of the growing burden of OA-related disability and impact on productivity, development of an intervention that integrates elements of occupational health and safety (e.g. injury and repetitive motion trauma) into a health education program offers an opportunity to increase workforce participation, improve productivity and reduce the incidence and progression of chronic diseases such as OA (see Fig. 1).

A comprehensive workplace program is one that integrates health promotion and disease management, is consistent with corporate objectives and includes evaluations of both clinical and cost outcomes (Pelletier, 2001). Such programs are more likely to be effective than those that do not meet these criteria (Erfurt, Foote, & Heirich, 1991; Harden, Peersman, Oliver, Mauthner, & Oakley, 1999; Heaney & Goetzel, 1997; Mills, Kessler, Cooper, & Sullivan, 2007; Serxner, Gold, Anderson, & Williams, 2001). Common program elements include health education; links to related employee services; supportive physical and social environments for health improvements; integration of health promotion into the organisation's culture; and employee screenings with adequate treatment and follow-up (Linnan & Birken, 2006). However, there is relatively little evidence of effectiveness of workplace programs relating to arthritis in the Australian context.

The Australian WorkHealth Program – Arthritis was established to develop and test an education program for implementation in the workplace to minimise risk for disease onset and prevent or reduce OA-related absenteeism and presenteeism. The program was designed to be evidence-based, effective, practical, whole of system (management through to workers), appropriate for a wide range of settings and endorsed by a wide range of stakeholders, including industry leaders, education experts, academics, 'coal face' clinicians, policymakers and workers. The program was funded by the Australian Government, through the Department of Health and Ageing, as a project under the Better Arthritis and Osteoporosis Care (BAOC) initiative. A number of integrated methodological approaches were used to inform program design, planning and evaluation.

The need for evidence-based health interventions has led to increased debate about the nature, generation and utilisation of this evidence by policymakers, practitioners and communities (Swinburn, Gill, & Kumanyika, 2005). The term 'knowledge exchange', or 'information exchange' has recently received attention in the public health literature (Lee & Garvin, 2003). It represents a move away from models where researchers deliver results and information to a passive audience. It incorporates the idea of knowledge as a changing set of understandings shaped by both researchers and users. (Jacobson, Butterill, & Goering, 2003). This approach helps to identify needs and incentives and has been shown to increase uptake and application of research information (Greenhalgh, Robert, Bate, Kyriakidou, & Peacock, 2004). This approach values the strengths of an evidence-based approach to public health while considering issues of context, policy, implementation and sustainability. This involves engaging decision makers (both in the business and government sectors) from the start and represents a move towards viewing practice-based evidence as equally relevant to evidence-based practice (Marmot, 2004). Such an approach is central to the development of the Australian WorkHealth Program - Arthritis.

A comprehensive workplace health education program is an example of a complex intervention. Such programs are multifaceted and operate within already complex systems, presenting challenges in development and evaluation (Pirkis et al., 2001). In 2000, the UK Medical Research Council (MRC) acknowledged these difficulties by publishing a framework for the development and evaluation of complex interventions (Campbell et al., 2000). This framework was updated in 2008 in response to further identification of limitations. These included the need for greater attention to early phase piloting and development work, integration of process and outcome evaluation and tailoring of interventions to specific contexts (Craig et al., 2008a, 2008b).

In a review of the literature on diffusion of innovations in organisations Greenhalgh et al. (2004) noted that implementation research should: be theory-driven; focus on the interaction between innovations and the contexts in which they take place; engage stakeholders as part of the research process; use common

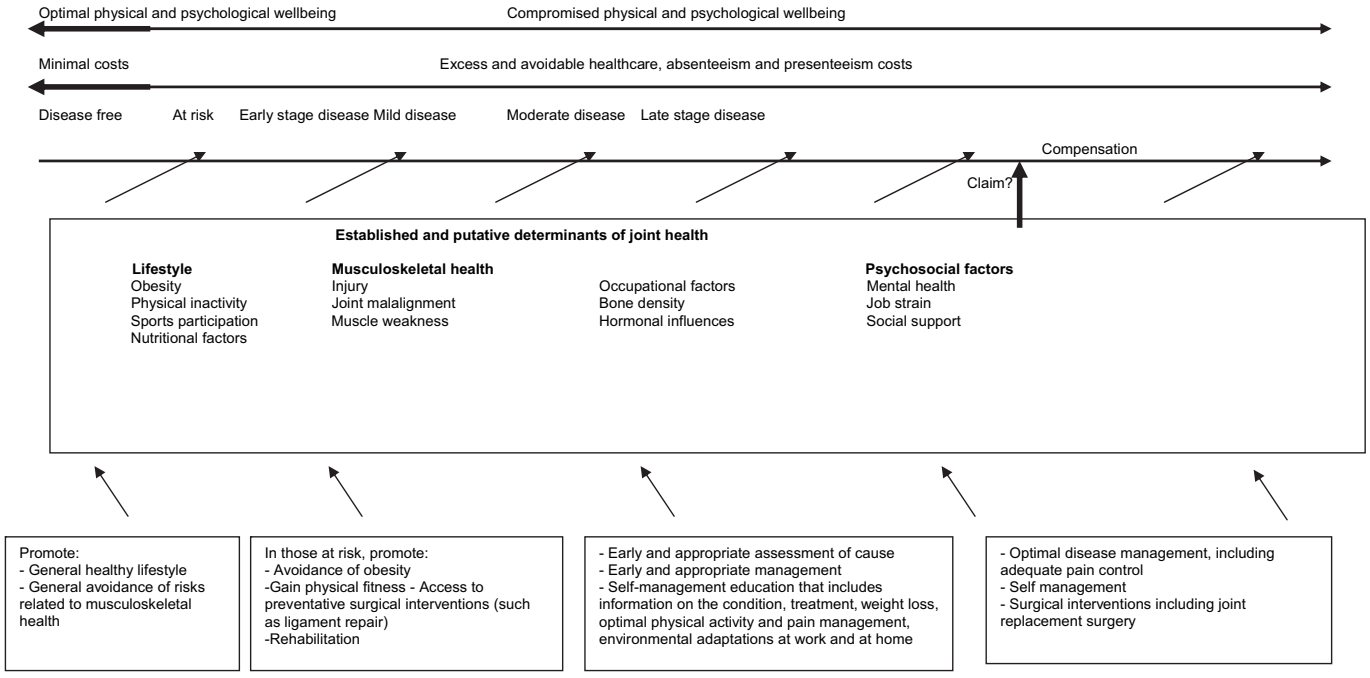

Fig. 1. Evidence informed map of the prevention and management of osteoarthritis and its' consequences.

definitions, measures and tools; include a number of professional disciplines and evaluation methods; and be documented in detail. Similarly, Knapp (1995) outlines key issues involved in evaluation and development of complex interventions. These issues are expanded to include

- The engagement of the full range of stakeholders to gain all participant perspectives. In the context of a workplace education program this would include senior management, line management, workers, regulatory authorities, policymakers, clinicians, allied health professionals and other service providers.
- Clear specification of what is to be measured. In the case of workplace health education programs this may include, for example, absenteeism and cost-benefit analyses. While several studies have attempted to evaluate workplace interventions (Aldana, Merrill, Price, Hardy, & Hager, 2005; Goetzel, 2001), methodological difficulties complicate accurate and detailed assessment of most programs and the lack of common metrics limits comparison between studies (DeJoy & Wilson, 2003; Goetzel, 2001).
- Attribution of effects to causes, which in the development phase involves careful examination of potential linkages between elements of a complex intervention and impacts that are likely to be produced.

To provide a solid foundation for the pilot phase of the Australian WorkHealth Program- Arthritis, a ground up and integrative approach to program design was adopted, that is, comprehensive consultation was used to identify stakeholders' perspectives, ideas and expectations and a social science approach was used to derive program theory from the existing body of literature (Chen, 1990). This integrated approach was selected because of the success of prior similar projects involving systematic national chronic disease self-management education programs evaluation and quality monitoring (Osborne, Elsworth, & Whitfield, 2007a) and the development and implementation of a whole-of-system model of care for management and prioritization of care of people with hip or knee arthritis (www.health.vic.gov.au/oahks).

Methods

Program development techniques involved structured concept mapping and the development of a program logic model. The concept mapping exercise and the initial program logic model development have a largely prescriptive function. They focus on the structure and activities of a program, including treatment, outcomes and implementation processes related to program values. These techniques are complemented by an exploration of the causative program theory which is defined here as the underlying mechanisms responsible for the linkages between program treatments, implementations, processes and outcomes (Chen, 1990; Leeuw, 2003). The study was undertaken between March 2007 and February 2009. Ethical approval was obtained from a University of Melbourne Human Research Ethics Committee.

Participants

The 47 participants at the workshop were invited for their expertise and current active participation in the field. They included occupational health and safety personnel, industry body representatives, consumers (people with OA), experts in chronic disease patient education/self-management program delivery, health professionals (doctors, nurses and physiotherapists), public health practitioners, academics, health service managers and policymakers (see Table 1). Participants were invited purposefully to ensure national representation, breadth of representation within the categories and interest in contributing to the process (Patton, 2002).

Concept mapping

A concept mapping process was undertaken to help specify program principles, aspects of service delivery and constituent elements (Batterham et al., 2002; Trochim & Linton, 1986; Trochim, Milstein, Wood, Jackson, & Pressler, 2004). Concept Mapping is a structured, systematic, computer-assisted qualitative method of obtaining and organising the largest possible breadth of ideas on

Table 1
Workshop participants.

Category	N
Consumer (people with arthritis)	8
Education (e.g. health educator)	3
University researcher	4
Government departments e.g. Department of Veterans Affairs, State Health Department, Department of Education, Employment and Workplace Relations	5
Emergency services	2
Health professional	9
Industry – Occupational health and safety	6
Industry – Authority (e.g. WorkSafe/WorkCover)	2
Non-Government organisation	6
Workplace health program provider	2
Total	47

a topic. The language and values of participants are used to derive a graphical representation of major ideas and their interrelationships. The 47 workshop participants were placed into groups of approximately 12 and each group was asked to brainstorm responses to the seeding statement: *Thinking as broadly as possible, what changes in education and support should occur in the workplace to help in the prevention and management of arthritis?* The single idea statements generated by each group were then brought to the larger group setting where a final list of statements was agreed upon. Each participant then sorted all individual statements according to their conceptual similarity into any number of piles (greater than one and less than the number of statements). Preliminary analyses of these data were conducted on site to feed back to participants for further refinement that day.

Data analysis was conducted with Concept System software (Concept Systems Inc. NY), which incorporates two main statistical routines that analyze the patterns among the sorted statements. Multi-dimensional scaling (MDS) was initially used to array the statements in two-dimensional space according to their degree of similarity. This resulted in a two-dimensional 'point-map' on which each statement was represented as a single point and where the closeness of two points was a measure of the common meaning of the statements as perceived by the group as a whole.

The numerical results that provided the point map were further analyzed by hierarchical cluster analysis. This procedure finds the two points on the map that are closest together and forms them into a single group. The next two entities (point or group) that are closest together are then found and amalgamated into a second group, and so on. If carried to completion, this hierarchical process results in the formation of a single group comprising all the statements. The Concept System program enables examination of any number of clusters, but the one which makes most conceptual sense is selected for discussion by participants (see Fig. 2). The cluster map was shown to participants along with a list of statements sorted according to cluster membership. Participants were asked to view and comment on the clusters, name them, discuss incongruities, missing themes and highlight areas for further consideration.

Group work to describe and sort desirable outcomes

Participants were also placed into 3 groups of approximately 15 people and asked to list desirable outcomes of a workplace education program and arrange these causally and hierarchically from short term to long term. They were also asked to consider strategies/activities to achieve these outcomes; how these might work; who they work for; where these work; what might stop them working and how it would be known that they had worked. Notes from the discussion were recorded on post-it notes and A3 matrix sheets and retained for further analysis (Funnell, 1997).

Results

Analyses of concept maps

The participants generated 99 statements in response to the seeding statement. Statistical analysis during the workshop followed by whole group discussion of the Concept Map generated 11 clusters that were named by the group as follows: "Resources/information and attitudes of employers", "Connecting health and industry", "Facilitating employer involvement", "Integration of workplace services", "Consultation between healthcare professionals and business management", "Quality assurance", "Safe work environment", "Community education and promotion", "Employee self-management", "Disease management systems" and "Public education".

Review by the whole group modified these slightly, yielding 10 clusters that were named as follows: "Management education and awareness", "Working practices/environment", "Program specialization and flexibility", "Financial/business Case", "Healthcare consultation and management", "Integration of workplace services", "Workplace evaluation/Quality Assurance", "Education of the general public", "Employee self-management", and "Disease management – evidence-based programs" (see Fig. 2).

Program logic model

The concept groups developed at the workshop were then used, along with other elements to inform the development of a program logic model. The other elements included the outcome hierarchies produced during the group discussion sessions and the key practice and evidence-based elements of successful educational interventions (Owen, Johnson, Clarke, Lovitt, & Morony, 1988) (see Table 2). The program logic model outlines the potential components of the Australian WorkHealth Program (McClintock, 1990) (see Fig. 3). The model consists of the guiding principles of the program (top row of concepts), service providers (second and third rows), the services they provide (fourth row), the intervention models used (fifth row), conditions for learning (sixth row), program elements (seventh row) and the causal processes by which the program is supposed to benefit participants (eighth and ninth rows). The conceptual and causal format used for the program logic model was selected from a small selection of approaches as most appropriate for a complex and multidimensional intervention (Batterham et al., 2002; Funnell, 1997; McClintock, 1990; Patton, 1997).

Discussion

It is argued that the program development techniques outlined here, which include concept mapping and program logic modelling, meet or exceed current recommendations for developing complex interventions and offer a dynamic approach to their development and implementation.

Concept mapping, a systematic Nominal Group process (Delbecq, Van de Ven, & Gustafson, 1975) for collecting information from purposefully selected stakeholders, gathers a range of ideas on a topic and presents conceptual frameworks back to those stakeholders in a relatively short timeframe, in this case, a few hours. This approach is valuable because all participants' views are represented within the context of the group's priorities. In addition, the results can be translated directly into specific objectives/characteristics that can be used to inform the development of a program logic model to guide the design, planning and evaluation of

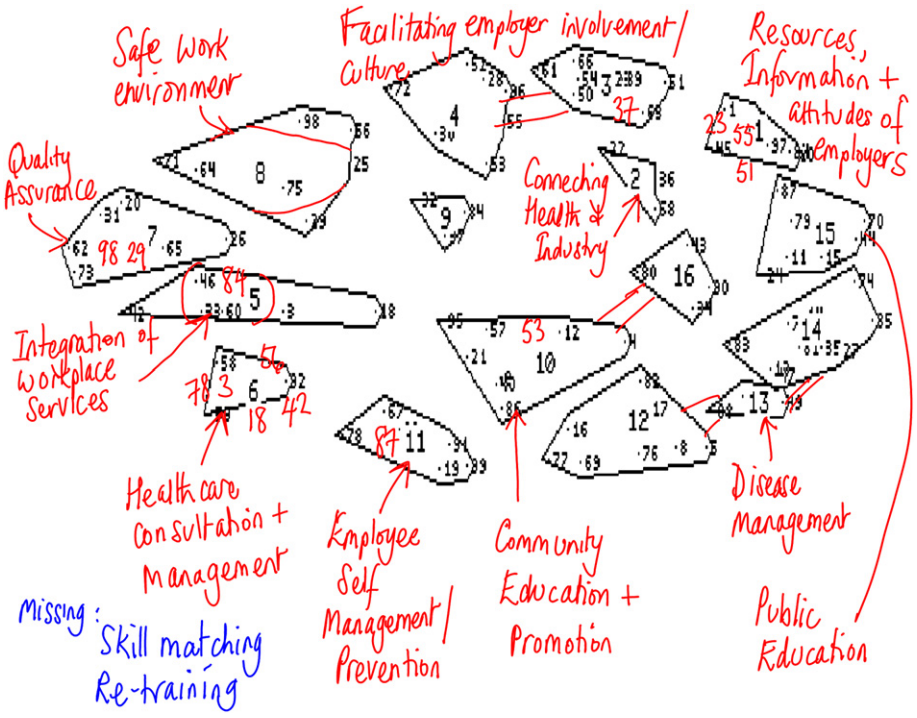

Fig. 2. Concept map and cluster names generated during the workshop discussion of the question: "Thinking as broadly as possible, what changes in education and support should occur in the workplace to help in the prevention and management of arthritis?".

a complex intervention. Concept mapping has been used for the planning of a statewide health improvement initiative (Trochim et al., 2004), in the development of a national quality and monitoring system for health education programs (Osborne et al., 2007a), in the development of a statewide whole-of-system hip and knee joint replacement surgery waiting list prioritisation system (www.health.vic.gov.au/oahks); (Witt, Scott, & Osborne, 2008) and in the development of health service innovations (Mannes, 1989; Yampolskaya, Nesman, Hernandez, & Koch, 2004).

Strengths of the overall approach to the development of complex interventions include:

- the opportunity to integrate existing evidence and theory (in this case, the characteristics of successful educational interventions) with primary research (in this case, the stakeholders' perspectives)
- the opportunity to integrate thinking about implementation and feasibility in the very first stages of development through the use of a seeding statement that concentrates on 'what works'
- a strong focus on understanding context. This is particularly important in cases such as the current example where there is very little literature relevant to the Australian context (Campbell et al., 2007)
- the development of theory of how the intervention might work, mapping out mechanisms and pathways to be evaluated
- the opportunity to identify barriers and potential for benefit
- the opportunity to identify outcome measures, both intermediate and final
- the form of the intervention to be adapted while standardizing process and function (Hawe, Shiell, & Riley, 2004).

The program logic model or explication of the 'theory of action' specifies program principles, elements and outcomes, along with the assumed linkages among these (Patton, 1997). It provides a framework to guide the development of the program through the translation of evidence into action plans. In this case, it was used to guide consideration of the evidence on the need to take action on OA prevention; identify the causal and protective factors that could potentially be targeted by interventions; define the opportunities for intervention; evaluate potential interventions; and select a portfolio of specific policies, programs and actions (Swinburn et al., 2005). Importantly, it enables decisions about the Australian WorkHealth Program to be made in partnership with policymakers, managers and other employees.

As Leeuw (2003) notes, a program logic model rarely outlines the underlying mechanisms that are presumed responsible for the linkages between program elements. Thus, the prescriptive approach to the development of program theory outlined above should be accompanied by literature review aimed at finding out what works for whom, in what circumstances, in what respects and how. This form of literature review, termed a realist review (using the methods outlined in Pawson, Greenhalgh, Harvey, and Walshe, (2005)), is currently being undertaken to clarify the mechanisms mediating the effects of the individual and organisational change processes and the changes in key indicators. It will be reported separately.

The program logic model proposes that the costs to employers and the economy are reduced as a result of improving employee health. The links between presenteeism and absenteeism and the variables given in the outcomes section of the program logic model are well-established in the case of obesity (Jans, van den Heuvel, Hildebrandt, & Bongers, 2007; Kouris-Blazos & Wahlqvist, 2007), musculoskeletal and chronic pain (Hutchings et al., 2007; Munce, Stansfeld, Blackmore, & Stewart, 2007), psychosocial health (Menzel, 2007), injury (Boden & Galizzi, 1999) and insomnia (Ozminkowski, Wang, & Walsh, 2007) and less well-established in the case of physical activity (Bernaards, Proper, & Hildebrandt, 2007). Thus it seems reasonable to assume that an intervention which favourably impacts on these variables will be effective in reducing costs to employers.

Table 2
Heuristic of successful interventions in the workplace.

Training model	Progresses through key aspects/stages	Addresses worker issues	In worker's environment	On-going over time	Has support of organisation	Has support of colleagues	Opportunity for feedback	Ownership developed	Develops commitment	Consultant Coach' role
1 Structured course (eg CDSM* or variant)	Potential for all aspects can be covered if course is of sufficient length	Yes	Practice encouraged	Strong feature of model	Through funding or sponsorship locally	Between sessions	Yes, a feature of the sessions	Develops over time	Develops over time	Provider of sessions, /logistics/ support when practice
2 Sandwich course (two sessions with gap)	Can select topic/theme of interest	Yes	Practice encouraged		Through funding or sponsorship locally	Restricted to participants	Yes, in sessions	To a limited extent	To a limited extent	Provider of sessions, /logistics/ support when practice
3 Within organisation intensive	Can select topic/theme of interest	Yes	Yes	Strong feature of model	Local support and time	Strong feature	Yes, if sessions well structured	Yes	Yes	Provider of sessions?, /logistics/ support when practice
4 Inter-organisational clusters	Can select topic/theme of interest	Yes	Yes	Yes		Between sessions	Yes, if sessions well structured	Yes, strong feature	Yes	Provider of sessions?, /logistics/ support when practice
5 Web/postal	Can select topic/theme of interest	Yes	Not necessarily	Yes	Possible	Possible	If designed to be interactive	Yes	Possibly	Logistics
6 Peer tutoring	Can select topic/theme of interest	Yes	Yes		Yes	Yes	Depends on sessions	Yes	Yes	Logistics
7 Documentation and sharing of successful intervention /best practice	Can select topic/theme of interest	Yes	Yes	Yes	Perhaps	Perhaps	Yes	Probably already developed	Yes	Cog in wheel, logistics
8 One-off model	May explain aspects/ stages but cannot practice them	To some extent	Perhaps	No	Perhaps	Perhaps	No	Unlikely	Perhaps	Information giving only

* Chronic Disease Self Management.
Adapted from Owen et al. (1988). Guidelines for Consultants and Curriculum Leaders. Canberra: Curriculum Development Centre.

Relatively few osteoarthritis clinical trials include productivity as an outcome measure and there is variability on how data on absenteeism and presenteeism are used and measured. There is a clear need to more accurately measure the effect of OA and the impact of health education programs on productivity. It is likely that this will focus on conceptual definitions of terms such as absenteeism, presenteeism, the approach to their measurement and the way these outcomes can be translated into productivity costs (Escorpizo et al., 2007). It should incorporate direct costs related to exit from the workforce and absenteeism (e.g. the cost of employing a staff member, sick leave uptake, overtime or additional work undertaken by other staff, retraining existing staff). It should also incorporate indirect costs related to absenteeism and presenteeism (e.g. lost knowledge, team inefficiency) and those related to psychosocial issues. These may be positive (eg. positive and active engagement in work, perceived safe and supportive work environment) or negative (eg. perceived job insecurity, sense of stigmatisation of those with health problems).

In their discussions of the study of comprehensive, collaborative services Knapp (1995, 1997) and Knapp et al., (2003) suggest that development and evaluation should be strongly conceptualised, descriptive, comparative, constructively skeptical, positioned from the bottom-up and collaborative. Strong conceptualisation involves a clear explanation of causal linkages between program elements. This may take the form of a literature review which attempts to explore how the delivery approaches outlined in the program logic model might affect the outcomes; the intervening factors that might mediate the effects of the treatments; and the contexts in which the causal relationships would be facilitated or inhibited (Leeuw, 2003). Evidence suggests that, to maximize the chances of being effective, workplace education interventions need to be comprehensive (Pelletier, 2001); include a significant level of stakeholder participation in planning and implementation (managers, employees and union representatives) (Erfurt et al., 1991; Harden et al., 1999; Simpson et al., 2000; Sorensen et al., 1992; Weston, 1995); provide a strong 'business case' for involvement (Goetzel, 2001; Goetzel et al., 2007); be tailored to an individual organisation's needs (Harden et al., 1999; Heaney & Goetzel, 1997); include a significant level of peer coaching/counselling or mentoring (Chapman, Lesch, & Baun, 2007); offer incentives (Chapman, 2006); be well evaluated (Chapman, 2005; Goetzel et al., 2007); and make strategic use of specific innovations theory including complexity and general systems theory (Greenhalgh et al., 2004).

As part of the development of a new intervention, it is useful to look at failures in workplaces and other settings. As Knapp (1995) notes, being constructively skeptical involves looking for the negative impacts of an intervention as well the positive ones. It also involves taking a constructively critical approach to current practice. An example may be found in the area of self-management skills training, which is a key element of the proposed Australian WorkHealth Program - Arthritis. The core concepts of self-management are engagement in self-care, improved self-monitoring, interactions with healthcare professionals and coping with disease (Osborne, Spinks, & Wicks, 2004). The well-known model in Australia is a group based chronic disease self-management program (CDSMP) led by peers or health professionals. However, there is limited evidence for the efficacy of such self-management programs for people with arthritis (Chodosh et al., 2005; Warsi, LaValley, Wang, Avorn, & Solomon, 2003; Warsi, Wang, LaValley, Avorn, & Solomon, 2004). Structured self-management courses appeal most to those who are female and who are reasonably well-educated and motivated enough to enroll (Osborne, Wilson, Lorig, & McColl, 2007b). Trials have not provided convincing evidence of

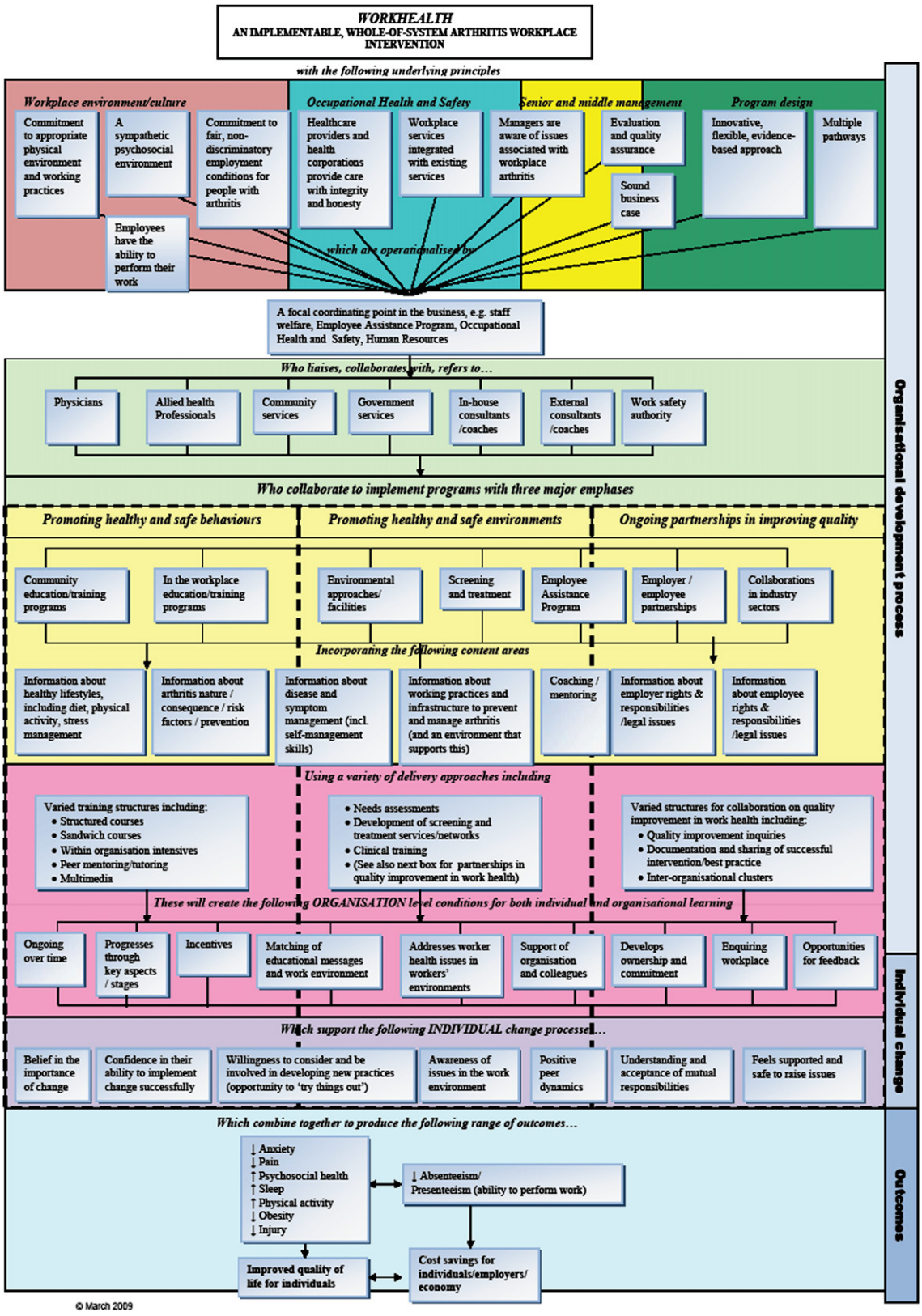

Fig. 3. Program logic model.

generalisability as men and ethnic groups are greatly under-represented in most studies (Sheikh, Netuveli, Kai, & Panesar, 2004; Warsi, LaValley, Wang, Avorn, & Solomon, 2003). Self-management programs may not reach those with limited education and low economic status (Foster et al., 2003), may worsen health inequalities between different socioeconomic groups and may even undermine patient encounters with their health practitioners (Osborne, Jordan, & Rogers, 2008).

Such evidence points to the importance of the systematic, ground up approach taken in the development of the Australian WorkHealth Program – Arthritis, and also to the necessity of carefully examining the contexts in which interventions are delivered. For example, there is evidence that involving employees in planning and implementation helps to ensure that any interventions are relevant and acceptable. They may also encourage employee ownership, thus increasing the chances of continued participation (Sorensen et al., 1992). However, not all studies show positive outcomes (Glasgow, Terborg, Hollis, Severson, & Boles, 1995; Sheeshka & Woolcott, 1994) and intervention strategies relying on worker participation may be less appropriate in companies with a high employee turnover, economic hardships, lay-offs and significant management changes (Sorensen et al., 1992).

To be most effective an intervention should be directly relevant to the recipients of the intervention (Knapp, 1995). Research evidence points to the importance of visible and enthusiastic support for, and involvement in, workplace interventions from all levels of management including the topmost level (Linnan, Weiner, Graham, & Emmons, 2007; Sorensen, Linnan, & Hunt, 2004). In the context of an integrated approach to program development such as that described here, a key component is the generation of stakeholder ownership through collaboration with industry. This will be facilitated through the formation of an Industry Advisory Group (IAG) consisting of representatives from leading companies in the mining, manufacturing, transport, financial services, communications, agriculture, cleaning and emergency services sectors. The aim of the IAG is to incorporate untapped industry 'best practice' to ensure the ongoing success of the program, both as a research project, and as a program with clear application in real situations. This is an essential part of a knowledge exchange framework that acknowledges the reciprocity involved in developing evidence-informed interventions. By carefully considering the needs of organisational management, the program and its application will be directly relevant to industry participants.

Conclusion

The program development techniques described here, which include concept mapping and program logic modeling, offer a useful methodology for those involved in the development and implementation of complex interventions. This systematic and genuine process of gaining information from purposefully selected stakeholders provides a framework to guide program design, planning and evaluation. It can be combined with a review of the evidence base and the principles of program development and evaluation and offers a systematic way of supporting the translation of evidence into action.

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