



The
Health
Foundation
Inspiring
Improvement

Report:

Improvement science

Research scan

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Identify Innovate Demonstrate Encourage

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Health Foundation research scans provide information to help those involved in improving the quality of healthcare understand what research is available on particular topics.

Research scans provide a rapid collation of empirical research about a topic relevant to the Health Foundation's work. Although all of the evidence is sourced and compiled systematically, they are not systematic reviews. They do not seek to summarise theoretical literature or to explore in any depth the concepts of, or arising from, the scan.

This research scan was prepared by The Evidence Centre on behalf of the Health Foundation

Key messages

Improvement science is about finding out how to improve and make changes in the most effective way. It is about systematically examining the methods and factors that best work to facilitate quality improvement.

What is improvement science?

The overriding goal of improvement science is to ensure that quality improvement efforts are based as much on evidence as the best practices they seek to implement.¹

Improvement science is an emerging concept which focuses on exploring how to undertake quality improvement well. It inhabits the sphere between research and quality improvement by applying research methods to help understand what impacts on quality improvement.

This research scan collates empirical articles about improvement science. The purpose is to help people understand the genesis of improvement science and the seminal pieces of research on this topic.

What terms have been used?

A number of terms have been used to refer to improvement science concepts, including the science of improvement, implementation science, translational research, quality improvement science, science of quality improvement, measurement for improvement and quality improvement methods.

The overriding goal of improvement science is to ensure that quality improvement efforts are based as much on evidence as the best practices they seek to implement.

What research is available?

The scan found a real paucity of research about improvement science. There are descriptive articles outlining the concept and suggesting frameworks for investigating factors that influence the implementation and spread of innovation, but little empirical research is available about improvement science.

The research that is available tends to comprise literature reviews outlining how others have applied the term ‘improvement science’ or using conceptual models to help plan or analyse research.

Overall, the scan found that ‘improvement science’ is a concept that may be gaining momentum, with a number of articles published over the past three years. Many different terms are used interchangeably to describe this field and the focus on researching ‘what works’ is common throughout. However, as yet the concept has not been widely applied empirically so there is much scope for more research to be undertaken to help define and develop the concept and practice of improvement science on a global scale.

1 Scope

This research scan summarises readily available research about the concept and practice of improvement science. It is not a systematic review and does not seek to summarise theoretical literature or to explore the narrative development of improvement science

1.1 Rationale

Every day changes are made to improve healthcare. Some of these changes are documented in the trade press or academic journals, whilst others are noted mainly by staff and patients.

Indeed, a common criticism of improvement efforts is that the evidence base is weak and that changes may not be guided by or analysed with theory.²

When organisations and teams decide what to change, they may not consider theories or frameworks that could help predict success or inform development.

It has been suggested that a minority of evidence-based healthcare improvements are implemented widely and that on average it takes 17 years to apply this knowledge.^{3,4}

Some authors suggest that studies about quality improvement initiatives often have limited designs, poor analysis and incomplete reporting.⁵ All of these theoretical and methodological issues signal a gap in what is known about how best to improve quality in healthcare.

Leaders in quality improvement, policy makers and healthcare managers increasingly recognise the need to develop a sound and scientifically rigorous knowledge base about quality improvement.^{6,7} But there has been a lack of investment in developing knowledge about how to improve the quality of healthcare and a lack of training opportunities to

help researchers learn about and lead improvement science.

The theories, methods, and designs for achieving rigorous research in the field are newly-arising and many healthcare scientists are not yet skilled in applying these new research methods. Some research approaches have yet to be invented.⁸

There is interest growing in helping the academic community of researchers and the practice community of healthcare managers and health professionals work together in the design and conduct of health services research and implementing improvement.⁹⁻¹²

The theories, methods, and designs for achieving rigorous research in the field are newly-arising and many healthcare scientists are not yet skilled in applying these new research methods.

1.2 Purpose

This research scan summarises readily available research about the concept and practice of improvement science.

As improvement science is a relatively new concept, people may have different views about what the term represents and varying ways to describe and define it.

This scan provides a rapid collation of empirical research about improvement science.

Although all of the evidence has been sourced and compiled systematically, the scan is not a systematic review and does not seek to summarise theoretical literature or to explore the narrative development of improvement science.

The key questions addressed are:

- What is improvement science?
- What terms have been used to describe improvement science?
- What empirical research is available about improvement science?

1.3 Methods

To collate evidence, one reviewer searched bibliographic databases, reference lists of identified articles and reviews, and the websites of relevant agencies for information available as at December 2010.

The databases included MEDLINE, Ovid, Embase, the Cochrane Library and Controlled Trials Register, PsychLit, Google Scholar, the WHO library and the Health Management Information Consortium. All databases were searched from inception until present using search terms such as improvement, quality improvement, improvement science, improvement leader, transformational research, translational research, improvement method and science of improvement.

Only studies or abstracts available in English were eligible for inclusion due to time constraints preventing translations.

We scanned more than 5,000 pieces of potentially relevant research, but most articles did not meet the inclusion criteria. We selected the most relevant empirical material to summarise here.

No formal quality weighting was undertaken within the scan, apart from the selection process outlined above.

Seventeen studies plus additional descriptive articles were synthesised.

Data were extracted from all publications using a structured template and studies were grouped according to key questions and outcomes to provide a narrative summary of trends.

When interpreting the findings it is important to bear in mind two caveats. First, the research scan is not exhaustive. It presents examples of studies but does not purport to represent every piece of research about improvement science. This is particularly important as other terms may be used to describe similar concepts, or no specific label may be used even where a study is describing something related to improvement science.

Second, there is a paucity of empirical research but this does not mean that improvement science is not emerging as an important concept. A number of descriptive articles are available, but these were outside the scope of the research scan.

2 Description

Improvement science is an emerging field of study focused on the methods, theories and approaches that facilitate or hinder efforts to improve quality and the scientific study of these approaches.

2.1 What is improvement science?

Improvement science is an emerging field of study focused on the methods, theories and approaches that facilitate or hinder efforts to improve quality and the scientific study of these approaches.

Improvement Science is a body of knowledge that describes how to improve safely and consistently. Improvement Science is not the same as Research. Research is designed to find out what is possible. Improvement Science is not the same as Audit. Audit is designed to find out what is actual. Improvement Science describes how to reduce the gap between what is actual and what is possible.¹³

Improvement science focuses on systematically and rigorously exploring ‘what works’ to improve quality in healthcare and the best ways to measure and disseminate this to ensure positive change.

Whereas ‘improvement’ focuses on optimising the benefits of change, ‘improvement science’ focuses on maximising learning from improvement.

The term improvement science recently emerged to identify a field of research focused on healthcare improvement. The primary goal of this scientific field is to determine which improvement strategies work as we strive to assure effective and safe patient care. The term is meant to include all aspects of research that investigate improvement strategies in healthcare, systems, safety, and policy.¹⁴

The field is predominantly concerned with healthcare, but manufacturing industries, aviation, software development, the military and other similar sectors have also systematically explored the most effective ways to improve quality and efficiency.

The term ‘improvement science’ tends not to be used in these industries and the focus is more on structured quality improvement approaches, such as plan, do, study, act (PDSA) cycles or statistical process control. This work has similarities to some components of improvement science conceptualisations in healthcare.

2.2 What terms are used?

A number of terms have been used to represent improvement science including, in order of frequency:

- implementation science
- science of improvement
- improvement science
- translational research
- translational science
- measurement for improvement
- quality improvement methods
- quality improvement science
- science of quality improvement
- evidence-based practice
- knowledge translation
- research utilisation

Some of these terms such as ‘measurement for improvement’ refer to small components of the broader concept. Other terms, such as ‘implementation science’ have various definitions but largely mirror the underlying purpose and scope of improvement science.

*Implementation science is the scientific study of methods to promote the integration of research findings and evidence-based interventions into health care policy and practice and hence to improve the quality and effectiveness of health services and care.*¹⁵

There seem to be two overlapping definitions of improvement science incorporated into these various terms. On one hand the term is used to refer to systematically studying what makes improvements effective and widely implemented. On the other hand, the term has been used to represent ways of narrowing the gap between research and practice, and ensuring that evidence-based findings are rolled out into routine care.

2.3 Historical development

There is no consensus about the development of the term 'improvement science' or the emergence of the field as a whole.

Some authors credit thought leaders such as Deming as founders of improvement science.¹⁶ More recently, professionals at the US Institute for Healthcare Improvement and various American universities have moved the field forward and the NHS Institute for Innovation and Improvement has championed the need for more rigorous exploration of improvement initiatives.¹⁷ These champions emphasise the importance of understanding context when planning and implementing change and theoretical frameworks such as complexity theory and complex adaptive systems.¹⁸ Improvement science is also thought to draw on expertise and concepts from a wide variety of other fields.

Most of the publications identified during the scan were sourced from the USA where the term 'implementation science' was more commonly used up until a few years ago. In the USA an open access 'Implementation Science' journal is published. This is dedicated to quality improvement more generally, as well as the methods used to undertake improvement and disseminate research into routine practice.

Implementation science originally drew on concepts from operations research, industrial engineering and management science. It has expanded to include a broader range of methods such as decision science and operations research, health systems research, health outcomes research, health and behavioural economics, epidemiology, statistics, organisation and management science, finance, policy analysis, anthropology, sociology, and ethics.¹⁹

Most articles that use improvement science terminology have been published recently. For instance, the majority of articles identified in the scan were published in 2010 and almost all were published between 2008 and 2010. Prior to this a small number of theoretical and descriptive pieces were available. These tend to use the term 'implementation science' or to emphasise the need for this field of study generally, rather than being empirical research.

In the USA, networks to promote improvement science are beginning to emerge. For instance, the University of Texas Health Science Center School of Nursing has set up an 'Improvement Science Research Network.' Overall, the term is reasonably specialised and uncommon.²⁰

Implementation science has expanded to include a broader range of methods, such as decision science and operations research, health systems research, health outcomes research, health and behavioural economics, epidemiology, statistics, organisation and management science, finance, policy analysis, anthropology, sociology, and ethics.

3 Empirical research

Our scan identified three categories of research in the field of improvement science:

- Research about improvement science.
- Articles detailing frameworks, models and concepts related to improvement science.
- Research using improvement science methods.

3.1 Improvement science research

Most of the empirical studies about improvement science are literature reviews focused on categorising different types of improvement methods and quality improvement approaches, or critiquing studies in this field.

For example, reviewers in the USA examined the research methods used to study quality improvement in healthcare organisations. They found that most quality improvement effectiveness research is conducted in hospital settings, is focused on multiple quality improvement interventions, and uses process measures as outcomes. There was a great deal of variation in the research designs used to examine the effectiveness of quality improvement initiatives.²¹

Another review of 107 studies aimed to help practitioners and researchers understand the structure, practices and context within organisations that help or hinder the implementation of quality improvement innovations. Studies were categorised in terms of the content of the quality improvement innovation, organisational processes, internal context and external context.

External context and organisational processes were most likely to impact on the implementation of quality improvement initiatives.

The authors concluded that there are many gaps in the literature about implementing quality improvement. Studies often lacked clear conceptual frameworks to guide the research and tended to use designs focused on simplistic causal relationships rather than capturing interactions among the many factors involved in implementation.

Most studies used cross-sectional designs and single sources of data collection and there was potential selection bias among study participants.²²

Another example of research into improvement science is the ‘Promoting Action on Research Implementation in Health Services’ framework (PARIHS) which considers the key elements influencing successful implementation of evidence-based practices. A systematic review included 24 articles about how this framework has been applied in implementation projects and research. Overall, the framework was thought to be useful for analysis purposes as well as being flexible and intuitive. However, there was a need for greater clarity about the definition of elements and the nature of relationships.²³

Other researchers conducted interviews and participant observation to examine how improvement scientists at one large healthcare organisation in the USA undertake research. They found that improvement scientists had to tailor their findings to particular audiences and were influenced by organisational factors, so there were questions about the extent to which this emerging field is being supported to grow.²⁴

3.2 Research about concepts

There is an increasing acknowledgement of the importance of studying the implementation of quality improvement rigorously.^{25,26}

A number of studies have focused on developing conceptual frameworks to help define the environmental and other components that may be important in implementing change.²⁷ While these are not strictly empirical in nature they sometimes draw on empirical research.²⁸

For instance, in the USA a Consolidated Framework For Implementation Research (CFIR) has been developed. This typology aims to help analyse what works, where and why. The framework includes five major domains: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and the process of implementation.²⁹

Similarly, researchers in the Netherlands developed a framework for considering how to apply and roll out improvement interventions. They found that factors influencing implementation include knowledge, cognition, attitudes, routines, social influence, organisation and resources. Determinants are often specific to the innovation, context and target groups. Strategies focused on individual professionals and voluntary approaches dominate research into how to enhance implementation.³⁰

There is also evidence about where improvement science ‘fits’ within wider research on quality improvement and health services research more generally. For instance, one theoretical framework groups the use of quality improvement interventions into several categories.³¹ This shows how improvement science, or discussions about methods of improvement, fit within wider quality improvement literature.

The categories are:

- empirical literature about the development of quality improvement interventions
- history, documentation or description of quality improvement interventions
- success, effectiveness or impact of quality improvement interventions
- quality improvement intervention stories, theories and frameworks
- quality improvement intervention literature syntheses and meta-analyses
- development and testing of quality improvement intervention related tools.

Improvement science material could be most evident in the empirical literature about development and the history and description of initiatives. While this framework is useful for illustrating the range of studies available, it doesn’t quantify how much research is available in each category or link explicitly to improvement science concepts.

3.3 Using improvement science

Commonly in the USA ‘improvement science’ has been used as a simile for structured quality improvement methods such as PDSA cycles or data interrogation.^{32,33} A number of these types of studies have been undertaken, focused on research with children.³⁴

For instance, researchers in the USA used ‘quality improvement science’ methodology to improve the use of evidence-based practice for airway clearance therapy in adolescents with cystic fibrosis in hospital. Here ‘quality improvement science’ was defined as the model for improvement or PDSA cycles. This model was used to develop and implement interventions and process control charts were used to monitor progress.³⁵

Another example is the Veteran's Health Administration which developed the Quality Enhancement Research Initiative (QUERI) to help address the gap between, available evidence and current practice in healthcare and 'contribute to the field of implementation science.'

QUERI used an organisational framework focused on three contextual elements: cultural norms and values, including the role of researchers in quality improvement; capacity; and supportive infrastructures to reinforce expectations for change and sustain new behaviours.³⁶ Researchers have tested the value of this approach and concluded that this is a useful way of accelerating the uptake of research findings in routine care.³⁷

3.4 Summary

Improvement science focuses on rigorously assessing 'what works best' to improve quality. The emphasis is on the methods and factors that can help and hinder the implementation and dissemination of improvements in order to get more research findings used in daily practice.

Components of this structured approach to what works have been applied in the manufacturing, aviation and military sectors, but in healthcare, improvement science is just emerging.

The concept and phrase is more commonly referred to in the USA than in the UK and Europe. Some authors suggest that leaders in quality improvement such as Deming were the founding fathers of improvement science because there was a focus on systematically exploring the factors needed to improve quality and efficiency. More recently, IHI in the USA has used terms such as 'the science of improvement' to define components of their work.

Most of the empirical articles explicitly referring to improvement science have been published within the past three years and there has been a move away from a focus on structured quality improvement methods (such as PDSA cycles) towards a broader view of exploring the factors that help or hinder improvement efforts.

Improvement science is but one of many facets within the wider arena of health services research. The majority of health services research focuses on ways to improve the structures, staffing and delivery of care, or ways of measuring and improving patient experience. Improvement science forms a small subcomponent of this, by looking explicitly and critically at which factors and techniques are most useful for facilitating improvement and roll out and by encouraging more rigorous use of scientific methods for planning, implementing, analysing and disseminating research findings. This is different to solely focusing on whether a particular initiative is effective or not, as is the emphasis in most health services research. The proportion of improvement science research is at present minuscule.

There are few seminal pieces of research on improvement science. This scan identified material published about the concept of improvement science, studies about how the concept has been applied and is emerging, and research that sought to apply improvement science approaches in their design and analysis. None of these could be said to be seminal pieces of research acting as building blocks for the field as a whole.

There is a real paucity of evidence about the field of improvement science, and thus much scope to develop this concept in future.

4 Key references

4.1 Empirical research about improvement science

Alexander JA, Hearld LR (2009). 'What can we learn from quality improvement research? A critical review of research methods.' *Med Care Res Rev* 66(3):235-71.

This review examined the research methods used to study quality improvement in healthcare organisations. The review categorised quality improvement programmes into groups such as data/feedback, information technology and staff education.

The reviewers found that most quality improvement effectiveness research is conducted in hospital settings, is focused on multiple quality improvement interventions, and used process measures as outcomes. There was a great deal of variation in the research designs used to examine quality improvement effectiveness.

Abstract weblink:

<http://www.ncbi.nlm.nih.gov/pubmed/19176833>

Method: systematic review
Country: USA
Date: June 2009

Alexander JA, Hearld LR (2010). 'The science of quality improvement implementation: developing capacity to make a difference.' *Med Care* (Published online September 2010).

This review aimed to help practitioners and researchers understand the structure, practices and context within organisations that help or hinder the implementation of quality improvement innovations. This review included 107 studies.

Studies were grouped according to factors that may affect implementation including the content of the quality improvement innovation, organisational processes, internal context, and external context.

Studies most commonly focused on internal context and organisational processes. External context and organisational processes were most likely to be found to impact on the implementation of quality improvement initiatives.

The authors concluded that there are many gaps in the literature about implementing quality improvement. Studies often lacked clear conceptual frameworks to guide the research and tended to use designs narrowly focused on simplistic causal relationships rather than capturing interactions among the many factors involved in implementation. Most studies used cross-sectional designs and single source data collection and there was potential selection bias among study participants.

Abstract weblink:

<http://www.ncbi.nlm.nih.gov/pubmed/20829724>

Method: systematic review
Country: USA
Date: September 2010

Helfrich CD, Damschroder LJ, Hagedorn HJ, Daggett GS, Sahay A, Ritchie M, Damush T, Guihan M, Ullrich PM, Stetler CB (2010). 'A critical synthesis of literature on the promoting action on research implementation in health services (PARIHS) framework.' *Implement Sci* 5:82.

The 'Promoting Action on Research Implementation in Health Services' framework (PARIHS) is a conceptual framework about the key elements that influence successful implementation of evidence-based practices. This systematic review examined how this framework has been applied in implementation projects and research. The review included 24 articles published up to March 2009.

The articles included six core concept articles from original PARIHS developers and 18 empirical studies including case reports and quantitative studies. The empirical articles tended to use PARIHS as an organising framework for analysis. No studies used the framework to prospectively design implementation strategies. Several studies suggested ways to refine or validate the framework.

Overall, the framework was thought to be useful for analysis purposes as well as flexible and intuitive. However there was a need for greater clarity about the definition of elements and the nature of relationships. The authors concluded that the model needs to be tested through rigorous prospective use of the framework to guide implementation projects.

Full text weblink:

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2988065/?tool=pubmed>

Method: systematic review
Country: USA
Date: October 2010

Sobo EJ, Bowman C, Gifford AL (2010). 'Behind the scenes in health care improvement: the complex structures and emergent strategies of Implementation Science.' *Soc Sci Med* 67(10):1530-40.

This study examined the concept of improvement science or implementation science. Implementation science takes a systems approach and emphasises the importance of building in contextual factors to research and analysis designs.

'Implementation Science is a new branch of health services research that strives to increase the efficiency and effectiveness of health care quality improvement efforts.'

The authors conducted interviews and participant observation to examine how implementation scientists in one large healthcare organisation in the USA conduct research. Factors influencing attitudes and behaviour included grant timelines, administrative burdens, team turnover and the need for publications. This meant that implementation scientists strategically highlighted particular aspects of their work depending on which audience or part of the system they needed to impress.

Abstract weblink:

<http://www.ncbi.nlm.nih.gov/pubmed/18760519>

Method: interviews
Country: USA
Date: November 2008

4.2 Articles about improvement science concepts

Rubenstein LV, Hempel S, Farmer MM, Asch SM, Yano EM, Dougherty D, Shekelle PW (2008). 'Finding order in heterogeneity: types of quality-improvement intervention publications.' *Qual Saf Health Care* 17(6):403-8.

This study explores the heterogeneity in publications about clinical quality improvement interventions. The authors developed a classification framework for articles about quality improvement interventions and asked experts to identify articles important to quality improvement science. The framework was then tested and revised using these articles.

The framework categorised articles into a number of headings including:

- empirical literature on development of quality improvement interventions
- history, documentation or description of quality improvement interventions
- success, effectiveness or impact of quality improvement interventions
- quality improvement intervention stories, theories and frameworks
- quality improvement intervention literature syntheses and meta-analyses
- development and testing of quality improvement intervention related tools.

Abstract weblink:

<http://www.ncbi.nlm.nih.gov/pubmed/19064654>

Method: literature review
Country: USA
Date: December 2008

Schackman BR (2010). 'Implementation science for the prevention and treatment of HIV/AIDS.' *J Acquir Immune Defic Syndr* 55 Suppl 1:S27-31.

This article defines improvement science or implementation science, and describes its historical development. The author states that 'implementation science is the scientific study of methods to promote the integration of research findings and evidence-based interventions into health care policy and practice and hence to improve the quality and effectiveness of health services and care. Implementation science is distinguished from monitoring and evaluation by its emphasis on the use of the scientific method.'

Implementation science originally drew on concepts from operations research, industrial engineering and management science. It has expanded to include a broader range of methods such as decision science and operations research, health systems research, health outcomes research, health and behavioural economics, epidemiology, statistics, organisation and management science, finance, policy analysis, anthropology, sociology, and ethics.

The author describes examples of implementation science research in the fields of HIV prevention and drug use among people with HIV.

Abstract weblink: <http://www.ncbi.nlm.nih.gov/pubmed/21045596>

Method: case study
Country: USA
Date: December 2010

Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC (2010). 'Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science.' *Implement Sci* 4:50.

There is increasing recognition of the need to understand the extent to which changes are effective in a specific setting and the factors involved in prolonging sustainability and promoting dissemination into other settings. A number of implementation theories have been published to help promote effective implementation. These have overlaps and gaps, and the terminology and definitions are not consistent across theories. This article describes a Consolidated Framework For Implementation Research (CFIR), a typology to help research what works, where and why.

Published theories were identified, assessed and combined. The resulting framework includes five major domains: intervention characteristics, outer setting, inner setting, characteristics of the individuals involved, and the process of implementation. There were eight subcomponents about interventions (such as evidence strength and quality), four elements of the outer setting (such as patient needs and resources), 12 components related to inner settings (such as culture and leadership engagement), five components of individual characteristics and eight components of process issues (such as planning, evaluating and reflecting).

Full text weblink:
<http://www.ncbi.nlm.nih.gov/pmc/articles/19664226/?tool=pubmed>

Method: literature review
Country: USA
Date: August 2009

Peden CJ, Rooney KD (2009). 'The science of improvement as it relates to quality and safety in the ICU' *JICS* 10(4): 260-265.

This article describes the development of improvement science, which is defined here as a systematic focus on ways to improve quality. The focus is on structured PDSA cycles, run charts and control charts.

The authors suggest that Deming is the 'father of improvement science.' As well as outlining the statistical monitoring processes Deming used, the authors focus on the concept of 'profound knowledge' which is used to educate people about how and where systems can be improved. This concept has four components: appreciation of the system, knowledge of variation in the system, the theory of knowledge and the limits of what can be known, and knowledge of psychology. The authors suggest that all of these components interact, and a process cannot be improved without considering each part.

Full text weblink: <http://journal.ics.ac.uk/pdf/1004260.pdf>

Method: not empirical research
Country: UK
Date: October 2009

Tansella M, Thornicroft G (2009). 'Implementation science: understanding the translation of evidence into practice.' *Br J Psychiatry* 2009 195(4):283-5.

This article describes knowledge about accelerating the transfer of research discoveries into routine clinical practice. It is suggested that the gap (in 'change-promoting' research) needs to be understood and narrowed by the application of 'implementation science'.

The authors describe three phases: adoption in principle, early implementation and persistence of implementation.

Full text weblink:

<http://bjp.rcpsych.org/cgi/content/full/195/4/283?maxtoshow=&hits=10&RESULTFORMAT=&fulltext=tansella+implementation+science&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT>

Method: not empirical research
Country: Italy
Date: October 2009

van Achterberg T, Schoonhoven L, Grol R (2008). 'Nursing implementation science: how evidence-based nursing requires evidence-based implementation.' *J Nurs Scholarsh* 40(4):302-10.

This article describes a framework to consider how to apply and roll out improvement interventions. Factors that commonly influence implementation include knowledge, cognition, attitudes, routines, social influence, organisation and resources. Determinants are often specific to the innovation, context and target groups.

Strategies focused on individual professionals and voluntary approaches dominate research into how to enhance implementation. Strategies such as reminders, decision support, use of information and communication technology, rewards, and combined strategies may encourage implementation of evidence and innovations. The authors suggest that using an 'implementation science' conceptual framework can help target initiatives to enhance implementation.

Abstract weblink:

<http://www.ncbi.nlm.nih.gov/pubmed/19094144>

Method: not empirical research
Country: The Netherlands
Date: 2008

Rubenstein LV, Pugh J (2006). 'Strategies for promoting organizational and practice change by advancing implementation research.' *J Gen Intern Med* 21 Suppl 2:S58-64.

This article describes the concept of implementation research.

'The persistence of a large quality gap between what we know about how to produce high quality clinical care and what the public receives has prompted interest in developing more effective methods to get evidence into practice. Implementation research aims to supply such methods.'

Full text weblink:

<http://www.ncbi.nlm.nih.gov/pmc/articles/16637962/?tool=pubmed>

Method: not empirical research
Country: USA
Date: February 2006

4.3 Examples of using improvement science methods

Ernst MM, Wooldridge JL, Conway E, Dressman K, Weiland J, Tucker K, Seid M (2010). 'Using quality improvement science to implement a multidisciplinary behavioral intervention targeting pediatric inpatient airway clearance.' *J Pediatr Psychol* 35(1):14-24.

Researchers in the USA used 'quality improvement science' methodology to develop a multidisciplinary intervention to improve the use of evidence-based practice for airway clearance therapy in adolescents with cystic fibrosis in hospital.

Here 'quality improvement science' was defined as the model for improvement or PDSA cycles. This model was used to develop and implement interventions and process control charts were used to monitor progress.

The quality of airway clearance therapy improved. At baseline from 21% of cases followed best practice guidelines whereas after the quality improvement process this increased to 73%.

Abstract weblink: <http://www.ncbi.nlm.nih.gov/pubmed/19366791>

Method: before and after study
Country: USA
Date: January 2010

Lynch-Jordan AM, Kashikar-Zuck S, Crosby LE, Lopez WL, Smolyansky BH, Parkins IS, Luzader CP, Hartman A, Guilfoyle SM, Powers SW (2010). 'Applying quality improvement methods to implement a measurement system for chronic pain-related disability.' *J Pediatr Psychol* 35(1):32-41.

Researchers in the USA used 'improvement science methodology' based on PDSA cycles to implement a measurement tool, the Functional Disability Inventory (FDI), assessing functional status in children with chronic pain referred for behavioural intervention.

Within one month, psychologists were administering the inventory at least 80% of the time. The authors concluded that quality improvement methods are an innovative way to make process changes.

Abstract weblink: <http://www.ncbi.nlm.nih.gov/pubmed/19270029>

Method: before and after study
Country: USA
Date: January 2010

Stetler CB, McQueen L, Demakis J, Mittman BS (2010). 'An organizational framework and strategic implementation for system-level change to enhance research-based practice: QUERI Series.' *Implement Sci* 3:30.

This article describes a framework used by the US Veteran's Health Administration to help address the gap between available evidence and current practice in healthcare. The Quality Enhancement Research Initiative (QUERI) aimed to generate research driven initiatives that enhance the quality of healthcare and contribute to the field of implementation science.

QUERI used an organisational framework focused on three contextual elements: cultural norms and values, including the role of researchers in quality improvement; capacity; and supportive infrastructures to reinforce expectations for change and to sustain new behaviours.

Full text weblink:

<http://www.ncbi.nlm.nih.gov/pmc/articles/18510750/?tool=pubmed>

Method: case study
Country: USA
Date: May 2008

Yano EM (2008). 'The role of organizational research in implementing evidence-based practice: QUERI Series.' *Implement Sci* 3:29.

It is important to understand the organisational context into which improvements will be introduced and the factors likely to help or hinder the adoption and use of new technologies and services. This article uses examples from the US Department of Veterans Affairs Quality Enhancement Research Initiative (QUERI) to describe the role of organisational research in putting evidence into practice. The authors present a six step QUERI process as a way to accelerate the implementation of evidence-based practice into routine care. They describe how evaluating organisational factors when planning has helped to develop more effective interventions.

Full text weblink:

<http://www.ncbi.nlm.nih.gov/pmc/articles/18510749/?tool=pubmed>

Method: case study
Country: USA
Date: May 2008

Bellin E, Fletcher DD, Geberer N, Islam S, Srivastava N (2010). 'Democratizing information creation from health care data for quality improvement, research, and education - the Montefiore Medical Center Experience.' *Acad Med* 85(8):1362-8.

The US National Research Council has outlined how difficulties accessing data impact on quality improvement initiatives. This case study describes how one medical centre has developed software that helps convert clinical data into information to support quality improvement and research and how this software has been integrated into the clinical culture.

Abstract weblink: <http://www.ncbi.nlm.nih.gov/pubmed/20453810>

Method: case study
Country: USA
Date: August 2010

Margolis P, Provost LP, Schoettker PJ, Britto MT (2009). 'Quality improvement, clinical research, and quality improvement research - opportunities for integration.' *Pediatr Clin North Am* 56(4):831-41.

This article describes the opportunities and challenges involved in integrating quality improvement approaches with more traditional forms of clinical research. The authors argue that improvement science would encourage more active experimentation in the healthcare system and that using quality improvement methods offers a fast and effective way to support the learning needed to adapt new knowledge to specific practice environments.

Abstract weblink: <http://www.ncbi.nlm.nih.gov/pubmed/19660630>

Method: not empirical research

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