

# Harnessing implementation science to improve care quality and patient safety: a systematic review of targeted literature

JEFFREY BRAITHWAITE<sup>1</sup>, DANIELLE MARKS<sup>1</sup> AND NATALIE TAYLOR<sup>1,2</sup>

<sup>1</sup>Centre for Clinical Governance Research, Australian Institute of Health Innovation, University of New South Wales, Sydney, NSW 2052, Australia, and <sup>2</sup>Bradford Institute for Health Research, Bradford, UK

Address reprint requests to: Faculty of Medicine, Centre for Clinical Governance Research, Australian Institute of Health Innovation, University of New South Wales, Sydney NSW 2052, Australia. Tel: +612-9385-2590; Fax: +612-9663-4926; E-mail: j.braithwaite@unsw.edu.au

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## Abstract

**Background.** Getting greater levels of evidence into practice is a key problem for health systems, compounded by the volume of research produced. Implementation science aims to improve the adoption and spread of research evidence. A linked problem is how to enhance quality of care and patient safety based on evidence when care settings are complex adaptive systems. Our research question was: according to the implementation science literature, which common implementation factors are associated with improving the quality and safety of care for patients?

**Methods.** We conducted a targeted search of key journals to examine implementation science in the quality and safety domain applying PRISMA procedures. Fifty-seven out of 466 references retrieved were considered relevant following the application of exclusion criteria. Included articles were subjected to content analysis. Three reviewers extracted and documented key characteristics of the papers. Grounded theory was used to distil key features of the literature to derive emergent success factors.

**Results.** Eight success factors of implementation emerged: preparing for change, capacity for implementation—people, capacity for implementation—setting, types of implementation, resources, leverage, desirable implementation enabling features, and sustainability. Obstacles in implementation are the mirror image of these: for example, when people fail to prepare, have insufficient capacity for implementation or when the setting is resistant to change, then care quality is at risk, and patient safety can be compromised.

**Conclusions.** This review of key studies in the quality and safety literature discusses the current state-of-play of implementation science applied to these domains.

**Keywords:** patient safety, appropriate healthcare

## Introduction

Many patients do not receive appropriate care or are harmed as a result of their care [1]. There is a large literature on evidence-based improvement strategies that healthcare organizations have used in attempting to improve the quality and safety of care. However, the factors associated with successful translation of evidence into practice are less clear.

The phrase ‘translational research’ refers both to an ideal and an endeavour. As an ideal, it aims to capture evidence produced by scientific or social scientific processes and get it into practice, spread it across services, organizations and systems and learn how to do this better over time. As an endeavour, translational research recognizes that these stages do not happen automatically,

often to no great extent, and sometimes not at all. This is apparent across medicine, but a particular exemplar is in respect of quality and safety initiatives, which have proven to be a considerable implementation challenge [2–4].

Implementation science is a related, more recent idea, but has already contributed a substantial literature. Implementation science has been defined with regard to the ‘the methods to promote the systematic uptake of clinical research findings and other evidence-based practices into routine practice and hence improve the quality and effectiveness of health care’ [5]. It seeks to focus attention on the achievement, accomplishment and execution of translation: of supporting the effective and rapid adoption of research findings into policy and practice, creating a science of this. There are multiple challenges. One is the volume

of research produced. There are 75 randomized trials and 11 systematic reviews published every day [6]. Much research evidence is stuck in studies that have not been published, lost amongst journals with small readerships and enmeshed in the practices of some clinicians and not others. When studies are published, they are often read by fellow researchers but not so much by policymakers, managers or clinicians. This has strong implications for the care patients receive. We need to publish the appropriate studies, publicize the important findings of papers, share the lessons, change behaviours and close the gap between clinicians using current best practices and those using best practices of, say, 10 years ago.

This is not an easy task given healthcare delivery occurs in a complex adaptive system (CAS) whereby there are multiple interacting and interdependent parts [7], stability is limited and simplistic ‘cause and effect’ or ‘command and control’ logic does not apply. Closing the gap between the translation of evidence into practice therefore involves at a minimum assembling and judging the quality of the evidence, factoring in the context, including taking into account its CAS features, and ensuring some form of facilitation of the evidence into the putative context [8]. Many implementation science interventional studies in quality and safety have not in the past adequately accounted for the characteristics of the evidence, complex context or facilitation, or all three. Understanding more about the factors associated with the success or failure of these interventions is important for the purposes of refinement, replication and transference across different contexts.

## Aims

This paper aims to synthesize the implementation science literature to identify and understand the factors associated with improving the quality and safety of patient care. We sought to review relevant literature, describe the current state-of-play and identify, distil and explicate common implementation success factors.

## Methods

### Literature search

A targeted search of specific journals was conducted in 2012 to examine implementation science features exhibited in the quality and safety literature. The literature review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) procedures [9]. Using a single search term, ‘implementation science’, we electronically interrogated key quality and safety journals: *BMJ Quality and Safety*, *International Journal for Quality in Health Care*, the journal *Implementation Science* and the highest ranking scientific literature and general medical journals: *Science*, *Nature*, *New England Journal of Medicine*, *British Medical Journal* and *The Lancet*. We targeted these because the first group is most likely to contain the core quality and patient safety studies we sought, the second represents most up-to-date health systems implementation

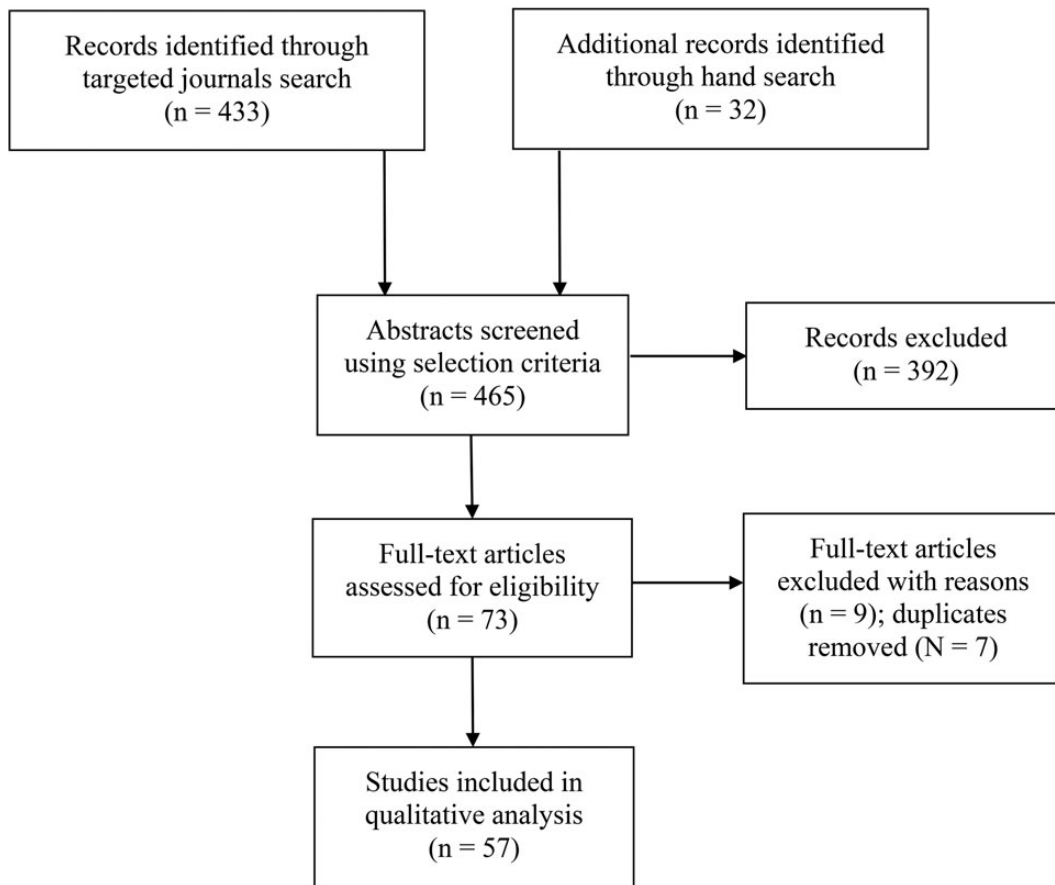
evidence, models and ideas, and the third are the highest ranking extant journals, likely to contain other key quality studies. Additional search terms such as ‘translational research’, ‘evidence into practice’, ‘adoption’ and ‘uptake’ were omitted in order to focus explicitly on implementation science. The search was limited to human, English, recent and empirical research and replicated by a second reviewer for rigour. No year limits were applied. To test whether we were obtaining all relevant studies, a hand search of *BMJ Quality and Safety* and the *International Journal for Quality in Health Care* was conducted in parallel with the electronic search. These journals were searched from 2007–2012. In addition, interventions not previously adopting the keywords ‘implementation science’ at the time of publication were included, drawn from the UK, USA and Australia, such as Pronovost *et al.*'s [10] intervention to reduce catheter-related infections, Haynes *et al.*'s [11] operating theatre checklist study, Lilford and colleagues' Safer Patients Initiative [12], an Australian group's [13] 4-year inter-professional collaboration study and Landrigan *et al.*'s [14] study of hospital error rates over a 6-year period in North Carolina.

### Literature review

The reference details and abstracts of the 466 articles retrieved from the literature search were downloaded to Endnote X5, a bibliographic management software program. Two independent reviewers narrowed the references to 64 articles following the application of exclusion criteria (Fig. 1). Non-research articles, articles without a direct focus on implementation or getting evidence into practice, intervention effectiveness and effectiveness of tools and methods to evaluate implementation were excluded, in order to focus explicitly, and as far as possible, on implementation science. We also excluded research in developing countries due to the limited amount of resources in these countries, the impact this may have on the extent to which new initiatives can be used to improve care, and the potential disproportionate impact of financial (as opposed to other) factors on implementation activities this may have portrayed in our review. A third reviewer resolved any disagreements about the inclusion of an article through discussion. Duplicates were removed, resulting in 57 articles, which were included in the final analysis.

### Literature analysis and categorization

The articles were subjected to content analysis by three reviewers, each of whom extracted and documented the key features of the 57 papers. One reviewer assessed the methodological quality of the papers using Hawker *et al.*'s critical appraisal tool [15], which is designed to evaluate studies with different methodologies and designs by assessing studies against nine criteria: abstract and title, introduction and aims, method and data, sampling, data analysis, ethics and bias, results, transferability or generalizability, and implications and usefulness. A second reviewer crosschecked 10% of the assessed papers and found 100% agreement. Articles could receive scores ranging from 90 (lowest score) to 360 (highest score). The included studies were of high quality: 50.9%



**Figure 1** The literature review process.

received a top score of 360, 36.8% received a score of 350, 5.3% scored 340 and 7% scored 330.

We used grounded theory to extract key features from the results, discussion or conclusion of the 57 studies using open-coding techniques to derive emergent implementation science success factors, which we defined as: ‘practices, skills, or provisions that advance the implementation of the initiative’, following procedures originally developed by Glaser and Strauss [16]. This process resulted in a list of factors facilitating implementation. Two reviewers (JB and DM) coded these factors according to similarity. These themes were reviewed by a third person (NT), and any disagreements were resolved through discussion. In parallel, the reviewers examined barriers to implementation through an analysis of the studies where the implementation effort failed or was partially realized.

## Results

The reviewers’ assessments of the literature revealed the key features of each paper. Studies took place in 19 countries, with the majority in Europe [16], the UK [16] and the USA [15]. Studies employed mixed methods, randomized, observational, experimental, survey, qualitative and quantitative designs. Key features of each paper are given in Supplementary material.

## Key success factors

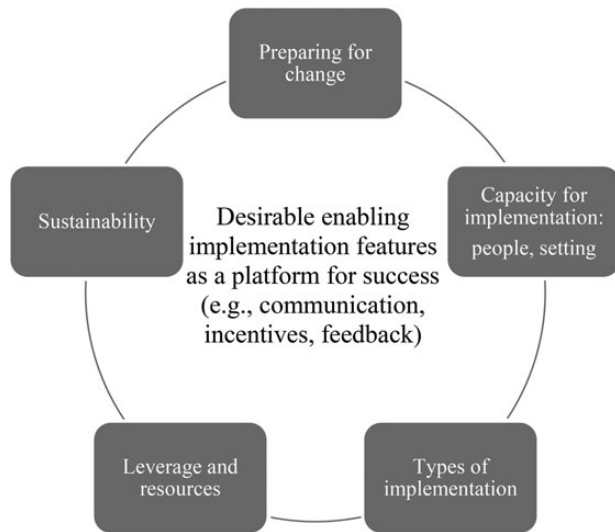
Eight recurring implementation science success factors emerged as key categories from the grounded theory approach. These are preparing for change, capacity for implementation—people, capacity for implementation—setting, types of implementation, resources, leverage, sustainability and desirable implementation enabling features. Table 1 presents the key success factor definitions, indicates the number of studies that contained information representing each category and provides an example of how success factors were represented by specific studies. Supplementary material documents of the key success factors are represented by each study. Across the 57 studies, the key success factor most frequently identified was ‘resources’, followed by ‘desirable implementation features’ and ‘preparing for change’. The least frequently identified factor was ‘leverage’. Studies represented between one (e.g. [17]) and five (e.g. [18]) of the eight identified success factors. The eight factors can be collapsed into a model for phasing implementation, depicted in Fig. 2.

## Discussion

This paper reviewed the implementation science literature to identify key success factors associated with improving quality

**Table 1** Definitions of key implementation science success factors and study exemplars

Success factor	Definition	<i>N</i> studies	Study example
Preparing for change	The organization and associated employees have planned for the initiative	16	Green and Aarons <i>et al.</i> [18] found the opinions of stakeholders in an implementation initiative varied widely. These opinions needed to be addressed in the planning stage to facilitate a smooth and successful implementation process
Capacity for implementation—people	There are enough people with necessary and synergistic skills to implement the initiative	12	Clinicians and managers reported that cooperation has an effect on the uptake of an implementation initiative [19]
Capacity for implementation—setting	There are capabilities and a receptiveness for change	15	The structural and cultural features of an organization affect implementation [20]
Types of implementation	The chosen implementation meets needs and is the best fit for the organization and stakeholders	14	A surgical checklist was accepted by operating theatre staff in hospitals in eight countries [11]
Resources	The necessary human and financial resources are available for implementation	26	Time was an important resource in the implementation of electronic health records [21]
Leverage	There is support and momentum throughout the implementation process	4	Change agents helped modify people's opinions about the implementation of shared electronic records [3]
Sustainability	Processes to support mid-to-long-term acceptance are established during preparation and anchored throughout the implementation process	10	Benchmarking is a valuable strategy for monitoring implementation efforts [22]
Desirable implementation features	Commonly recurring, desirable features of successful implementation include: effective planning; project management; communication; collaboration; useful tools; clear implementation strategy; teamwork; champions; monitoring, evaluation and feedback; incentives; flexibility; autonomy; standardization; tailoring implementations to the local context	24	Øvretveit and Klazinga [23] showed that a flexible approach to the implementation strategy facilitates success



**Figure 2** Phases of implementation.

of care and patient safety in healthcare settings. While there is no one-size-fits-all, step-by-step instruction manual for implementation, eight key success factors for improving quality and safety through implementation strategies emerged from the grounded theoretical approach [24] synthesized from the 57 articles.

Overall, the literature indicates that implementation success is discernible, and codifiable into discrete phases. We would not argue that these are independent categories, but they are notable factors in achieving translation effects. Nevertheless, implementation remains difficult, despite us distilling these eight factors. Providing a set of identifiable factors does not suddenly make implementation easy. It still takes place in a complex environment, with all the features that CAS's exhibit, such as emergent activities, dynamism, multi-layered hierarchies, adaptive capacity, herding behaviour and feedback from within, and externally affecting and perturbing the status quo [25]. Nevertheless, capitalizing on these factors most likely supports implementation activities and initiatives to strengthen care quality and patient safety. Making use of these factors might also help with replicability. If implementers used them, they may be better placed in being able to describe the key steps they have taken in implementing change to others who may be looking for evidence-based effective implementation strategies.

We now turn to providing specific examples of how each success factor is represented by the studies included in the review. The absence or malfunction of one or more of these factors hinders the implementation effort. Thus, success factors can become barriers that could compromise patient safety and quality of care: for example, if an organization is not sufficiently prepared, if it does not have the appropriate people, setting or resources, if it does not utilize leverage or the appropriate type of implementation or if the implementation effort is unsustainable.

### Preparing for change

The starting point in applying implementation ideas to improve quality of care or create safer care for patients is being

sufficiently prepared for the implementation initiative. Implementation requires careful planning. Designing an implementation strategy should be a collaborative and coordinated effort between all stakeholders involved in the initiative [18, 26]. Stakeholders should be in agreement that there is a need for change [27], that the intervention being adopted is appropriate for the purpose or organization [27] and that they should have a shared meaning about the purpose of the initiative [28]. According to this logic, it is important to develop realistic timetables [29], clearly define the roles and responsibilities of the stakeholders in the early stages of the implementation, and champion an explicit implementation strategy [30–32]. Learning from the organization's track record of successes or failures can help inform the strategy [33, 34].

Healthcare organizations and the people within them need sufficiently high levels of change readiness and receptivity [3]. Understanding the preconditions that signal an organization is ready and amenable to the implementation can inform realistic expectations of the outcomes of the implementation effort [35]. Burnett *et al.* [35] found that a 'bottom-up' approach was associated with a high level of organizational readiness. In another study, a 'bottom-up' approach in the implementation of chronic obstructive pulmonary disease management programmes led to significant improvements on various quality-of-life measures [36]. But other research recommends a hybrid of 'top-down' and 'bottom-up' approaches [21, 37]. In such 'middle-out' approaches [38], the implementation effort benefits from high-level leadership and support with local autonomy.

### Capacity for implementation—people

Much research argues that the key ingredient for success in quality and safety is people, and they represent the chief capacity for change. High levels of cooperation between managers and clinicians have been shown to facilitate uptake and spread [19, 39]. If organizational cooperation breaks down, it can ultimately harm the patient [19]. Leadership and team training can shape how an intervention is implemented, which has consequences for its effectiveness [40]. Psychological factors such as attitudes, beliefs and social influence affect clinicians' adoption of evidence-based practices [41, 42]. Implementation efforts need to be tailored to the needs of the parties involved, as clinicians, administrators, policymakers and external stakeholders will likely have differing priorities for the implementation effort. Green and Aarons [18] noted that clinicians involved in direct practice rate the impact of the implementation on clinical practice significantly more highly than do policymakers. Customizing the implementation to different stakeholders' needs may promote more positive attitudes towards the implementation [18].

### Capacity for implementation—setting

The context in which the implementation takes place can make or break the initiative. Assessing contextual factors prior to implementation is a vital step in identifying, understanding and guarding against potential obstacles and enablers in the

environment [43]. Collaborative and supportive environments can facilitate implementation [19, 44]. Organizations require resilience during an implementation, and any resistance to change should be assessed, addressed and overcome [45]. Leaders in the organization should promote a culture of safety and teamwork [46]. In addition to considering microsystem characteristics [28], it is vital to examine the political, cultural and social settings, which can impede or promote the implementation effort [3, 23, 45].

Sociocultural and structural factors such as inter- and intra-professional hierarchies can also affect the uptake of evidence-based practice [20]. Understanding these features and having a plan to deal with them could improve adherence to the implementation [47]. Williams *et al.* [48] found that the size of an organization, for example, can affect implementation. Hospitals in the USA that saw a low number of cardiovascular cases (<90 cases) were significantly less likely to apply evidence-based practices in the treatment of cardiovascular patients than hospitals with higher case-loads (>90 cases).

### Types of implementation

A key goal is to choose the type of implementation that meets needs and is the best fit for the organization and stakeholders. Is the change being implemented to improve quality or make care safer through a guideline [49], a reminder [47], an alert [50], a checklist [11, 51] or a culture change [2]? Optimally, this is a collaborative decision.

Researching the evidence of the efficacy of an intervention and the context in which it is implemented can aid the decision-making process and potentially save time and resources [33]. For example, if an organization is implementing a new guideline, logic suggests that it must be feasible and appropriate for stakeholders' needs. Health professionals are more likely to use guidelines if they observe immediate benefits [17].

Quality improvement systems can be an effective implementation strategy; however, they are not sufficient to ensure practices diffuse across an organization [52]. Large investment and effort may be required to achieve even small improvements to an organization's patient safety climate and capability [2, 12, 14].

### Resources

Organizations with limited resources obviously may struggle during an implementation process. Green and Aarons [18] observed that policymakers and clinicians rated funding and costs as amongst the most important factors in implementing evidence-based practice. In an implementation, context resources encompass much more than discretionary budgets. Organizational structure [53], managerial support [27, 33], infrastructure [10, 18], technology [54], time [35] and staff capabilities [23] are all essential resources with potential to enable or constrain implementation.

Heiwe *et al.* [55] identified lack of time as a major barrier to implementation. Time needs to be accounted for when preparing for the change, in order for it not to become a barrier to the implementation effort or become a hazard for patient

safety. However, it is not always possible for the implementation process to be time efficient, as is the case with the implementation of electronic health records [21, 37]. Delays and disruptions in implementing IT systems are seen as a risk to patient safety [29]. Saving time can be a motivator. For instance, the successful implementation of an information technology system was perceived to save time and improve the quality of patient care [27].

Staff capabilities are a valuable resource that should be nurtured and utilized. Staff values [29, 56], attitudes [13, 57], knowledge [58], job satisfaction [59] and workload [60] can all affect the implementation process. Role modelling can be a valuable technique to diffuse practices across an organization. Haessler *et al.* [61] found that if senior clinicians adopt a practice, it is more likely to be spread across the organization. In the case of hand hygiene, differing levels of staff can influence their peers [61]. If the first person entering a room complied with a hand hygiene protocol, then other team members were significantly more likely to follow than if the first person failed to comply [61].

### Leverage

Beyond resources, successful implementation is more likely if leverage and enablers are harnessed. Opinion leaders [43], champions [62] and change agents [63] can assist adoption and diffusion. Greenhalgh and colleagues [63] found that the success of the implementation of centrally stored summary care records was due to the work of change agents bridging clinical, political, technical and commercial stakeholders. Champions are more effective at implementing technologies than more general 'behaviour' change, particularly in organizations where professional relationships are poor [62].

### Sustainability

Many implementation efforts are not sustained. Processes to support sustainability need to be established during the initial stages of preparing for the change [18] and anchored at various stages. Suñol *et al.* [64] found that several basic patient safety strategies had not been successfully implemented in acute care hospitals across Europe. Implementation was often not sustained or was adopted by one department but did not spread to the rest of the hospital. Benefits of an implementation initiative can be more subtle than stakeholders anticipate, and a lack of progress can be concerning [29, 63]. Changes need to be embedded and monitored over time [64]. There should be systematic evaluations of an implementation [39], and benchmarking can be adopted to help judge progress [22]. Organizations need to commit to ongoing support at a managerial level [55].

### Desirable implementation enabling features

The 57 studies show that there are commonly recurring, desirable features of successful implementations designed to improve care quality and patient safety, which facilitate the success of the other seven key factors. Conducting effective

and detailed planning and project management are essential first steps [18, 31]. Good communication and collaboration between stakeholders involved in the implementation effort is important [30, 63]. Participants need tools, checklists, algorithms, standards, clearly defined roles or articulated expectations to understand what is going on and contribute effectively [10, 11, 13]. The implementation strategy must be well defined and utilize teamwork [65], champions [4, 33] and staff capabilities [55, 60]. Monitoring, evaluation and feedback are central to the success of an initiative [10, 14, 51]. The implementation strategy and the organization itself must be flexible, as conditions change over time [27, 37]. De Allegri [53] noted that a loss of freedom is a key concern of health professionals when an intervention is implemented. There is a fragile balance between local autonomy and standardization of a system [37]. Tailoring implementations to an organization's and the professions' needs increases the likelihood that staff will adopt the initiative [18, 43]. Without these features, evidence-based practice will continue to be underutilized [66].

## Limitations

Limitations of this study include the use of a single search term in targeted journals rather than a wide database search, and as such potentially relevant articles could have been missed. However, this method was adopted to focus specifically on implementation science applied to quality and safety in healthcare. Future research could make use of more sophisticated search methods that may provide more accurate results from the search strategy [67, 68]. Although study quality was generally high, there are well-known limitations of qualitative analyses as compared with meta-analytic approaches; therefore, it may be worth exploring the possibility of analysing studies quantitatively to determine whether the same key success factors emerge, and any differences in levels of effectiveness. By excluding research in developing countries, we may have overlooked vital information about any additional factors associated with successful implementation in healthcare. Future research might seek to compare the key success factors between developing and non-developing countries to see what similarities and differences exist.

## Conclusion

Implementation is complex and challenging, and while there is evidence to help guide change processes, every situation is different, especially due to local contextual issues. This review has summarized the implementation science literature to identify key success factors associated with improving quality of care and patient safety in complex healthcare settings. We targeted the quality and safety literature to reveal the current state-of-play and identified eight facilitators and barriers to implementation that policymakers, researchers and clinicians can learn from. Some implementation efforts in the studies were successful, others moderately so, whereas some efforts were either not fully realized or not sustained. Desirable implementation enabling

features can facilitate implementation. However, because health-care implementation always takes place in a CAS [7], progress will typically be slower than most proponents hope.

## Supplementary material

Supplementary material is available at *INTQHC* online.

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