Supporting NHS Scotland in developing a new Knowledge-to-Action Model

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**Objectives**
In support of the development by NHS Scotland of a new Knowledge-to-Action Model, we looked at the existing evidence on knowledge to action frameworks and on implementation strategies. Our objectives were to draw on published research and sources of experience from the grey literature to provide:

a) an annotated reference list of key knowledge to action frameworks  
b) an explication of knowledge to action frameworks in operation  
c) an annotated reference list of key literature resources and evidence-informed reviews on implementation strategies and challenges.

**This document**
This paper sets out the evidence uncovered in two main sections:

Section 1: Knowledge to action frameworks  
Section 2: Information to support implementation strategies

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Executive Summary

Introduction

In support of NHS Scotland in its development of a new knowledge-to-action framework, we collated a range of evidence resources that can inform thinking in this area. These evidence resources are grouped in two broad areas:

Section 1: Knowledge to action frameworks

Section 2: Information to support implementation strategies

Two broad types of evidence emerge from these evidence sources:

1. Instrumentalist evidence, that is, evidence that either supports or refutes the use of specific definable interventions and approaches. Typically, such evidence comes from quantitative evaluative methodologies including (but not exclusively) randomised control trials.

2. Broader evidence, that is, research findings that are not directly related to the testing of specific interventions, but which can nonetheless provide insights and guidance in the development of an overall approach. Such evidence often utilises diverse and multiple methodologies.

Both types of evidence appear throughout this compilation.

Section 1: Knowledge to action frameworks

Core question: What knowledge to action frameworks exist and what do we know about their use?

The review focuses on 16 knowledge-to-action frameworks and also considers two papers that review and synthesise multiple models. We have divided the frameworks into two categories:

a) implementational frameworks: these focus on the implementation of well-defined codified knowledge (e.g. clinical guidelines)

b) interactional frameworks: these focus on social knowledge and learning about how to change practice (e.g. problem-solving processes)
These categories are a rough guide: there are many overlaps between the different types of framework. In this paper we briefly summarise each of the knowledge to action frameworks and then review some case studies of these frameworks in use.

The knowledge to action frameworks reviewed point to the following key points and considerations:

- Knowledge to action processes need to be aimed at something. What is the problem we are trying to address? What are our local priorities? What do we need knowledge about?

- Knowledge comes in many different forms (e.g. research findings, population data and statistics, quality and performance data). The importance of each form may alter according to the problem being addressed.

- Getting knowledge into practice is not a linear process but an iterative dynamic process, involving feedback loops and the need to revisit problems and sources of knowledge.

- Knowledge to action involves and affects many different actors (e.g. individuals, teams, organisations, different professions, patients and the public, policy-makers).

- There are many barriers to getting knowledge into action (e.g. the priorities, expectations and attitudes of different actors and the systems they work in).

- Knowledge to action strategies need to take these barriers in the local environment into account along with other factors (e.g. the problem being faced, the types of knowledge required).

- There are different forms of knowledge use (e.g. direct application of specific pieces of knowledge, changing attitudes, opinions or ideas, challenging or reinforcing priorities); evaluating knowledge use is therefore not straightforward.

We suggest that these considerations should form the background to choosing and using the implementation strategies which we have focused on in the rest of the review.

Section 2: Information to support implementation strategies

Core question: What can be done to support and encourage knowledge to action processes?
Implementation approaches can be thought of as located along a spectrum - from concrete interventions aimed at increasing the use of specific and explicit knowledge, through to addressing factors in the broader organisational environment that encourage greater engagement with a wide variety of research-based evidence. Recognising this spectrum we developed three broad categories in summarising the evidence:

1. **Implementing specific interventions around knowledge use (e.g. clinical pathways and guidelines)**
   - Many interventions have only limited evidence as yet in their favour;
   - However, there is some evidence to support a range of specific interventions, including: clinical pathways; teaching critical appraisal skills; on-screen point-of-care reminders; computerised advice on drug dosage; continuing education meetings and workshops; and audit and feedback.

2. **Developing and using networks and communities of practice**
   - Knowledge is ‘social’: it is defined and interpreted, assimilated and used, by individuals who are members of formal and informal groups in organisations;
   - Encouraging the use of knowledge in practice therefore means:
     - Acknowledging the major ‘communicating and influencing’ role played by networks and ‘communities of practice’;
     - Supporting network development and encouraging the formation of new networks (e.g. health professionals, researchers, information specialists and brokers);
     - Feeding knowledge resources into networks and communities of practice.

3. **Addressing factors in the broader organisational environment/culture**
   - Success or failure of interventions depends on the broader organisational environment/culture;
   - Implementation needs to take into account the structural, political, cultural, educational, emotional, physical and technological challenges of organisational change;
   - Key conditions for successful implementation include:
     - Strong leadership from clinical, managerial and political leaders at different levels of the organisation and wider health care system;
     - Ensuring that health professionals (especially doctors) are actively engaged and that they believe that the changes will benefit both staff and patients;
     - Using – and sustaining - a range of interventions at different levels (i.e. individual, team, organisation, the wider health care system);
- Collecting robust and timely data to monitor changes and to adjust actions as needed
- Ensuring that there are adequate resources (e.g. finance, staff, training, IT systems) to support the change.

**Building strategies in any of these three areas may well involve refined and reformed roles.** It is not yet clear from current evidence how clinical librarian roles should best be developed, but there is clear scope for these roles to evolve in support of strategy in each of the three areas.

**End Executive Summary**
THE EVIDENCE RESOURCES

Section 1: Knowledge to action frameworks

Introduction
In previous work we identified 28 individual frameworks which were relevant to the process of translating knowledge into action (see Ward et al, 2009). For the purpose of this review we have focused on explicating some of the better known frameworks in more detail and identifying relevant models not included in our original review. Evidence for this part of the review has been drawn from published research (experimental and theoretical) and pre-existing reviews. Sources were identified using our own professional knowledge, citation searching and electronic searching in major databases (e.g. Web of Science, Medline). We identified 16 knowledge to action frameworks and two papers which reviewed and synthesised multiple models.

Making sense of the frameworks
We have found that it has been useful to think of the knowledge to action frameworks as falling into two categories. The first category contains implementational frameworks. By this we mean frameworks which focus on the implementation of well-defined, codified knowledge (e.g. clinical guidelines). These frameworks tend to explore the values or constructs associated with effective implementation or good implementation practice. The second category contains interactional frameworks. By this we mean frameworks which focus on social knowing and learning about how to change practice (e.g. problem solving processes). These frameworks tend to explore the contextual features and background to change and how problems can be formulated and solved. Some of the models are a hybrid of both approaches, usually focusing on the way in which codified knowledge is influential in the context of social interaction. We have divided the frameworks into these categories in our summary below, but it should be noted that they are a rough guide only and that there are many overlaps between the different types of framework.

Summary of the frameworks reviewed
What follows is a listing of the key frameworks uncovered together with annotations on their features and use. In addition, Appendix A reproduces diagrammatic representations for many of the models.

Implementational frameworks
**Consolidated Framework for Implementation Research** is a comprehensive typology to guide formative evaluation or synthesise knowledge about effective implementation. It consists of 37 constructs organised into five domains, giving values associated with effective implementation for each construct and incorporating summaries of professional consensus on good implementation practice. The framework has not yet been tested empirically, but the authors claim adaptability to multiple settings through the selection of appropriate constructs.


**Knowledge Dissemination and Utilization Framework** is a typology of diffusion strategies intended for use by researchers to integrate knowledge utilisation into the research process, presented as a check-list. It distinguishes strategies according to goal and audience. Three US case studies claim that use of the framework enhanced knowledge utilisation, but evidence is anecdotal. The framework was illustrated in hospital and community settings.


**Knowledge to Action (KTA)** is a comprehensive conceptual framework comprised of two overlapping phases of knowledge translation, called knowledge creation and the action cycle. In the former, knowledge is filtered to make it more useful; in the latter, a planned-action cycle (based on synthesis of 60 existing models) is implemented. The knowledge creation phase privileges scientific knowledge; experiential knowledge is integrated in the action cycle. The framework has not been tested empirically. The authors claim adaptability to multiple settings.


**Interfaces and Receptors** model is a framework for assessing research utilization, planning user-driven research and influencing design of effective national or sub-national health research systems. It models interactions between researchers and policymakers and factors affecting reception. Its focus is on the conditioning institutional arrangements for knowledge use. Illustrated (as opposed to tested) through four case studies in a policy making setting.

Promoting Action on Research Implementation in Health Services (PARiHS) framework represents successful implementation as a function of the nature of evidence, the qualities of the context and the facilitation of the implementation process. Later iterations expanded the way evidence and context are conceived, but the framework has been criticised for a narrow conception of the facilitation role. Operationalised as a practical tool through diagnostic questions and a grid-plotting device to assess ‘readiness’. Originated in collaborative research, validated by retrospective application to research projects and refined through empirical case studies. An international collaborative is developing/using the framework, so there is opportunity for comparative testing. The framework has been used in a variety of settings, but was initiated in the field of nursing research.


Ottawa model of research use (OMRU) consists of six key elements to be assessed, monitored and evaluated before, during and after knowledge translation initiatives: the practice environment, the potential adopters, the evidence-based innovation (these three elements are assessed as barriers and/or supports), the transfer strategies, adoption/use and outcomes of use. Put forward as a practical, non-linear model to promote research use, aimed at policymakers. The model was developed in a hospital setting and focused on clinical teams.


Framework informed by diffusion theory, which distinguishes three phases of implementation: research, translation and institutionalisation. Emerged out of the search for a common language between scientists and practitioners at the US Centers for Disease Control and Prevention. The framework was developed by a working group and not yet tested empirically. Intended for use in public health settings within the community.

Interactional frameworks


Collaborative knowledge translation model based on a collaborative relationship and a KT cycle (the process dimension) and a sequence of collecting, analysing and synthesising knowledge (the content dimension). Developed through a single-site programme of research about experiences of hospitalization and discharge in Canada.

Integrated interdisciplinary KE framework organised around three basic components of knowledge exchange systems: the role of individuals in collective systems, the nature of the knowledge exchanged, and the process of knowledge use. Developed from a systematic snowball sampling review of literature in science-society studies and political science. A key insight is that knowledge use is shaped by the polarisation of the collective action system and the way costs are shared within that system. Usefulness only assessed through discussions with Canadian decision-makers. Not specified for any particular setting, but the implication is that it is most relevant to policy and decision making.


Model that classifies knowledge along a continuum from knowledge-as-object to knowledge-as-process, suggesting strategies for different types. Although based only on a single case study, the model is useful for thinking about the diversity of knowledge types in a complex organization and how to manage their combination to minimize loss of meaning. It is relevant to goal of “capturing and managing tacit knowledge” listed as “key area for development” in the NHS Scotland scoping study (5.4.7). Developed in a social work setting in a single organisation.


Tool for self-evaluation of communicative effectiveness by knowledge teams in research, practice and policy, using computer-aided dynamic agent-based modelling. Mathematically models the occupational distance between team members, their individually-held knowledge resources and discourse ethics, and the mutual understanding acquired through social interaction, taking into account power differentials. Running the model suggested that mutual understanding is a dynamic, fluctuating achievement of teams. The framework has not yet been tested empirically. It is intended for community settings with a focus on interdisciplinary teams.


Model identifies five crucial elements in the knowledge transfer process: identifying and communicating about the problem which the knowledge needs to address; analysing
the context which surrounds the producers and users of knowledge; developing and selecting the knowledge to be transferred; selecting specific knowledge transfer activities or interventions; considering how the knowledge will be used in practice. Operationalised as two practical frameworks for thinking about the issues associated with knowledge transfer – one for the producers and one for the users of research. The framework was refined following three case studies in a mental health setting. 2 sites were multidisciplinary teams who were focusing on service planning and evaluation. The other site was a single professional team (community mental health nurses) who focused on service delivery.

**Hybrid frameworks**


   Typology of ten pathways that lead to the use of health services research by policymakers, with the emphasis on how researchers can increase chances of use and what policymakers should do to create a favourable infrastructure for research use. Output of an expert panel advising the US Agency for Healthcare Research and Quality. The framework has not yet been tested empirically. It may be relevant to NHS Scotland in its capacity as commissioner or funder of research and is intended for policymaking contexts.


   **Critical Realism & the Arts Research Utilization Model (CRARUM)** is an adaptation of the Ottawa Model of Research Use, borrowing additional concepts from critical realism (generative mechanisms, structural and agential powers) and incorporating arts-based methodologies with the potential to foster critical awareness and transformation. More dynamic than OMRU, with more room for agency by the adopters of research. It has not yet been tested empirically. The authors claim applicability in multiple settings.


   **Participatory Action Knowledge Translation** model combines a social constructivist approach with elements of the PARiHS framework and the Knowledge to Action framework. It claims applicability to the design and implementation of KT across fields. It takes the components of PARiHS (content, context, facilitation) and the idea of a dynamic relationship between ‘science push’ and ‘demand pull’ from the KTA framework. The framework was tested in a multi-site study in a multi-agency Canadian care homes programme, using facilitation within action groups.

Normalisation Process Theory draws on social constructivism and implementation theory is a non-linear model for use with formal implementation processes in organisational settings. Its key elements are the social organization of the work (implementation), making practices routine elements of everyday life (embedding), and sustaining embedded practices in their social contexts (integration). It defines activities, mechanisms and actors’ investments that are crucial to the outcome of an implementation process. Operationalised as a planning or evaluation tool by means of questions about the work required for normalization and the actors who accomplish it. Empirically tested by retrospective application to experimental, qualitative and review data, which demonstrated utility. Not specified for any particular setting, but is usually illustrated in clinical contexts.


4Cs model for leadership in inter-organisational learning and knowledge management puts forward four principles: Clarity (of purpose, e.g. is focus exploratory or exploitative learning?), Capacity (of collaborating agencies to absorb new knowledge, and interoperability of KM systems), Culture (recognition of interdependence, appropriate balance of cognitive proximity / distance), Catalysts (champions, brokers and role models with the right skill set). Leadership understood as predominantly facilitative, so this model may be useful in association with PARiHS. The model combines structural and interpretive conceptions of learning, which maps onto a distinction between planned and naturalistic / facilitative KM strategies. The framework is aimed at public sector or cross-sector inter-organisational collaborations.


The Knowledge Integration model effects a shift from internal to external validity concerns, arguing that a systems-oriented approach to knowledge into action is lacking from other models. The model attempts to provide guidance that will align knowledge to action strategies across individual, organisational and system levels, recognising that actors in KTA occupy positions in systems that affect their outlook and behaviour. Strategies thus need to align collaborative goals with distinct priorities. The model is operationalised as a nine-cell matrix characterising the philosophy and some possible implementation strategies appropriate to three domains of inquiry (individual, organisational and system/policy) and three types of science (basic, clinical and
population). The job of the planner/evaluator is to choose the most relevant approach for a given problem and context from this repertoire, that ranges from transfer, through linkage and exchange to co-production. The framework was produced for cancer communications, but the language is not disease specific.

Reviews of multiple frameworks


Literature review (current to October 2009) covering 47 models of knowledge translation. Identified four themes: EBP, research utilization and knowledge transformation processes; strategic and organizational change theory to promote adoption of new knowledge; knowledge exchange and synthesis for application and enquiry; designing and interpreting dissemination research. Intended for rational selection of a suitable conceptual model to guide a specific initiative. Each model is appraised for purpose, emphasis and scope, but not quality. Models are illustrated using examples from community / policymaking setting.


Theoretical essay summarising five knowledge-for-action theories for the purposes of evaluating complex interventions. Combines insights from knowledge utilization theory, transfer theory, implementation theory, translation theory and diffusion theory to evaluate outcomes and understand how stakeholders value these outcomes. From each theory it identifies the ‘added lens’ for evaluation: language from translation, movement from transfer and diffusion, use from knowledge utilization, socio-political factors from implementation.

Knowledge to action frameworks in operation

Introduction

Our aim in this section of the review was to identify how knowledge to action frameworks have been operationalised in the context of improvement/clinical change activity. Evidence for this part of the review has been drawn from a range of academic and grey literature, both published and unpublished. Sources were identified alongside our searches for the first part of the review, with the addition of specific citation searches and the use of our own professional networks and contacts. We explicitly focused on identifying case studies of the knowledge to action frameworks outlined above. We identified 12 case studies which operationalise 5 of the frameworks.
identified in part 1 of the review. We also identified two sets of case studies which do not expressly operationalise any single knowledge to action framework, but may provide some insight into the range of knowledge to action approaches which may be taken.

**Making sense of the case studies**

It has been suggested that the use of a coherent knowledge to action framework can support and underpin the choice of specific knowledge to action/implementation strategies and direct implementation activity. However, we have found few examples of the frameworks being used in this way. This is due, in part, to the complex and at times abstract nature of the knowledge to action frameworks, particularly those which take an interactional approach. This complexity may explain why we found more examples of implementational frameworks being used in practice, but it could also be explained by the relative recency of the interactional frameworks. It is apparent that the PARiHS framework has been applied more often than any of the others, and this may explain why numerous weaknesses have been identified, even when evaluators found the framework useful. We have divided the case studies according to the knowledge to action framework which they operationalise in our summary below. In a further section we provide details about two sets of case studies which provide some insight into knowledge to action, but which do not appear to be underpinned by any framework.

**Exemplar case studies**

**KTA framework**


Development and implementation of interprofessional protocols in Family Health Teams in Ontario, guided by knowledge translation principles including KTA framework. Implementation strategies included formal educational events, individual meetings, emails and the formation of committees to work through the resource materials. Outcomes were increased mutual awareness between professional groups and some practice and organisational changes. Case study did not attempt to validate model.


Implementation, monitoring and evaluation of a strategy for mentorship in academic medicine, using KTA framework to structure the timing of the process (division into three phases: knowledge creation, the action cycle and monitoring knowledge use). Interactive stakeholder workshops were the main planning and implementation tool. It
is claimed that using the KTA framework “resulted in a meaningful exchange of knowledge among relevant stakeholders ... driven by an equal partnership between researchers and decision-makers”. The paper provides little hard evidence of effectiveness or take-up, although follow-up studies were planned.

3. See also Campbell (2010), below.

**PARIHS**


Protocol for “the first multiple case study research project focused on KTA processes in Canada” which will use PARIHS to inform a study of KTA practices in 9 communities of practice in the Seniors Health Research Transfer Network. The CoPs are topic-focused and include caregivers, policymakers, researchers, educators, librarians and others. The study sets out to assess how well the three PARIHS dimensions (evidence, context and facilitation) describe the emergent patterns of knowledge flow.


Alberta Context Tool measures organisational context in order to inform design of interventions to improve research uptake in complex healthcare settings, and is intended for use “at the level of the individual healthcare provider”. It uses PARIHS’s context element. They found that PARIHS did not provide enough direction about all dimensions of the organisations they were concerned with, so drew on other relevant literature (Greenhalgh et al 2004, Grol et al 2008, Grol & Grimshaw 2003, Fleuren et al 2004) to develop the ‘missing’ dimensions of context: social capital, formal and informal interactions and organisational slack. Tested in a multi-site study (hospital setting, respondents: nurses and allied HPs), where the PARIHS variables explained 34.5% of variance in self-assessed variables, and the other context variables explained an additional 22.5%.


Description of the approach taken to implementation design and evaluation in GM CLARHC, which is characterised as flexible, combining knowledge from different sources, and making use of facilitation to achieve quality improvement. PARIHS is used as a conceptual framework, but they have embedded within it a rapid-cycle improvement process, since the model alone “provides little guidance about how the implementation process might unfold in practice, in what way the facilitation component of the framework could be institutionalised ... and what should be done to
create an organisational environment open to reflection, learning and co-production of knowledge.” They considered but rejected the KTA model as not providing enough flexibility for complex interventions.


Paper reviews over 20 PARiHS-related studies, most of which use it as an organising framework for analysing and reporting findings. Contrary to the developers’ intentions, it had not been used prospectively to guide implementation, and it is rarely used in combination with other conceptual frameworks. Empirical studies revealed a number of weaknesses: a lack of conceptual clarity (conceptual overlap between sub-domains); limitations of the linear scale (low to high) on which elements vary; lack of attention to non-human actors (personification of the facilitator); vagueness on what constitutes successful implementation. The model was useful conceptually, but needs extra configuration to guide implementation. Predominance of hospital settings, if stated.


Improvement initiative (multiple settings) that used the facilitation element of PARiHS via “reflective exploration” of facilitators’ experiences for formative purposes. PARiHS had not been used to design the facilitator role. They aimed to assess whether their experience confirms the way PARiHS operationalises facilitation. PARiHS covered many but not all elements of the definition of facilitation that emerged from the reflective process: specifically, it did not give enough emphasis to ‘telling and persuading’ for a programme that had preconceived goals. Emergent definition of facilitation strongly resembles Ward et al.


Secondary analysis of survey data from the 1996 and 1998 Alberta Registered Nurse surveys, undertaken to verify and validate the context element of PARiHS. Found that “higher research utilization scores were associated with better contextual conditions” as defined in the model, and recommends PARiHS for use to understand and improve how context affects research use. However, the survey questions had not been designed to test PARiHS, and the proxy variables used to operationalise culture, leadership and evaluation were not ideal.

Building Effective Engagement Tool (BEET) – “a practical tool to assist clinicians to build strong relationships” – combines principles derived from motivational psychology with PARiHS, selected because it was seen as consistent with evidence-based practice change. Empirically tested through observation studies and collaborative research in hospital setting, but evidence of effectiveness only anecdotal. Users reported finding it challenging to use it in a disciplined way, but “those with more experience of practice change state they believe the effort is worth the reward”.

**Ottawa model of research use**


Children’s health participatory action research project that used OMRU and the KTA framework to inform and understand knowledge use. OMRU was initially adopted to guide the facilitation of community action planning, but was found to be incompatible with participatory action research and difficult to apply in a community setting. KTA, with its ‘fluid and permeable’ conception of knowledge exchange, was more useful, but both frameworks were constraining by privileging scientific knowledge over the generative knowledge of this project. These evaluations are, however, subjective.


Comparative case study of technology adoption in hospital settings, using parts of OMRU (characteristics of innovation, characteristics of potential adopters, characteristics of environment) to guide question and topic selection for interviews and data coding/organisation. The study explores discrepancies between awareness and adoption, highlighting the role of champions, resources, ways of reaching consensus and willingness to take risks, but it does not explicitly attempt to validate OMRU.

**Ward**


Worked example of how KT framework can be operationalised in the context of a change initiative in an acute stroke unit.
Normalisation process theory


Analysis of interview data on implementation of the Mental Health NSF in 12 PCTs, structured using the first iteration of the NPM. The model was used to derive yardsticks for assessing how well embedded the clinical governance arrangements envisaged in the NSF were (in 2003-04) and to make policy recommendations about improvement strategies. The model helps show how contextual factors like organisational instability and contested professional jurisdictions inhibited collective action to operationalise new practices and standards, and is used to inform recommendations about skill-sets, monitoring of patient flows and referral criteria.


Evaluation of a phase II RCT and design of a phase III clinical trial in a primary care setting, informed by the second iteration of the NPM, which was operationalised as questions about the work required for normalisation and the actors who accomplish it. The model was found to have predictive power: “it was possible to observe that certain predictions about work that would need to be done that could be made from analysis of the pre-trial data relating to the four different factors of the NPM were borne out in the post-trial data”. It also revealed ‘hidden work’ not apparent at the trial’s inception but essential to make the intervention work. They suggest a similar procedure could be followed to develop guidance for implementation processes.

Other KT case studies

We have identified two further sets of case studies which may provide some insight into the knowledge to action process. These are briefly summarised below with weblinks.

CIHR KT casebook

The Canadian Institutes of Health Research has compiled four knowledge translation casebooks (http://www.cihr-irsc.gc.ca/e/29484.html) designed to showcase and encapsulate important lessons about end-of-grant and/or integrated knowledge translation derived from the experience of projects funded by the Institutes, Canada’s government agency for health research. They present personal stories, written by the researchers, but they rarely refer to the use of specific frameworks, nor do they assess implementation success systematically.
South Yorkshire CLAHRC KT Casebook
South Yorkshire CLAHRC is building a KT Casebook, similar to that produced by CIHR. This is due to be released imminently but will include summaries of 11 well-established innovation/evidence-based practice/clinical governance projects taking place in their partner NHS organisations. Based on information provided by the organisations (via reflective conversations with spokespeople), each summary will include information about the context of the project, the knowledge translation activities and approaches used and the impact of those activities on clinical practice. The casebook will be published on the SY CLAHRC website (http://clahrc-sy.nihr.ac.uk/theme-knowledge-casebook.html). More information about the casebook and SY CLAHRC’s approach to KT can also be found here.
Section 2: Information to support implementation strategies

Making sense of the evidence on implementation approaches
The evidence underpinning the development of new implementation strategies can be thought of as falling into four broad categories:

1. Evidence assessing the impacts of specific interventions (e.g. use of clinical pathways; application of educational outreach; automated point-of-care reminders etc.). Here the evidence tends to focus on quantitative estimates of impacts with the methodological ‘gold standard’ being (sometimes clustered) randomised control trials. The Cochrane Library is a key source of evidence here.

2. Evidence exploring the dynamics and impacts of networks of influence (e.g. work on diffusion of innovations, research/service partnerships, or communities of practice). Here multi-method approaches try to unpack the processes and pathways of influence within these complex social forms, and theorising plays an important role in both explaining patterns of interaction and providing guidance.

3. Evidence addressing the broader organisational environment/culture (e.g. work examining the precursors of change within organisations, and the capacities of organisations to adapt and adopt new knowledge). Work here tends to draw on longitudinal in-depth case studies, often of an ethnographic nature, with researchers working with health care organisations as they seek to address quality and safety issues. The outcomes from this type of research tend to be in the form of insights for change and the identification of facilitating and inhibiting factors.

4. Evidence exploring the formation and effectiveness of new or reformed roles (e.g. the development of new informationist roles, and the influence of change agents such as knowledge brokers, opinion leaders and boundary spanners). Work here tends to be more descriptive and suggestive rather than directly evaluative.

Interaction and overlap: of course, none of these categories are well-delineated. There are many overlaps and there is considerable interaction between them. While some studies of specific interventions seek to isolate the effects of that intervention from its context and control for extraneous factors, many other studies look for a detailed situated understanding of (often multiple) interventions embedded in facilitated networks of influence that pay cognisance to the wider organisational and cultural factors. Thus, the evidence base on specific interventions may help us to answer the question ‘can it work?’, and the wider evidence and experience on situated change can
help us see ‘will it work here?’ and, perhaps more usefully, ‘how might we make it work better?’.

In terms of implementation it is clear that few simple ‘evidence-based prescriptions’ exist. However it is possible to assess broader intervention strategies (that is, composites of: specific interventions; facilitated networks; organisational preparedness; and reformed roles) for their fit with the available evidence. The sources of much of that evidence are outlined below.

**Key evidence sources**
The review work has focused on existing reviews and secondary sources, around 50 of which have been consulted. These fall into three distinct categories of study:

A. Cochrane reviews carried out by the Effective Practice and Organisation of Care (EPOC) Group (19 specific systematic reviews) and recent systematic reviews on computerised clinical decision support systems (6 systematic reviews).

B. Major academic reviews of knowledge-to-action, quality improvement and innovation diffusion experience and evidence (14 reviews).

C. Other major sources of evidence and experience drawn mostly from the grey literature from the UK and further afield.

**Category A sources: Cochrane Reviews and other systematic reviews**
Cochrane reviews carried out by the Effective Practice and Organisation of Care (EPOC) Group favour quantitative assessments of impacts using methods aimed at maximising internal validity (e.g. RCTs, interrupted time series, controlled before-and-after studies etc.). As such, these reviews tend to miss the more qualitative, interpretive and contextualised work carried out using mixed-methods and situated case study work (these are covered more under Category B sources below).

We judged 19 of these EPOC reviews to be relevant: 14 of these reviews provide encouraging findings (i.e. there is some evidence to support particular intervention approaches); five of these reviews suggest that there is currently little evidence available in support of the approaches tested. Appendix B provides full references and web links to each of these reviews.

Intervention strategies for which there was some evidence available in support (i.e. a Cochrane systematic review) included:

1. Use of clinical pathways
2. Dissemination and implementation of guidelines in professions allied to medicine
3. Teaching critical appraisal skills
4. Audit and feedback
5. Continuing education meetings and workshops
6. Educational outreach visits
7. On-screen, point of care computer reminders
8. Interventions to improve question formulation in professional practice and self-directed learning
9. Local opinion leaders
10. Printed educational materials
11. Tailored interventions to overcome identified barriers to change
12. Computerized advice on drug dosage to improve prescribing practice
13. Practice-based interventions on inter-professional collaboration
14. Interventions to improve antibiotic prescribing practices for hospital inpatients

Of course the evidence base (e.g. number and quality of studies) underpinning each review, and the strength of the evidence (in terms of potential effect sizes) varied greatly between reviews. Moreover, there is a real lack of evidence as to how effects combine when multiple intervention strategies are used in tandem.

Intervention strategies for which there is at present little evidence available in support are listed below. For many of these it is unclear whether this is truly evidence of absence (i.e. there is unlikely to be an effect), or simply an absence of evidence (i.e. the studies to date are just not large enough or well conducted enough to draw any real conclusions). Currently, little evidence exists to support the following:

1. Using strategies to change organisational culture to improve health care performance;
2. Organisational infrastructures (e.g. organisational policies, working patterns and skill mix, nurse development units, research and development support systems etc) to promote evidence based nursing practice;
3. Educational games as a teaching strategy for health professionals;
4. Electronic retrieval of healthcare information by healthcare providers to improve practice and patient care;
5. Inter-professional education.
**Systematic reviews published in Implementation Science (2011) on computerised clinical decision support systems**

A series of systematic reviews recently published in Implementation Science (2011) considered a range of uses for computerised clinical decision support systems (CCDSS). We are including them here because NHS Scotland has a particular interest in the evidence on these systems.

The researchers conducted the reviews in partnership with individuals responsible for implementing CCDSS in the local region (in Canada). Decision-makers (both managers and clinicians) met the review team periodically to discuss the direction of the reviews and specific details for the data extraction, analysis, presentation and interpretation of the results. Reading across the conclusions of all six reviews, it is clear that there is currently not sufficient robust evidence on CCDSS to make general recommendations for their adoption. The key findings from each systematic review are summarised below. Appendix C provides full references and weblinks for each of these reviews.

1. **Computerized clinical decision support systems for chronic disease management: A decision-maker-researcher partnership systematic review (Roshanov et al 2011)**
   - Of the 55 included trials, 87% (n=48) measured the impact of the CCDSS on the process of care and 52% (n=25) of those demonstrated statistically significant improvements.
   - 65% of trials (36/55) measured impact on, typically, non-major (surrogate) patient outcomes and 31% (n=11) of these demonstrated benefits.
   - Factors of interest to decision-makers e.g. cost, user satisfaction and effects on user workflow were rarely investigated or reported;
   - The researchers emphasised that the evidence for CCDSS in chronic disease management is limited; in particular, there are only a few small studies measuring patient outcomes.

2. **Computerized clinical decision support systems for acute care management: A decision-maker-researcher partnership systematic review of effects on process of care and patient outcomes (Sahota et al 2011)**
   - Of the 36 studies, the CCDSS improved the process of care in 63% (22/35) of studies, including 64% (9/14) of medication dosing assistants, 82% (9/11) of management assistants using alerts/reminders, 38% (3/8) of management assistants using guidelines/algorithms and 67% (2/3) of diagnostic assistants.
• 20 studies evaluated patient outcomes; three of these studies (15%) reported improvements (all on medication dosing assistants)

• The authors concluded that it is difficult to make general recommendations regarding the broad applicability and effectiveness of CCDSS in acute care settings given the current literature and heterogeneity of the individual studies.

3. Computerized clinical decision support systems for therapeutic drug monitoring and dosing: A decision-maker-researcher partnership systematic review (Nieuwlaat et al 2011)

• 33 trials were identified, assessing the effect of a CCDSS on management of specific drugs (e.g. vitamin K antagonists, insulin)

• Overall, 18 of 30 studies (60%) showed an improvement in the process of care and 4 of 19 (21%) showed an improvement in patient outcomes

• Studies were small and generally of modest quality

• Effects on patient outcome were uncertain, with no convincing benefit in the largest studies

• More potent CCDSS need to be developed and robustly evaluated.

4. Computerized clinical decision support systems for drug prescribing and management: A decision-maker-researcher partnership systematic review (Hemens et al 2011)

• The review considered 65 studies

• CCDSS improved processes of care in 37 of the 59 studies assessing this outcome (64%, 57% of all studies)

• 29 trials assessed patient outcomes, of which 6 trials (21%, 9% of all trials) reported improvements

• The researchers concluded that lack of clear patient benefit and lack of data on harms and costs preclude recommending that CCDSS be adopted for drug therapy management.
5. Can computerized clinical decision support systems improve practitioners’ diagnostic test ordering behavior? A decision-maker-researcher partnership systematic review (Roshanov et al 2011)

- The review considered 35 studies
- 55% (18/33) of CCDSS improved practitioners’ diagnostic testing behaviour overall
- 4 of the systems explicitly attempted to reduce test ordering rates and all succeeded
- Factors of particular interest to decision makers (e.g. costs, user satisfaction, impact on workflow) were rarely investigated or reported
- The authors concluded that some CCDSS can modify practitioners’ test-ordering behaviour but that to inform CCDSS development and implementation, future studies need to describe in more detail a range of important factors (e.g. local context, implementation strategy) and to evaluate impact fully (e.g. costs, user satisfaction, workflow, unintended consequences).

6. Computerized clinical decision support systems for primary preventive care: A decision-maker-researcher partnership systematic review of effects on process of care and patient outcomes (Souza et al 2011)

- CCDSS improved the process of care in 25 of 40 (63%) RCTs
- Evidence supports the effectiveness of CCDSS for screening and treatment of dyslipidaemia in primary care
- There is mixed evidence of effectiveness in screening for cancer and mental health-related conditions, vaccinations and other preventive care
- Evidence is limited for the effects of CCDSS on patient outcomes, safety, costs of care and provider satisfaction.

*Category B sources: Major academic reviews*

Drawing on our own professional knowledge and networks, citation searching and some electronic searching using key words, 14 major academic reviews are highlighted that offer useful insights into implementation challenges, strategies, impacts and accomplishment. These reviews employ a broader array of methodological approaches
than those summarised through the Cochrane EPOC Group, and tend to highlight learning around implementation rather than signalling support for specific implementation approaches. Much of this work uses the language of ‘quality improvement’ rather than ‘evidence-based practice’, but its aims and goals have sufficient overlap to make it an essential literature resource for understanding ‘knowledge to action’ options and challenges. The reviews are listed below, with some brief notes on key findings.

1: Knowledge to Action? Evidence-Based Health Care in Context (Dopson and Fitzgerald, eds, 2005). This edited collection of chapters draws on around 50 in-depth NHS case studies (around 1400 interviews) that explored innovation diffusion and evidence implementation carried out in the NHS over a period of around ten years. Key points emerging include:

- The need for a social perspective on the use of evidence: “the search for generic interventions is seen as a less promising strategy for promoting evidence-informed practice... than increasing the supply of actors to diagnose the nature of local contexts, and the supply of skilled and context-sensitive action, especially from clinical leaders, to steer these ideas forward” p.184

- The critical importance of the health care professions in the diffusion of evidence-based innovations in health care – much more so than other stakeholders like managers and patients.

- The observation that different health professions have finely nuanced and distinctive ideas about what made evidence ‘credible’ – thus, when designing effective change processes, there is a need to take account of all three levels of professional influence - national (Royal Colleges etc), regional (e.g. regional groups) and local (e.g. local community of health care practice, other multi-professional fora etc.).

- The importance of boundaries between and within professions that impede spread of knowledge and practice (and the uni-professional education, post-registration training and socialisation that reinforce these boundaries).

- The importance of clinical opinion leaders in sponsoring innovations and encouraging rank and file health professionals to engage; hence there is a need for ‘soft leadership’ from well-placed clinicians, with little evidence that managers alone can produce effective diffusion strategies or clinical buy-in.

- The need for well-developed professional (and especially inter-professional) fora that generate real engagement and high attendance levels in order to move evidence and new working practices more effectively across the social and cognitive boundaries. The studies in this book found that bridging or facilitation
roles could sometimes help to reduce the timescale for shared learning or to change the negative perceptions between different professional groups.

2: *Diffusion of innovations in service organisations: systematic review and recommendations (Greenhalgh et al 2004).* This major review took in a range of research traditions relevant to the diffusion of innovations in healthcare including medical sociology, communication studies, marketing, health promotion and organisation studies. It describes a spectrum of change from ‘let it happen’, through ‘help it happen’ to ‘make it happen’. The review developed a unifying conceptual model derived from their synthesis of theoretical and empirical findings. The model draws attention to key (interconnected) factors for consideration in the development of any implementation strategy:

- Characteristics of the innovation itself e.g. its relative advantage, compatibility, trialability etc.
- Patterns of communication and influence e.g. social networks, peer opinion influence, degree of homophily etc.
- Characteristics of the outer context e.g. socio-political climate, incentives and mandates, environmental stability.
- System antecedents for innovation e.g. structure, absorptive capacity for new knowledge, receptive context for change.
- System readiness for innovation e.g. dedicated time and resources, monitoring and feedback systems.
- Characteristics of the proposed adopters e.g. their needs, motivation, values and goals, skills etc

3: *Organising for Quality: the improvement journeys of leading hospitals in Europe and the United States (Bate P, Mendel P, Robert G eds. 2008).* Here the research team selected nine hospitals and medical centres in Europe and the US that are renowned for high performance and for sustained improvement in quality of health care and conducted fieldwork over an 18 month period using a range of research methods including interviews, documentary review and direct observation. They found that the organisations shared two common factors: they had *adapted* generic quality improvement strategies to fit the context and circumstances of their own organization; and they had *addressed simultaneously* a range of challenges inherent in quality improvement. In particular, the researchers outlined six inter-related core challenges:
• the *structural* challenge: structuring, planning and coordinating quality and service improvement efforts and embedding them within the organizational fabric;
• the *political* challenge: negotiating the politics of change associated with starting and sustaining the improvement process; securing agreement to common goals; dealing with conflict and opposition; building new relationships to enable improvements to spread rapidly and effectively through the organization;
• the *cultural* challenge: building shared understanding and commitment around the improvement process; developing a culture that makes quality the over-riding concern and that values innovation, learning and collaboration;
• the *educational* challenge: encouraging a continuous learning process in relation to quality and service improvement; developing formal and informal learning and mentorship; enabling staff to acquire relevant knowledge, skills and expertise to underpin service improvement;
• the *emotional* challenge: inspiring and motivating staff to want to join and sustain the improvement effort; developing individual and collective enthusiasm and momentum around service improvement; using clinical champions and informal networks of professional and social affiliations;
• the *physical and technological* challenge: developing a physical and technological infrastructure that enables service improvement and improves patients' experience; using information to enable service improvement.

Taken together, these six challenges provide an agenda for organisations interested in using knowledge to improve the quality of services.

4: *Quality Improvement: theory and practice in healthcare (Boaden et al. 2008).*
This review, from the University of Manchester/NHS Institute for Innovation and Improvement, summarises the evidence on quality improvement in healthcare. In particular it explores a range of common industrial approaches now being used in healthcare including the Plan-Do-Study-Act (PDSA) cycle, Statistical Process Control, Six Sigma, Lean, the Theory of Constraints and Mass Customisation.

5: *A systematic narrative review of quality improvement models in health care (Powell, Rushmer and Davies, 2009).* This review, produced for NHS Quality Improvement Scotland in parallel with the Boaden review (above), covered similar ground and came to a range of largely compatible conclusions. The review includes the following summary of the 'necessary but not sufficient' conditions for successful implementation:
• Quality seen as an integral part of everyday work and as the responsibility of all staff (i.e. not handed over to a separate unit or directorate)
• Requirement for the active engagement of health professionals, and in particular doctors
• Belief among staff that they as well as patients will benefit from the changes
• Strong leadership from clinical, administrative and political leaders at different levels of the health system and a clear vision to guide the programme
• Sustained and active participation in quality improvement activities by board members and senior managers
• The use of multifaceted interventions and sustained action at different levels (i.e. individual, team, organisation, the wider health care system)
• Substantial investment in training and development (e.g. in project management and facilitation of change as well as in clinical skills required for new roles)
• Support from a designated team of change agents to provide skills and knowledge and to maintain momentum
• Robust and timely data of different kinds (quantitative and qualitative)
• Resources (e.g. finance, staff cover, training, IT systems) to support quality improvement
• Substantial training and support for health professionals and other staff using IT in new ways

6: *Improving Patient Care: the implementation of change in clinical practice* (Grol, Wensing and Eccles eds. 2005). This review complements the work of the Cochrane EPOC (Effective Practice and Organisation of Care) review group by setting out insights gleaned from across these reviews and outlining the challenges of evaluation.

7: *The attitudes of health care staff to information technology: a comprehensive review of the literature* (Ward et al. 2008). This review explores the complexity of factors that contribute to staff attitudes to information technology. Key points include:

• Attitudes of health care staff are a significant factor in the acceptance and efficiency of use of IT in practice.

• Many of the issues are about the perceived flexibility and usability of the systems, and whether they are ‘fit for purpose’; the confidence and experience of the staff in using IT are also important.

• Appropriate education and training are needed.

• Further qualitative and quantitative research are needed to identify which approaches have most impact on the attitudes of health care staff to IT.
8: Evaluating clinical librarian services: a systematic review (Brettle et al 2011).
This review notes that previous systematic reviews of the effectiveness of clinical library services (published in 2003, 2004 and 2005) have shown that while there is some evidence that such services are well used and liked by clinicians, overall there is only limited evidence on the effectiveness of clinical library services and many evaluations have been of poor quality. This latest (2011) review concludes that:

- there are 4 models of clinical library service provision: question and answer service; outreach (e.g. attendance at journal clubs and ward rounds, the most common model in the UK); question and answer service plus critical appraisal; and outreach plus critical appraisal plus synthesis, what is called ‘the informationist approach’ (librarian uses a range of approaches to provide information to users; and literature search includes a synthesised critical appraisal).

- there is limited evidence that clinical librarians are effective in saving health professionals time and that the results of literature searches are seen by clinicians as relevant and useful;

- clinical librarians have a positive effect on clinical decision-making by contributing to better informed decisions. There is limited evidence that clinical librarians impact on diagnosis and the choice of drug or therapy.

9: The Emerging Informationist Specialty: A Systematic Review of the Literature (Rankin et al 2008). The review concludes that:

- The informationist concept is at an early stage of development and there are many areas on which further and more robust research is needed e.g. on what the components of training should be.

- Domain and information science knowledge, continuous learning and embedding (working in context rather than remotely from a library) are essential to success.

- Librarians need to move to greater specialisation and libraries need to emphasise customised service.

The review includes summaries of:

- key success factors (grouped under organisational characteristics, programmatic characteristics and service provider characteristics);

- challenges and barriers (grouped by workforce issues, social barriers, organizational and system issues), and opposing opinions about the need for and merits of informationists.
10: Are clinicians engaged in quality improvement? A review of the literature on healthcare professionals views on quality improvement initiatives (Wilkinson, Powell & Davies, 2011). This review funded by The Health Foundation explored reasons for the non-engagement of clinicians in quality-related improvement work (including evidence-informed practice). It concluded:

- Healthcare professionals express strong support for the principle of quality patient care, but this may not reflect a clear understanding as to how quality might be defined, recognised or improved.

- Healthcare professionals’ espoused beliefs about quality may not translate into changes in everyday practice. Instead, clinicians have shown a variety of responses to quality initiatives, ranging from apathy to outright resistance, although a de facto involvement with recent mandatory initiatives (such as the QOF) is evident.

- Attitudes towards specific quality initiatives are influenced by the political and local contexts and by other events occurring at the same time. Contextual features that have been particularly influential in shaping healthcare professionals’ attitudes to quality and quality improvement in the period covered by the review are: the substantial and sustained organisational turbulence in the NHS; the sustained and largely critical attention the NHS receives from politicians and the media; and the increasing patient involvement focus.

11: Use of communities of practice in business and health care sectors: a systematic review (Li et al. 2009). This review concluded that there was a great deal of variety in the application of the communities of practice (CoP) concept, ranging from informal voluntary networks to work-supported formal education sessions. While it did identify some core characteristics for CoP groups, the review was unable to uncover any study in the health sector that met the eligibility for quantitative analysis of effectiveness, concluding ‘the effectiveness of CoP in this sector remained unclear’.

12: Knowledge Brokering: The missing link in the evidence to action chain? (Ward et al 2009). This paper explores various models of knowledge brokering as a key mechanism for moving knowledge to practice. It identifies three models of brokering (knowledge management; linkage & exchange; and capacity enhancement) as well as discussing the challenges of effective brokering practice. The review suggests that better conceptualisations may allow for better testing of brokering effects.

13: Practice-based evidence for healthcare: clinical mindlines (Gabbay and le May 2011). This book presents the findings from a long-term ethnographic study in one UK primary care practice, supplemented by other observational studies. It examines how clinicians develop and use clinical knowledge through ‘mindlines’ – internalised,
collectively-reinforced tacit guidelines – and shows how these are continually formed and transformed through interactions with colleagues and patients. The authors consider how practice-based evidence might be improved.

**14: Using evidence: how research can inform public services. (Nutley et al 2007).** This book explores a range of multi-disciplinary frameworks for understanding research use, summarises the empirical evidence from health care, education, social care and criminal justice, and draws out practical issues that need to be addressed if research is to have greater impact on public services. A key point that the book emphasises is that the findings from research are merely inanimate data; these data only acquire meaning and the potential to motivate action – that is, they become construed as knowledge or evidence – when processed by a human actor. Several important observations flow from this:

*Research does not speak for itself:* research findings need to be translated, set in context and amalgamated with other sorts of data and knowledge (including tacit knowledge and professional experience);

*Knowledge production from research is a deeply social and contextual process:* the process of interpretation and integration happens through dialogue in a sociocultural context, driven by awareness of local problems, challenges and decision needs;

*Evidence is what the powerful say it is:* within any sociocultural system there are power dynamics that confer or attenuate legitimacy.

The book also emphasises that there is a danger on focusing too much on ‘evidence for decision making’ as this may lead to a relative neglect of the much broader research base that can inform new ways of thinking. Research that reshapes conceptual categories and mental models may have more influence in the longer run. Such research may challenge long-held assumptions (prompting unlearning), allow a reconceptualisation of the issues that need to be addressed (perhaps even reshaping values in the process), or provide new models and frameworks for understanding these issues. Such fundamental shifts in shared logics may in turn open up whole new ways of engaging with workplace problems. The book argues that notions of ‘evidence’ should go far wider than ‘does it work?’ to help us think more deeply and more critically about the work with which we are engaged, the assumptions that underpin it, and the values that drive us.
Category C: Other major sources of evidence and experience

These key sources are drawn mostly from the grey literature.

1: Promising Practices in Research Use, Canadian Health Services Research Foundation
www.chsrf.ca

This section of the Foundation's website gives brief case studies of health care organisations that have invested time, energy and resources to improve their ability to use research in providing health care. Examples include: using an evidence-informed approach to transfer knowledge from experienced nurses to new nursing staff; using evidence to tackle overcrowding in emergency departments and using evidence to improve the care of patients with long-term conditions.

2: Evidence Boost for Quality, Canadian Health Services Research Foundation
www.chsrf.ca

This series of essays summarises the evidence on management and policy options for improving care. For example, the essay “Performance reporting to help organizations promote quality improvement” discusses the evidence on public report cards, considers what type of indicators can be helpful in improving quality of care and suggests ways to ensure that performance reports have most impact.

3: How to change practice: understand, identify and overcome barriers to change.
National Institute for Health and Clinical Excellence (2007)
http://www.nice.org.uk/usingguidance/implementationtools/howtoguide/barrierstochangep.jsp?domedia=1&mid=D338165D-19B9-E0B5-D43AD49FC7949D90

This guide discusses the different types of barriers to change encountered in health care, offers practical suggestions for how to identify the barriers in an organisation, suggests ways that these barriers can be overcome and gives real-life examples of the methods being used in a range of health care settings.

4: Delivering 'Better Health Better Care' through continuous improvement: Lessons from the National Programmes (2008);
Scottish Government Directorate of Health Delivery: Improvement and Support Team
http://www.scotland.gov.uk/Publications/2008/02/08154504/2

The national improvement programmes are designed to support NHS Boards deliver sustainable improvements, through the development of capability and capacity in technical and behavioural change management. These webpages summarise key lessons learned from a range of national programmes (e.g. Cancer Performance Support
Programme, Planned Care Improvement Programme) and give case studies of actions taken by individual boards.

5: **Institute for Healthcare Improvement White Papers**

http://www.ihi.org/IHI/Results/WhitePapers/

The Institute's white papers set out the quality improvement problems that the Institute is addressing, the ideas, changes and methods being developed, the evidence on which these are based and examples of their use in a range of health care settings. Recent white papers have covered ways to improve care for patients with multiple health and social needs, designing, testing and implementing changes in inpatient hospital care and a systematic method to identify and reduce clinical and operational waste.

6: **NHS Institute for Innovation and Improvement resources**

http://www.institute.nhs.uk/

The Institute's publications and resources include:

- **Quality and Service Improvement Tools**: a comprehensive collection of proven quality and service improvement tools, theories and techniques that can be applied to a wide range of situations.

  http://www.institute.nhs.uk/option,com_quality_and_service_improvement_tools/Itemid,5015.html

- **Facilitation guides**: guidance for group leaders on how to make group meetings more effective.

  http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/facilitation_guides.html

- **Improvement Leaders’ Guides**: 15 guides covering three themes (General Improvement Skills; Process and Systems Thinking; Personal and Organisational Development). The guides are collections of advice from people with experience of health care improvement.

  http://www.institute.nhs.uk/building_capability/building_improvement_capability/improvement_leaders%27_guides: introduction.html

7: **Implementing Point of Care Clinical Knowledge and Decision Support Systems (CDSS): Evidence Base and Proposals for Pilot Projects (Discussion Paper for Steering Group, NES October 2010)**. This review considers point of care knowledge support (e.g. evidence-based summaries, guidelines, care bundles etc) and ‘context-specific CDSS’ which is defined as algorithmic knowledge support that automatically
synthesises patient-specific data mined from clinical systems and uses this to generate recommendations from the knowledge base. The review concludes that:

a) Successfully implemented context-specific CDSS integrated with clinical systems can improve patient safety, increase compliance with clinical guidelines and prescribing recommendations, and can reduce length of hospital stay, although few evaluations to date have included measurement of patient outcomes. Furthermore, most studies have been carried out with doctors rather than with nurses or other health professionals.

b) The evidence base for the effectiveness of ‘standalone’ point of care knowledge services though positive in tendency is less well-defined.

c) The approach to implementation is key. Critical determinants of success include: speed of access; integration with clinical workflow; effective management of organisational change and dissemination; ensuring that the system reflects the diversity in frequency, type and level of clinician knowledge needs, and in the knowledge sources appropriate to meet these needs.

d) CDSS are complex interventions which require evaluation across many dimensions to assess impact on process and outcomes.

8: Literature search and synthesis services to support knowledge into action (version 0.8, 17 June 2011, NHS Education for Scotland) This paper considers the literature on ‘search and synthesis’ services, supplemented by a survey of Scottish librarians to confirm current practice, a survey directed at the international clinical librarian community and discussion with key contacts. Two of the three systematic reviews referred to in this paper (Brettle et al 2011 on clinical librarian services and Rankin et al 2008 on the informationist specialty) are referred to separately under Category B above.

In relation to enhanced librarian roles, the paper makes the following points:

- There is a proliferation of library roles with varying job titles which contain to varying degrees the same knowledge and skill components
- Librarians are engaged in providing a range of services including:
  - Literature searching
  - Critical appraisal and knowledge of research methods
  - Summarising the evidence base
  - Clinical expertise or specialist knowledge
  - Contribution to decision-making
• Outreach is a core component i.e. the librarian is visible, present or embedded in clinical teams, units or governance structures

• The posts range from project positions to confirmed establishment posts

• Posts tend to be provided on a local basis (i.e. based within one organisation)

• The number of clinical librarian posts has increased in the UK in recent years, partly because of a strategic drive for library services to develop expertise in this area; posts exist over a variety of clinical specialties and structures and include corporate clinical librarian roles to support strategic and operational decision-making

• There are variations in the service provided by clinical librarians; the majority of clinical librarian roles do not extend to appraisal and synthesis

• Informationist roles differ from the clinical librarian model as they tend to have a high level of domain knowledge

• The professional literature identifies key roles for librarians in relation to decision support systems but current evidence of these roles comes mainly from the US

• There is a paucity of substantial impact data.
Appendix A: Diagrammatic representations of Knowledge to Action Frameworks

Consolidated Framework for Implementation Research (Damschroder et al 2009)

Knowledge Dissemination and Utilization Framework (Farkas et al 2003)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Exposure</th>
<th>Experience</th>
<th>Expertise</th>
<th>Embedding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>Increased knowledge</td>
<td>Increased knowledge and positive attitudes</td>
<td>Increased competence</td>
<td>Increased utilization over time</td>
</tr>
<tr>
<td>Target Population</td>
<td>Articles, seminars, E-mail; web-based information</td>
<td>Mentorship</td>
<td>Internships, manuals</td>
<td>Ongoing availability of experts, ongoing research funding</td>
</tr>
<tr>
<td>Researchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Providers</td>
<td>Conferences, popular media, electronic user groups</td>
<td>Videos, internships, program visits</td>
<td>Manuals, training programs</td>
<td>Programmatic, systems-level technical assistance, organizational development, ongoing supervision, advocacy</td>
</tr>
<tr>
<td>Administration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers/Families</td>
<td>Popular media, community lectures, Websites</td>
<td>Role models</td>
<td>Manuals, training programs</td>
<td>Ongoing support meetings, feedback tools</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Knowledge to Action Framework (Graham et al 2006)

PARiHS (Kitson, Rycroft-Malone et al 2008)

**Figure 1**
The PARiHS Diagnostic and Evaluative Grid.
OMRU (Logan & Graham 1998)

NCCDPHP Knowledge to Action Framework (Wilson et al 2011)
Collaborative knowledge translation model (Baumbusch et al 2008)

Integrated KE framework (Contandriopoulos et al 2008)
Knowledge as a continuum (Leung 2009)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Knowledge-as-object</th>
<th>Knowledge-in-midway</th>
<th>Knowledge-as-process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types</td>
<td>Information</td>
<td>Tools</td>
<td>Still enactment</td>
</tr>
<tr>
<td></td>
<td>Procedural knowledge</td>
<td>Stories</td>
<td>Practice reasoning process</td>
</tr>
<tr>
<td></td>
<td>Theoretical knowledge</td>
<td>Mental models</td>
<td>Work process knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Value sharing process</td>
</tr>
<tr>
<td>Nature</td>
<td>Mainly descriptive &amp; procedural</td>
<td>Mainly procedural &amp; reasoning</td>
<td>Procedural &amp; reasoning</td>
</tr>
<tr>
<td>Source</td>
<td>Mainly organisation, policy, research and general communities</td>
<td>Organisation and practitioners</td>
<td>Practitioners and organisations as CoPs and other social networks</td>
</tr>
<tr>
<td>Mode</td>
<td>Explicit, or tacit but captable</td>
<td>Explicit tacit</td>
<td>Tact</td>
</tr>
<tr>
<td>Orientation</td>
<td>Domain &amp; relational</td>
<td>Domain, relational &amp; self</td>
<td>Relational &amp; self</td>
</tr>
<tr>
<td>When shared and/or reused</td>
<td>Recapping</td>
<td>Reconstituting</td>
<td>Re-creating &amp; co-constructing</td>
</tr>
</tbody>
</table>

*Figure 2* Extended conceptual framework of social work knowledge as a continuum.

Communicative Action Model (Quinlan & Robertson 2010)

```
Time = t

Discourse Ethic

Knowledge

Mutual Understanding

Occupational Distance

```

```
Time = t + 1

Discourse Ethic

Knowledge

Mutual Understanding

Occupational Distance

```
Knowledge transfer process model (Ward et al 2010)

CRARUM (Kontos & Poland 2009)
Participatory Action Knowledge Translation model (McWilliam et al 2009)

NORMALISATION PROCESS THEORY

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Framework for operationalizing normalization process theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherence</td>
<td>Cognitive Participation</td>
</tr>
<tr>
<td>What is the work?</td>
<td>Who does the work?</td>
</tr>
<tr>
<td>Systematic explanation of mechanisms and components at work</td>
<td>Factors that promote or inhibit the mobilization of a practice</td>
</tr>
<tr>
<td>Knowledge about the sources and operation of investments at work</td>
<td>Beliefs and behaviours that define and organize objects</td>
</tr>
<tr>
<td>Investigation of core questions that could include…</td>
<td>How is a practice conceptualized by participants?</td>
</tr>
<tr>
<td></td>
<td>How does it hold together in action?</td>
</tr>
</tbody>
</table>

Normalisation Process Theory (May & Finch 2009)
Appendix B: Cochrane Effective Practice and Organisation of Care Group (EPOC) reviews

This Appendix gives the full reference for each of the Cochrane reviews referred to on p20-21.

Cochrane Effective Practice and Organisation of Care Group (EPOC) reviews: intervention strategies for which there is some evidence in support

1. Clinical pathways


http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD006632/frame.html

2. Dissemination and implementation of guidelines in professions allied to medicine


http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD000349/frame.html

3. Teaching critical appraisal skills in health care settings


4. Audit and feedback: effects on professional practice and health care outcomes


5. Continuing education meetings and workshops: effects on professional practice and health care outcomes


6. Educational outreach visits: effects on professional practice and health care outcomes


7. The effects of on-screen, point of care computer reminders on processes and outcomes of care


http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD001096/frame.html
8. **Interventions to improve question formulation in professional practice and self-directed learning**


9. **Local opinion leaders: effects on professional practice and health care outcomes**


10. **Printed educational materials: effects on professional practice and health care outcomes**


11. **Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes**


12. Computerized advice on drug dosage to improve prescribing practice


http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD002894/frame.html

13. Interprofessional collaboration: effects of practice-based interventions on professional practice


http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD000072/frame.html

14. Interventions to improve antibiotic prescribing practices for hospital inpatients


http://onlinelibrary.wiley.com/o/cochrane/clsysrev/articles/CD003543/frame.html

Cochrane Effective Practice and Organisation of Care Group (EPOC) reviews: intervention strategies for which there is currently little evidence in support

1. Strategies to change organisational culture to improve health care performance


2. Organisational infrastructures to promote evidence based nursing practice


3. **Educational games for health professionals**


4. **Electronic retrieval of health information by healthcare providers to improve practice and patient care**


5. **Interprofessional education: effects on professional practice and health care outcomes**


Appendix C: Systematic reviews published in Implementation Science (2011) on computerised clinical decision support systems

This Appendix gives the full reference for each of the reviews referred to on p22-24.

1. Computerized clinical decision support systems for chronic disease management: A decision-maker-researcher partnership systematic review (Roshanov et al 2011)


http://www.implementationscience.com/content/6/1/92/abstract

2. Computerized clinical decision support systems for acute care management: A decision-maker-researcher partnership systematic review of effects on process of care and patient outcomes (Sahota et al 2011)


http://www.implementationscience.com/content/6/1/91/abstract

3. Computerized clinical decision support systems for therapeutic drug monitoring and dosing: A decision-maker-researcher partnership systematic review (Nieuwlaat et al 2011)


http://www.implementationscience.com/content/6/1/90/abstract
4. **Computerized clinical decision support systems for drug prescribing and management: A decision-maker-researcher partnership systematic review (Hemens et al 2011)**


[http://www.implementationscience.com/content/6/1/89/abstract](http://www.implementationscience.com/content/6/1/89/abstract)

5. **Can computerized clinical decision support systems improve practitioners’ diagnostic test ordering behavior? A decision-maker-researcher partnership systematic review (Roshanov et al 2011)**


[http://www.implementationscience.com/content/6/1/88/abstract](http://www.implementationscience.com/content/6/1/88/abstract)

6. **Computerized clinical decision support systems for primary preventive care: A decision-maker-researcher partnership systematic review of effects on process of care and patient outcomes (Souza et al 2011)**


[http://www.implementationscience.com/content/6/1/87/abstract](http://www.implementationscience.com/content/6/1/87/abstract)
References


