



Review Paper

Creating system-wide change in medicine: The role of implementation science in achieving scale and adoption

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ABSTRACT

Delivering meaningful change in healthcare is less about new discoveries and more about ensuring adoption at scale of what is already known to work. Implementation science (IS) studies the methods that support systematic uptake of evidence-based practices into routine care. Yet traditional strategies – like policy mandates, staff training alone, or the passive spread of information – often fail to deliver sustained change. This paper introduces the foundational principles of IS, critiques conventional approaches, and shares lessons learned from national-scale digital implementation efforts in Wales. Key IS enablers, including leadership, stakeholder alignment, readiness and feedback systems, are described in practical terms. We aim to make IS accessible for healthcare leaders and clinicians seeking to reduce variation and embed innovation at scale.

Introduction

Medicine is grounded in evidence,¹ yet clinical practice often fails to reflect the best available knowledge. Variation in care is widespread,² not solely due to differences in resources but also because of inconsistent implementation of innovations. Establishing that something is effective does not necessarily mean that it will be adopted. In fact, in one study it has been shown to take on average 17 years for uptake of new evidence into routine clinical practice.³ This delay highlights the need for a systematic approach to understanding and overcoming barriers to adoption. Implementation science (IS) offers tools and frameworks to bridge this gap, utilising knowledge from multiple social science disciplines. Ironically, despite its core mission to get evidence into practice, IS has often remained academic and disconnected from real-world healthcare systems. However, there is a growing shift toward more practical and applied approaches.^{4,5}

What is implementation science?

IS has been defined as ‘the scientific study of methods to promote the systematic uptake of evidence-based clinical treatments and practices and organisational interventions into routine clinical practice’.⁶ It investigates behavioural drivers, organisational readiness, communication strategies and the broader system-level factors that affect change.

What doesn't work

Extensive research and experience indicate that certain traditional strategies, when used in isolation, often fail to achieve lasting change. These include:

- **Dissemination of information:** Merely distributing guidelines or recommendations has minimal impact on clinician behaviour unless accompanied by additional supports.⁷
- **Training alone:** Educational interventions, particularly didactic sessions, show limited effect on behaviour or outcomes when not part of a larger strategy.^{8,9}
- **Policy mandates:** While these may drive initial compliance, they often encounter resistance and do not address local contextual barriers.¹⁰
- **Financial incentives:** These have shown variable and often unsustainable impacts on care delivery.¹¹
- **Organisational restructuring:** Structural changes rarely succeed without concurrent attention to culture, capacity and communication.¹²

These methods are still widely used in practice, despite repeated findings about their limitations. Table 1 summarises these ineffective standalone approaches.

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Table 1
Common but ineffective standalone implementation strategies.

-
- Dissemination of information
 - Staff training
 - Policy mandates/regulation
 - Financial incentives
 - Organisational restructuring
-

What are the important enablers in implementation science?

One of the largest efforts to define implementation strategies, the ERIC (Expert Recommendations for Implementing Change) project, identified 73 discrete strategies using a modified Delphi process.¹³ This study was entirely based in the USA and some of the drivers may therefore have variable relevance for other health systems. Moreover, as acknowledged in the paper, it is not envisaged that all of these recommendations are necessary for successful implementation, but rather that ‘the ERIC compilation provides a list to select discrete strategies that can be used to build a tailored multicomponent strategy for implementation’. This scenario renders the field bewildering for the non-specialist and does not aid practical application of IS themes.

A complementary approach focuses on evaluating the key factors that can be used to evaluate implementation success, rather than looking at clinical outcomes. This approach has validity as a tool because a treatment or innovation will not be effective if not implemented well. The proposed metrics to be measured are acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration and sustainability.¹⁴ Unfortunately, a follow-up study 10 years after this paper was published noted a poor adoption of these proposed standardised measures of implementation success,¹⁵ a rather ironic finding given the subject matter.

In Wales, through work led by the Respiratory Health Implementation Group in partnership with the Institute of Clinical Science and Technology (ICST), a practical set of enablers was developed and refined through real-world trials over 8 years. This work was underpinned by the need to implement several national innovations including prescribing pathways for asthma and chronic obstructive pulmonary disease, educational modules to standardise asthma annual reviews and patient-facing solutions (apps) for those with asthma or COPD.

The key enablers in implementation success are detailed below (Table 2). Each one of these alone is not sufficient, but together, they act synergistically to create a successful outcome. Some of these aspects can be very much context dependent. For example, during the COVID-

19 pandemic, capacity and readiness changed dramatically to enable rapid, effective implementation that would not have been possible during normal circumstances.

These enablers are vital to implementation success, but are rarely considered as part of a strategy to create behaviour change. Implementation science is, in principle, a behaviour change process and there are other models, particularly from the field of psychology, that address this from slightly different perspective. One such model is COM-B (capability (C), opportunity (O) and motivation (M) that lead to behaviour change (B)).⁸ It is interesting to consider this model in the light of the enablers detailed above as there is much synergy. Capability and opportunity relate to capacity and readiness and motivation relates to alignment.

Creating change at a national level: pitfalls and process

Many of the advances of modern science have come about through a careful, controlled investigation of whether a defined intervention or treatment works, striving to eliminate bias to strengthen the result. However, we have already identified that there is huge variation in adoption in what is already known to be effective from scientific studies. For example, personalised asthma action plans, well known to improve asthma care, have only been adopted for about 25% of people with asthma in Wales, with repeated audits showing no improvement in this figure.¹⁶ The question therefore is how to rectify this problem. The traditional solution is to create a ‘test case’ in a defined small area. This, in our view, is the norm for behaviour change in the NHS (and elsewhere), but it is one that is usually destined for failure. This is the story of the pilot study.

Pilot studies: why they rarely fail, but also rarely scale

Pilot studies are frequently used in healthcare to test interventions in a controlled, limited setting. Advocates of pilot studies reason that it makes sense to test an intervention in a defined area to see whether it has the desired outcome. For pilot studies it is easy to control the key factors that support implementation success, as they concern a limited locus where stakeholders often are well known to each other, and alignment is relatively straightforward. The target layer is small and easy to define, and influencers are often known to those promoting the study. In addition, pilot studies are often supported by extra funding, which promotes capacity and readiness. For these reasons, pilot studies are usually successful.

The problem comes when attempts are made to scale up the pilot study over a larger area. Without a framework for implementation at

Table 2
Enablers that influence implementation success.

Implementation team	A carefully picked team of individuals with expertise and knowledge of IS who are engaged in creating system-wide readiness and who drive the implementation process.
Organisational structure	An understanding by all those involved in the implementation process and especially those in the implementation team of the formal structures of the environment into which the innovation is to be adopted.
Target layer	Define and have an understanding of the intended audience which the innovation is aimed at. This could be a particular group of patients, for example people with asthma, or healthcare professionals, for example nurses who undertake asthma annual reviews.
Power layer/influencers	Identify and empower individuals who have status within the organisational structure and have a special interest in making change in the field. These could, for example, be senior respiratory nurses in primary or secondary care.
Alignment	Are all the individuals and group stakeholders aligned? Are there any with barriers to alignment and what are their reasons? This is extremely important and often neglected. Alignment may be considered to be on a scale from active support to active opposition. Identifying and addressing the concerns of those who are actively oppositional, particularly if they have a high status in the organisational structure, is critical to implementation success.
Capacity	Understanding whether the target audience has the capacity to make changes to their practice.
Readiness	Does the system have capacity to implement change, and, if not, can readiness be created and nurtured? Is there tension for change?
Fidelity	Fidelity refers to the extent to which an intervention or programme is delivered as intended by its developers. For this to be achieved, clear and consistent messaging is required and multimedia channels can be utilised to support this.

scale, all the factors that create success in a pilot study are reasons for failure in a larger environment. Influence and alignment breaks down, the target layer becomes much larger, capacity and readiness are much harder to achieve, and competing interests adversely affect fidelity. Similar findings are reported in studies on scaling healthcare interventions, such as the review by Greenhalgh *et al* on diffusion of innovations and the work of Chambers *et al* on implementation across contexts.^{17,18}

Implementation at scale: lessons from implementation success in Wales

Here we draw on experience gained from utilising a digital implementation framework created in Wales to highlight what we believe are the key features of delivering successful implementation at scale. All of the key IS enablers listed above are employed within this framework, but there are also additional important features.

The importance of a digital implementation framework

A digital framework is a structure that supports targeted engagement, messaging, education and behaviour change and, crucially, delivers a flow of data back, thus providing feedback that supports iterative improvements within the system. Such a system can be deployed at scale, for example nationally. An important feature of the digital framework that we propose is that it requires user registration. This ensures that there is a known audience (registrants) who can be targeted with relevant information and for whom engagement can be measured. The alternative, more frequently used solution is an open access website where ‘hits’ can be measured, for example by Google Analytics, but it is unknown who has accessed the site, whether they are an appropriate target audience and they are lost to further interactions.

We can illustrate this with two examples of implementing national approaches in Wales. The first of these was a hospital guideline for COVID adopted across all acute hospitals in Wales at the start of the pandemic in March 2020. User registration was required to access the guideline, meaning that we had a defined target layer to deliver guideline updates too (all in short video-based format) and we could measure engagement with the guideline (how many videos were watched, and for how long by each user). This guideline was adopted by nearly 100% of the target audience (senior clinicians dealing with acute COVID) across all hospitals in Wales.¹⁹ To our knowledge, this is the first time that guideline engagement has been measured in a healthcare setting at a

population level. In order to create implementation success across all hospitals, we identified key individuals (the power/influencer layer), who liaised with clinicians and managers to promote adoption of the guidelines. Although this was a ‘digital’ system, we also developed laminated pathways with QR codes promoting platform registration, which were put up across clinical areas in every hospital.

The second example is implementing national respiratory apps for patients with COPD and asthma into primary care across Wales. The NHS Wales respiratory apps were created by ICST and launched in 2019, following a period of co-production with patients. These tools have a number of functions, including supporting self-management of asthma, providing support for patients across a range of key issues and promoting the green agenda in inhaler prescribing. The difficulty was in ensuring that they were adopted nationally across every practice in Wales. By utilising the same digital platform that we had created during COVID, and by expanding its influence into primary care by offering access to guidelines, educational modules and QI tools, we were able to get almost universal coverage across all practices in Wales. Recent published data have shown improving clinical outcomes and population-level behaviour change with this approach.^{20,21}

Defining the value proposition

What is the value proposition for all actors in an implementation programme? There must be a clear and defined benefit for all to create implementation success. This factor is often not sufficiently considered and lies at the heart of the motivation (M) component of the COM-B model. Failure to establish the value proposition of an intervention for key stakeholders is likely to result in failure, since it will not promote alignment. The value proposition should be applied to all stakeholders, not just the target of an innovation. For example, when considering the value proposition of the apps:

- **For the patients:** They promote better self-management and improved symptoms.
- **For HCPs:** they reduce healthcare interactions, as patients’ conditions are better controlled.
- **For managers:** reduced pressure on the health service (eg reduced accident and emergency visits), and potential financial savings thereof.
- **For politicians:** A chance to champion successful innovation.

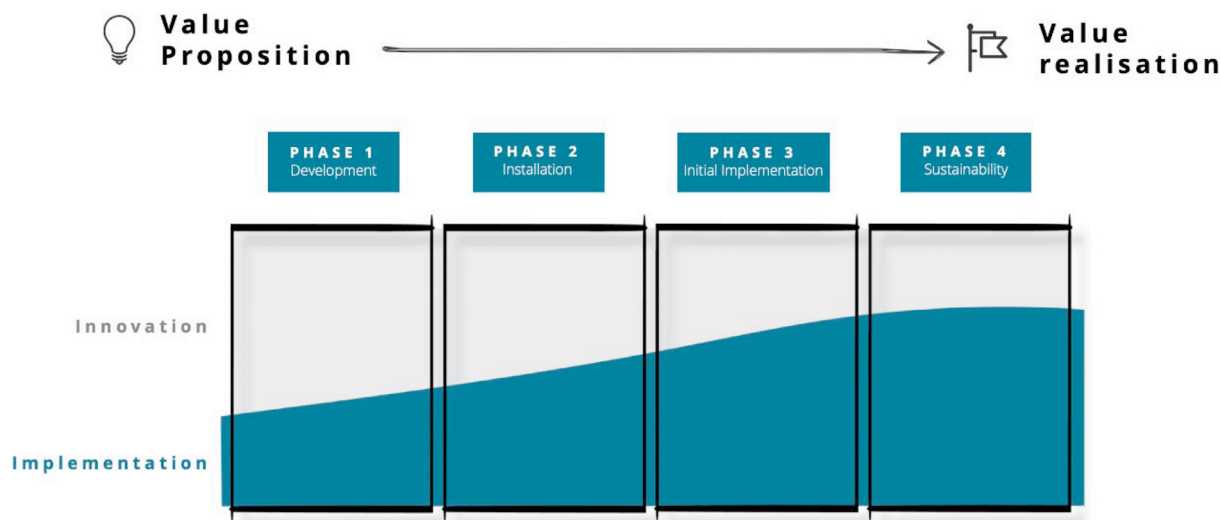


Fig. 1. The four stages of implementation from value proposition to value realisation.

Utilising a phased approach to implementation success

The start of this process is a focus on creating the innovation, which can be many different things, but here we have considered guidelines, educational modules, patient applications (apps) and quality improvement tools. The traditional approach is to create the innovation and rarely is the implementation of that innovation addressed, and hence it has limited success. An obvious example is a new guideline. Creation of the guideline (the innovation) is complex and time-consuming, involving experts trawling through and assessing the evidence and creating consensus views on what constitutes best practice. Once created, the guideline is published and there is an expectation that it will somehow be read and adopted. A more effective approach is to consider the implementation aspect at the start of the process. Define the target audience, understand the key components of alignment and who might be the influencers (power layer) to promote adoption and what is the capacity and readiness in the system. Once these are all established, it means that the transition through to the second phase (installation) is much more effective. This is particularly important when considering implementation at scale. During this phase, feedback is gained and, if necessary, the innovation can be adjusted to ensure that it is real-world compliant. In phase three (initial implementation), the implementation team and influencer layer are vital to promote adoption at scale. Even during the final phase of sustainability, there is a predominant focus on the implementation strategy, but resource is still applied to the innovation to ensure that it is continually improved. When the difficult problem of adoption at scale is considered using this framework, the likelihood of the transition from value proposition to value realisation is greatly increased (Fig. 1)

Summary

Many healthcare systems fail to deliver high-value care, not because they lack effective innovations, but because they fail to implement them successfully. Traditional methods are familiar but weakly effective. A shift toward structured, theory-informed, practical implementation strategies is essential. By combining implementation science principles with digital frameworks and phased planning, Wales has achieved successful national-scale change. These lessons offer a scalable, transferable model for broader health system transformation.

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Declaration of competing interest

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ogy (ICST), which is headed by CD to implement the digital innovations described in this article.

CRediT authorship contribution statement

Simon Barry: Writing – original draft, Conceptualization. **Chris Davies:** Writing – review & editing, Software, Resources, Methodology.

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