Change facilitation for the implementation of innovation in healthcare practice.

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Certificate of original authorship

I, *Lydia Michel Moussa*, declare that this thesis is submitted of the requirements for the award of Doctor of Philosophy, in the Discipline of Pharmacy, Graduate School of Health at the University of Technology, Sydney, Australia. This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. This document has not been submitted for qualification at any other academic institution.

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Abstract

Background: The Implementation of innovations in healthcare is complex and multi-dimensional. An intervention that is commonly used in healthcare is change facilitation. There is, however, a lack of frameworks specific to change facilitation, evidence into the specific strategies conducted by Change Facilitators (CFs), and the effectiveness of CF strategies. In addition, there is a gap in the literature regarding frameworks that encompass diagnosis of implementation barriers, prescribing of strategies, and evaluation of effectiveness. Chapter 1 presents an introduction and background to the use of change facilitation during the implementation of innovations in healthcare practice.

Methods: This research involved four phases. Phase one (Chapter 2) was to conduct a systematic review of randomised controlled trials following the Cochrane handbook and PRISMA guidelines. Phase two (Chapter 3) was a mixed method study of a two-year implementation program involving qualitative input by CFs of the barriers and facilitation strategies used during implementation of innovations in community pharmacy, and quantitative analysis using a machine learning approach to predict the effectiveness of facilitation strategies in overcoming the barriers. Phase three (Chapter 4) was the use of an effectiveness-implementation hybrid study during a Minor Ailments Service (MAS) study in community pharmacy aimed at evaluating the effectiveness of a tailored change facilitation intervention using findings from the mixed method study in phase two. Statistical analysis was conducted to determine the resolution percentage of change facilitation categories and longitudinal analysis was conducted to determine the effectiveness of the change facilitation intervention. Phase four (Chapter 5) brings together the findings from phases one, two, and three, and proposes a change facilitation framework.

Results: Chapter 2 presents 51 change facilitation strategies captured from the literature, including common strategies in studies reporting positive outcomes. Chapter 3 presents a link between 36 barriers identified during the two-year implementation study, and a prediction of the most effective facilitation strategies to overcome the barriers. Chapter 4 presents the evaluation of a tailored change facilitation approach, resulting in CFs identifying 67% of implementation barriers in the first two monthly visits and overcoming 75% of these barriers in the same visits. Chapter 5 proposes the 6E Change Facilitation Framework for CFs as a dynamic, non-linear approach allowing CFs to explore barriers, tailor their strategies, evaluate their progress, while ensuring adoption by stakeholders.

Conclusion: Change facilitation is an effective intervention for the implementation of innovation in healthcare. A tailored change facilitation approach according to existing barriers has been deemed effective in early identification and resolution of implementation barriers in community pharmacy. The 6E Change Facilitation Framework provides a guiding structure for CFs to tailor their interventions and move dynamically through the implementation and adoption of innovations in healthcare and beyond.

Dissemination of Research

The research described within this thesis has been disseminated as follows,

Publications

1. **Moussa, L.,** Garcia-Cardenas, V., & Benrimoj, S. I. (2019). Change Facilitation Strategies Used in the Implementation of Innovations in Healthcare Practice: A Systematic Review. *Journal of Change Management*, *19*(4), 283-301.

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3. **Moussa, L.**, Benrimoj, S., Dineen-Griffin, S., Garcia-Cardenas V. Evaluation of tailored change facilitation interventions used during the implementation of a Minor Ailments Service in community pharmacy **(To be submitted)**

4. **Moussa, L**., Moussa, A., Benrimoj, S., Garcia-Cardenas, V., The 6E Change Facilitation Framework | A dynamic change framework to navigate implementation and adoption of innovations in healthcare and beyond **(To be submitted)**

Conference proceedings

1. **Moussa, L.,** Benrimoj S.I, Garcia-Cardenas V. Change facilitation strategies used in the implementation of innovation in healthcare. FIP Pharmacy Practice Research Symposium Lisbon, Portugal. 2019. (Poster Presentation).

2. **Moussa, L.,** Benrimoj S.I, Garcia-Cardenas V. Change facilitation strategies used in the implementation of innovation in healthcare. Congreso Simpodader Annual Conference. Granada, Spain. 2018. (Poster Presentation)

3. **Moussa, L.,** Garcia-Cardenas V. What's stopping pharmacy from adapting. Pharmaceutical Society of Australia 2019 Conference, Sydney. (Oral Presentation)

4. **Moussa, L.,** S.I, Musial, K., Kocbek, S., Garcia-Cardenas V. The use of machine learning to link change barriers with the most effective change facilitation strategies. Society of Implementation Science (SIRC), Seattle, United States of America. 2019. (Oral Presentation).

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Preface

This thesis is presented in fulfilment of the doctoral requirements for UTS. The thesis is structured as a PhD by compilation. Six chapters are presented throughout the thesis, comprising a coherent suite of articles, some of which are published or currently under review, and some of which are to be submitted. Lydia M Moussa is the primary author of each publication. Co-authors include supervisors and collaborators who contributed concepts, design,data collection, data analysis, data interpretation, and revision of manuscripts.

This thesis applied a mixed-methods approach to investigate the strategies used by change facilitators for the implementation of innovation in community pharmacy.

The thesis has been organised into six chapters:

Chapter 1 presents an introduction and background to the research. It provides a justification of why the research was conducted, and objectives of the research.

Chapter 2 presents a systematic review of published literature. The systematic review was undertaken as part of the early exploratory work to capture the breadth of literature surrounding facilitation strategies used by change facilitators to implement innovations in healthcare practice. Thirty-five Randomised Controlled Trials were reviewed, and 51 change facilitation strategies were extracted. Such findings helped form an initial understanding of actions taken by change facilitators and highlighted the need for more evidence-based strategies, and a framework specific to change facilitation.

Chapter 3 presents a mixed-methods implementation study that follows the activities conducted by change facilitators during a two-year implementation study in community pharmacy. Change facilitators recorded the barriers identified during implementation of Professional Pharmacy Services in community pharmacy and the facilitation strategies they used to overcome these barriers. Thirty-six implementation barriers and 111 facilitation strategies were identified. A Machine Learning approach (Random Forest) was used to predict the effectiveness of the facilitation strategies to overcome specific implementation barriers.

The most common implementation barrier identified was, 'the inability for teams to plan for change'. To overcome this barrier, the most effective change strategy was to 'engage stakeholders by creating ownership of the change', which had a predictive resolution percentage (PRP) of 84%. The strategy that was predicted to overcome the most implementation barriers was to 'empower groups to develop objectives and solve problems'.

The chapter concludes by highlighting the need for change facilitators to take into consideration the implementation barriers within the practice and tailor their strategies accordingly. The chapter also mentions that there is no one-size fits all strategy, and that whilst one strategy may be effective in overcoming a specific implementation barrier, it may not be effective for another.

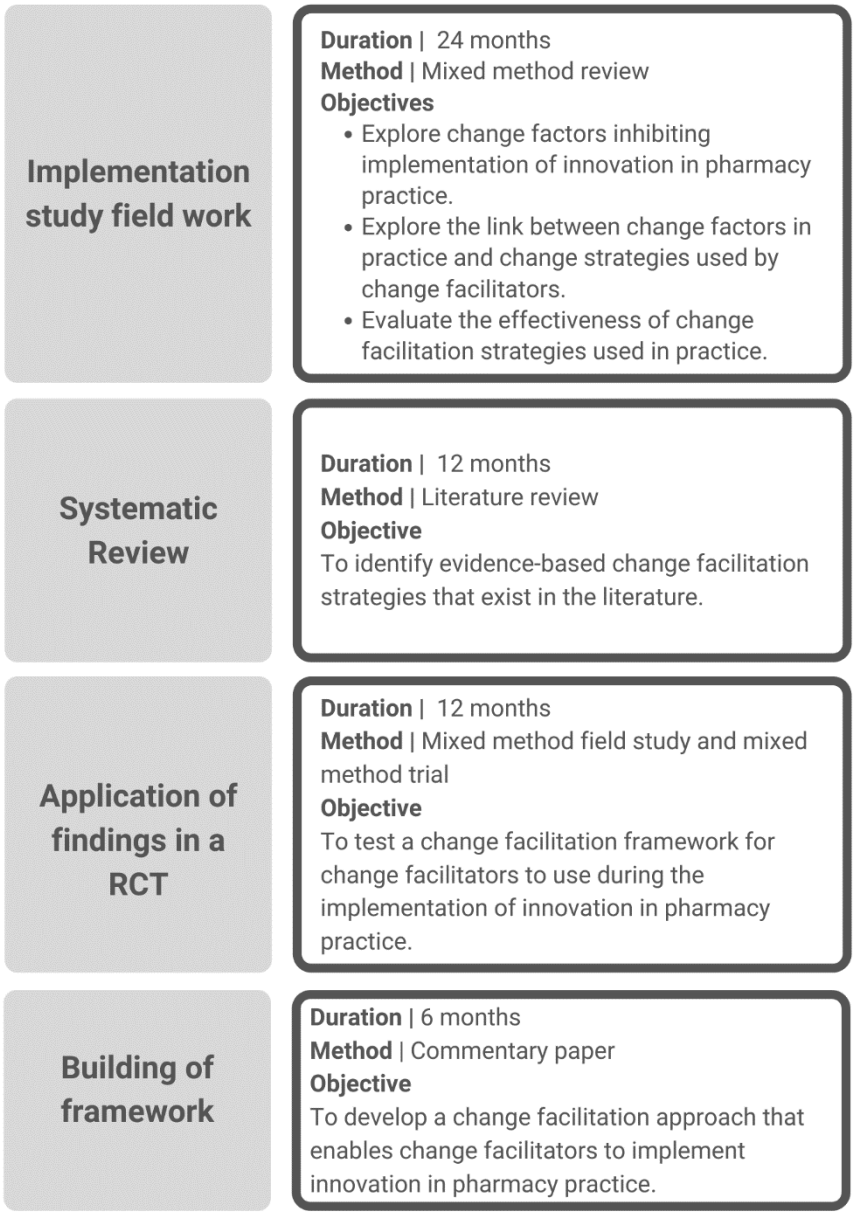
Chapter 4 focuses on the implementation aspect of an effectiveness-implementation hybrid study, where data pertaining to a tailored change facilitation intervention was recorded by CFs during a Minor Ailments Service (MAS) study in community pharmacies. CFs used a preliminary facilitation approach, which included exploration of implementation barriers using a list of implementation factors identified in the previous implementation study in community pharmacy and establishing facilitation strategies using a list of 111 facilitation strategies, also compiled from findings of the previous implementation study in community pharmacy. Longitudinal analysis of the tailored interventions demonstrated that CFs identified 67% of all implementation barriers in the first two visits (across two months) and resolved 75% of these barriers in the same two visits. The most common implementation barrier identified during the MAS study was 'a lack of prioritisation of the change'. To overcome this barrier, the most effective change strategy was to 'communicate the change to stakeholders' with a Resolution Percentage of 67%. The Chapter concludes by highlighting the importance of equipping CFs with a framework to navigate implementation barriers, facilitation strategies, and a way to evaluatethe effectiveness of their strategies, allowing for a dynamic yet streamlined approach to changeimplementation.

Chapter 5 presents a commentary that proposes the 6E Change Facilitation Framework. This framework is proposed for use by CFs to tailor their interventions according to the implementation factors identified in a particular setting. The framework proposes 6 principles,

three of which focus on theimplementation of the innovation and three that focus on adoption by stakeholders.

Chapter 6 discusses the overall research and its implications. The chapter focuses on describing how the research methods addressed the overall objectives and discusses contributions to existing knowledge in implementation science, business management, and the wider literature. The chapter reflects on the overall strengths and limitations of the research, describes the implications of the research findings and areas for future research. The chapter concludes by drawing conclusions from the overall research and provides recommendations for practice.

Figure 1. Flow chart of study Work Streams and methods



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Chapter 1: Introduction and research objectives

Implementation of innovation in healthcare practice

To ensure patients receive the most up to date, evidence-based care, healthcare practices need to ensure constant adoption of innovations. Innovation is understood as:

> "The intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society" [1]

Healthcare innovations have included a new way for practitioners to motivate their patients [2], introducing a new model of care [3], implementation of new disease guidelines [4], the use of telehealth during COVID-19 pandemic [5]), amongst many others. Implementation of such innovations, however, goes beyond simple dissemination of information.

Implementing innovations in practice is often a 'challenge for healthcare professionals as they each work in specific social, organisational and structural settings involving factors at different levels that may support or impede change' [6]. Implementation science recognises that the process of implementation goes beyond simple dissemination of information, it requires the use of strategies that are more specific to the practice's setting [7].
Implementation science researchers have developed over 60 models and frameworks that explore the implementation of evidence-based practice [8]. In 2015 a systematic review exploring implementation frameworks was conducted, from which a Generic Implementation Framework (GIF) was designed [9]. GIF (figure 1) provides a holistic view of implementation as both an iterative process as well as a dynamic approach that looks more incrementally at the factors, strategies and evaluations pertaining to a specific context. GIF also presents phases to implementation starting with pre-implementation, the process of implementation, and post-implementation. GIF allows core concepts of implementation to be considered for every implementation effort while highlighting differences in the structure and order in which the implementation process and domains are depicted, as well as the comprehensiveness of factors, strategies, and evaluations (the inner circles within the framework.

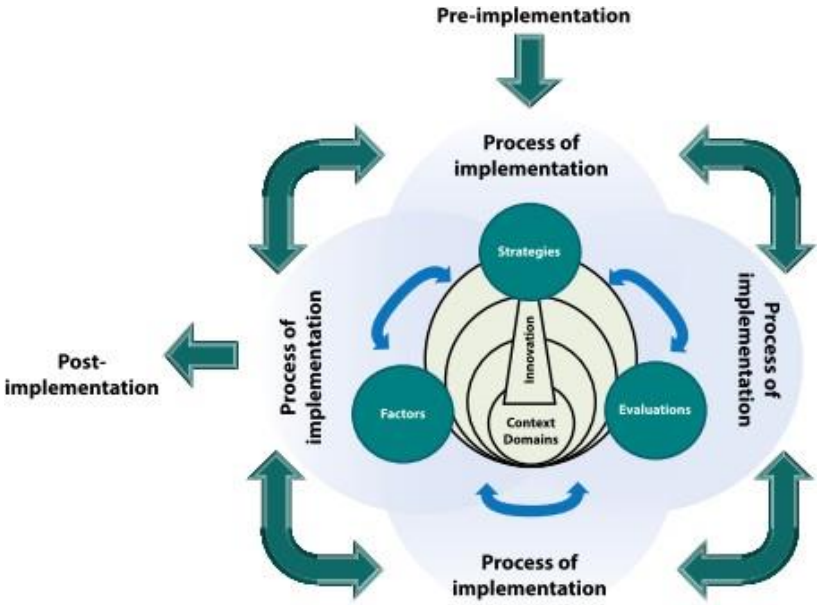

Figure 1: The Generic Implementation Framework (Moullin et al. 2015)

Researchers have highlighted that there is "limited how-to support for carrying out implementation endeavours since the determinants usually are too generic to provide sufficient detail for guiding an implementation process" [10]. A gap, therefore, in the details pertaining to the linkage of factors, strategies and evaluations, to guide the implementation approach.

Factors specific to a context or setting can enable or inhibit successful implementation of innovation. Implementation researchers have extensively explored these factors, and have referred to them as 'constructs' [11], 'determinants of practice' [12, 13], barriers [14], enablers [15], facilitators [14], problems and needs, or disincentives and incentives [16], and 'Implementation Factors' [17]. Throughout this thesis, these factors will be referred to as implementation factors as it has a neutral connotation, and the name reflects the objective to be achieved i.e. implementing an innovation [17].

According to the Consolidated Framework for Implementation Research (CFIR), [11], implementation factors are categorised in different domains such as the intervention, outer setting, inner setting, characteristics of individuals involved, and the implementation process. For example, when looking at the characteristics of individuals involved one must consider

different constructs such as that individuals have cultural, organisational, professional, and individual mindsets, norms, interests and affiliations.

To add to the complexity of implementation factors, each implementation factor can act as a barrier or an enabler to implementation [17]. For example, a factor identified by the CFIR is 'knowledge and understanding of the innovation being implemented'. A lack of knowledge and experience would act as a barrier to implementation, while having knowledge and experience would act as an enabler.

Pharmacy researchers have therefore explored implementation factors for the implementation of innovation in community pharmacy [17–19]

Implementation of innovation in community pharmacy

Governments and health care practitioners share common goals to improve patients' clinical outcomes, quality of life and the rationale use of medicines [20]. To achieve these goals, there has been an increasing international trend towards the delivery of innovations such as professional services in pharmacy practice [21]. A professional pharmacy service can be defined as:

> "an action or set of actions undertaken in or organised by a pharmacy, delivered by a pharmacist or other health practitioner, who applies their specialised health knowledge personally or via an intermediary, with a patient/client, population or other health professional, to optimise the process of care, with the aim to improve health outcomes and the value of healthcare." [22]

A systematic review showed that Professional Pharmacy Services are an effective strategy to prevent and resolve drug related problems, such as medication nonadherence or inappropriate medications [23]. They have also been shown to decrease medication-related hospital admission rates in aged polypharmacy patients [24], improve clinical and humanistic outcomes [25], reduce hospitalization rates, general practice, and emergency department visits [26] and are economically viable compared to usual care [27, 28]. Whilst this evidence highlights the

benefits of implementing Professional Pharmacy Services in community pharmacy, there still exist a need for effective service implementation.

In a study exploring enablers for pharmacists to implement professional pharmacy services, pharmacists indicated the need for 'external support/ assistance' [29]. This finding led pharmacy researchers to explore implementation frameworks that include 'external support/ assistant'.

The use of change facilitation and challenges faced by Change Facilitators during implementation

While many frameworks have been described in the literature to support researchers and practitioners to implement innovation in practice [8], the Promoting Action on Research Implementation in Health Services (PARiHS) Framework [30, 31] presents 'facilitation' as a key role which not only affects the context in which change is taking place, but also aids participants in making sense of the evidence being implemented [32]. Facilitation requires a Change Facilitator (CF) to provide "support to help individuals and groups realise what they need to change and how to make changes to incorporate evidence into practice" [33].

There is evidence displaying the efficacy and success of facilitation worldwide [25, 34–36] as well as the role of CFs [37, 38]. In the community pharmacy setting, CFs face the difficulty of ensuring the successful uptake of innovations such as professional pharmacy services by pharmacy teams [39]. Such difficulties include both overcoming implementation barriers and integrating services with existing community pharmacy business models [40, 41]. Previous studies in pharmacy practice highlighted that CFs overcame barriers such as 'lack of resources' by providing pharmacy teams with 'documentation tools' and 'weekly schedules' [42]. Once CFs understand the implementation factors associated with the implementation of professional pharmacy services, they can tailor interventions that meet the specific needs of those impacted by the implementation.

Tailored interventions are defined as "strategies to improve professional practice that are planned, taking account of prospectively identified determinants of practice" [43]. This leads to

thesecond aspect within the GIF, which is strategies. There is a clear link highlighted by the GIF between implementation factors within a particular context and the strategies that need to be conducted to deal with such factors. For example, in the aforementioned example of 'Knowledge and understanding of the innovation being implemented', tailored interventions could include a) providing technical training or b) knowledge training.

The challenge that CFs face when it comes to the need to tailor interventions is that it can be time-consuming and may require trialling of different strategies to reach the desired changes. Which leads to the third and final aspect of GIF, which is evaluations. The challenge with many trials and interventions involving CFs is that the facilitation intervention itself is rarely measured. Interventions involving CFs often measure patient outcomes or adoption of the service, there are limited frameworks and models that look at the evaluation of strategies conducted by CFs [44]. There remains a need to provide more precise, detailed and reproducible descriptions of the interventions used for implementation [45]. Between 5-30% of trials of behavioural change are described in sufficient detail to discern which components are essential and whether they are intended to be implemented [11, 46]. In addition, there is a needfor methods for assessing and prioritizing implementation factors during an implementation effort and linking implementation strategies to these implementation factors [47].

There is also the challenge of balancing the implementation of innovation within a specific context, and its successful adoption by stakeholders. Stakeholders refer to "any group or individual who can affect or is affected by the achievement of the organisation's objectives [48]". Some stakeholders embrace change initiatives readily, while others fight the change and deny its necessity [49].

With the latest innovation in data analytics and prediction, innovations such as Machine Learning and data analytics can provide researchers with more targeted, effective strategies that can tackle implementation barriers more efficiently, such as the approach used to predict disease risk of individuals by analysing their medical diagnosis [50].

CFs would not only benefit from application of such innovations, but also the development of a

more systematic, yet dynamic framework to allow them to explore implementation factors, determine whether these are acting as barriers or enablers, then move towards establishing facilitation strategies to overcome the barriers or leverage the strategies, and allow them to evaluate such strategies. Such a framework would also allow for consistency of implementation among CFs as there is often a high degree of variability in facilitation delivery 'due to the facilitators' professional backgrounds, role setup and activities' [51]. It would also reduce the time spent by CFs trialling different strategies as the strategies would inherently be tailored to overcome the specific implementation barriers within a specific context.

Research objectives

This thesis explores change facilitation strategies used during the implementation of innovation in healthcare with a specific look into those used during the implementation of professional services in pharmacy practice. The thesis aims to look at how change facilitators can implement innovation by linking implementation barriers with effective change strategies.

Specific Objectives

- To identify and summarise evidence-based facilitation strategies that exist in the literature.
- To determine implementation barriers preventing implementation of innovation in community pharmacy.
- To tailor facilitation interventions by linking implementation barriers to facilitation strategies.
- To determine the most effective facilitation strategies to overcome implementation barriers in community pharmacy.
- To evaluate the effectiveness of a tailored change facilitation intervention during a MAS study in community pharmacy.
- To develop a change facilitation framework for Change Facilitators to use during the implementation of innovations.

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Chapter 2: Change facilitation strategies in the literature

Citation: Moussa, L., Garcia-Cardenas, V., & Benrimoj, S. I. (2019). Change facilitation strategies used in the implementation of innovations in healthcare practice: a systematic review. *Journal of Change Management*, *19*(4), 283-301.

Change Facilitation Strategies Used in the Implementation of Innovation in Healthcare: A Systematic Review

Abstract

To improve patient outcomes, healthcare practices undergo constant implementation of innovations. An implementation intervention that considers organisational and behavioural aspects is facilitation. Change Facilitators help individuals and groups realise what they need to change and how to make change happen. However, behavioural change trials require more sufficient details to improve delivery, fidelity, and evaluation.

The aim of this paper was to identify facilitation strategies used during the implementation of innovations in health care, determine those most frequently used and their relation to study outcomes.

For this systematic review, randomised controlled trials reporting an onsite facilitator to aid in innovation implementation in a healthcare setting were identified.

The database search yielded 2,350 articles, from which 35 studies were included. From these, 51 facilitation strategies were identified. Nine of the strategies appeared in more than 50% of studies and those reporting positive results included: goal setting, assessing progress and outcomes, and providing tools and resources.

These findings provide facilitators with evidence-based strategies to deliver in practice and to ensure consistency in facilitation training. Future research should aim to provide further tools that recommend the most effective facilitation strategies and a framework to improve the effectiveness, efficiency, and evaluation of the change facilitation process.

KEY WORDS: Facilitation, innovation, healthcare organisations, implementation, change management, healthcare management, evidence-based practice, strategies**.**

M.A.D Statement

This article sets out to make a difference for those implementing innovations in the healthcare industry, by arming change facilitators with practical, evidence-based strategies to facilitate change more effectively. Furthermore, this article highlights the need for specific tools and models that improve the efficiency and effectiveness of the change facilitation process and its evaluation.

Introduction

To ensure patients receive the most up to date, evidence-based care, healthcare practices need to ensure constant adoption of innovations. Innovation is understood as:

> "The intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society" (West & Farr, 1990).

Healthcare innovations have included a new way for practitioners to motivate their patients (Fu et al., 2015), introducing a new model of care (Dickinson et al., 2015), implementation of new disease guidelines (Harris et al., 2015) amongst many others.

Implementation of such innovations, however, goes beyond simple dissemination of information. It requires the use of strategies that are more specific to the practice's setting (E. K. Proctor et al., 2009). Over 60 models and frameworks explore the implementation of evidence-based practice (Tabak et al., 2012).

The Promoting Action on Research Implementation in Health Services (PARiHS) framework presents successful implementation research as a function of the relationship between evidence, context and facilitation (Jo Rycroft-Malone, 2004). Of the three, 'facilitation' has been proposed as a key role which not only affects the context in which change is taking place, but also aids participants in making sense of the evidence being implemented (Harvey et al., 2002).

Facilitation has been defined as:

> "A technique whereby facilitators provide support to help individuals and groups realise what they need to change and how to make changes to incorporate evidence into practice" (Dogherty et al., 2010).

In health care, "facilitator" is one of a number of titles given to an internal or external person who is a 'catalyst for change' (Bentley, 1994). Other titles include; 'coaches' (Fu et al., 2015), 'knowledge brokers' (Dobbins et al., 2009), 'outreach visitors' (Engels et al., 2006), 'practice enhancement assistants' (Aspy et al., 2008) and 'practice facilitators' (Kotecha et al., 2015).

A number of researchers have explored the role of the facilitator. The role is said to be aimed at 'working with individual practices on relationship building, education, and quality improvement' (Nagykaldi et al., 2005). Facilitators work closely with a practice to identify areas of improvement, set improvement goals, provide tools and facilitate quality improvement activities and practice redesign (Kotecha et al., 2015). They increase awareness of a need for change, and work with teams or individuals to improve leadership and project management, relationship building, and communication. They also aid individual understanding of the importance of the local context, and provide ongoing monitoring and evaluation (Dogherty et al., 2010).

There are a number of examples proving the efficacy and success of facilitation worldwide (Baskerville et al., 2012; Dietrich et al, 1992; Fullard et al., 1984). In the United Kingdom, specially trained nurse facilitators organised preventive care in practitioners' offices for the prevention and early detection of cardiovascular disease (Fullard et al., 1984). In the United States, the health facilitator model was shown to be efficacious in establishing office routines and significantly improved the provision of services for the early detection and prevention of cancer (Dietrich et al., 1992). Similarly, findings from a systematic review and meta-analysis showed that practice facilitation has a moderately robust effect on evidence-based guideline adoption (Baskerville et al., 2012).

Whilst there is evidence displaying the importance and success for the use of facilitation in implementation, researchers realise the need to provide more precise, detailed and reproducible descriptions of the interventions used for implementation (Bellg et al., 2004). Between 5-30% of trials of behavioural change are described in sufficient detail to discern which components are essential and whether they are intended to be implemented (Damschroder & Hagedorn, 2011; Michie et al., 2009). Even though the role of facilitators is highlighted in the literature, there remains a gap in the research regarding the specific strategies used by facilitators to implement these innovations (Dogherty et al., 2010). This gap increases the challenge of providing consistent facilitation, determining the fidelity of facilitation interventions and enabling the appropriate evaluation of facilitation trials.

The aim of this systematic review is, therefore, to identify strategies conducted by facilitators when implementing innovations within healthcare practice, and to determine the strategies most frequently used.

This review will identify evidence-based strategies that can be utilised by facilitators to implement innovations for further improvement of health care, providing researchers, organisations and implementation teams with strategies for facilitators to use during the implementation of innovations. Future research should aim to provide facilitators with further tools that improve the effectiveness, efficiency and evaluation of the change facilitation process.

Review Methods

A systematic review was undertaken following the methodological and reporting standards recommended by PRISMA (Liberati et al., 2009). To identify studies eligible for this review, the following electronic databases were searched: PubMed, SCOPUS and Web of Science for records published until April 2017. Neither time nor language restrictions were used. The search strategy by database and word query can be found in additional File 1. After all duplicate articles were removed, the first screening by title and abstract was conducted**.** Studies that

clearly did not meet the inclusion criteria were excluded and the full texts of potentially relevant references were obtained.

Inclusion criteria were: randomised controlled trials, and use of an onsite facilitation intervention where a facilitator physically visits the healthcare practice.

The exclusion criteria including the reasoning for exclusion are shown in Table 1.

Study characteristics were extracted using the Cochrane Effective Practice and Organisation of Care Group (EPOC) Data Collection Checklist (Mowatt et al., 2001) which included study objectives, setting, study design, target population, outcome measures, description of the intervention and outcomes. When the article referred to supplementary materials or reference articles that provided further details of the intervention and strategies, those references were searched and read. If further clarification was required, the authors were contacted.

Explanation of terms

See Table 2 for an explanation of the following terms: healthcare practice, innovation, intervention, facilitator, facilitation, and facilitation strategies. A number of different definitions for innovation exist in the literature. The West et al. definition was chosen as they have not predefined who introduces the innovation, leaving it possible for researchers, the government, an organisation or a facilitator to introduce the innovation. This definition includes the wide range of application of an innovation and its benefit to the individual, which may be a team member, practitioner or patient in the healthcare setting, as well as to the group, which may be a team within a healthcare organisation, or groups of practitioners or patients.

Data analysis

Each of the 35 studies identified reported a number of facilitation strategies; these were extracted from the studies exactly as they appeared. For example, if a paper highlighted the use of goal setting by the facilitator, the term “goal-setting” was added to the list of strategies.

The study outcomes were categorised into a) patient-related, b) innovation adoption-related, or c) a combination of both. Patient-related outcomes were those relating to the

evaluation of a patient clinical or humanistic outcome. Innovation adoption-related outcomes were those related to the intention, initial decision, or action of an attempt to employ an innovation or evidence-based practice (E. Proctor et al., 2011).

To evaluate the effectiveness of facilitation strategies according to study outcomes, the study results were categorised as follows:

a) Positive results, which were studies whose outcome measures all showed statistically significant positive results

b) Negative results, which were studies whose outcome measures all showed statistically significant negative results

c) Non-significant results, which were studies whose outcome measures did not show either positive or negative statistically significant results and

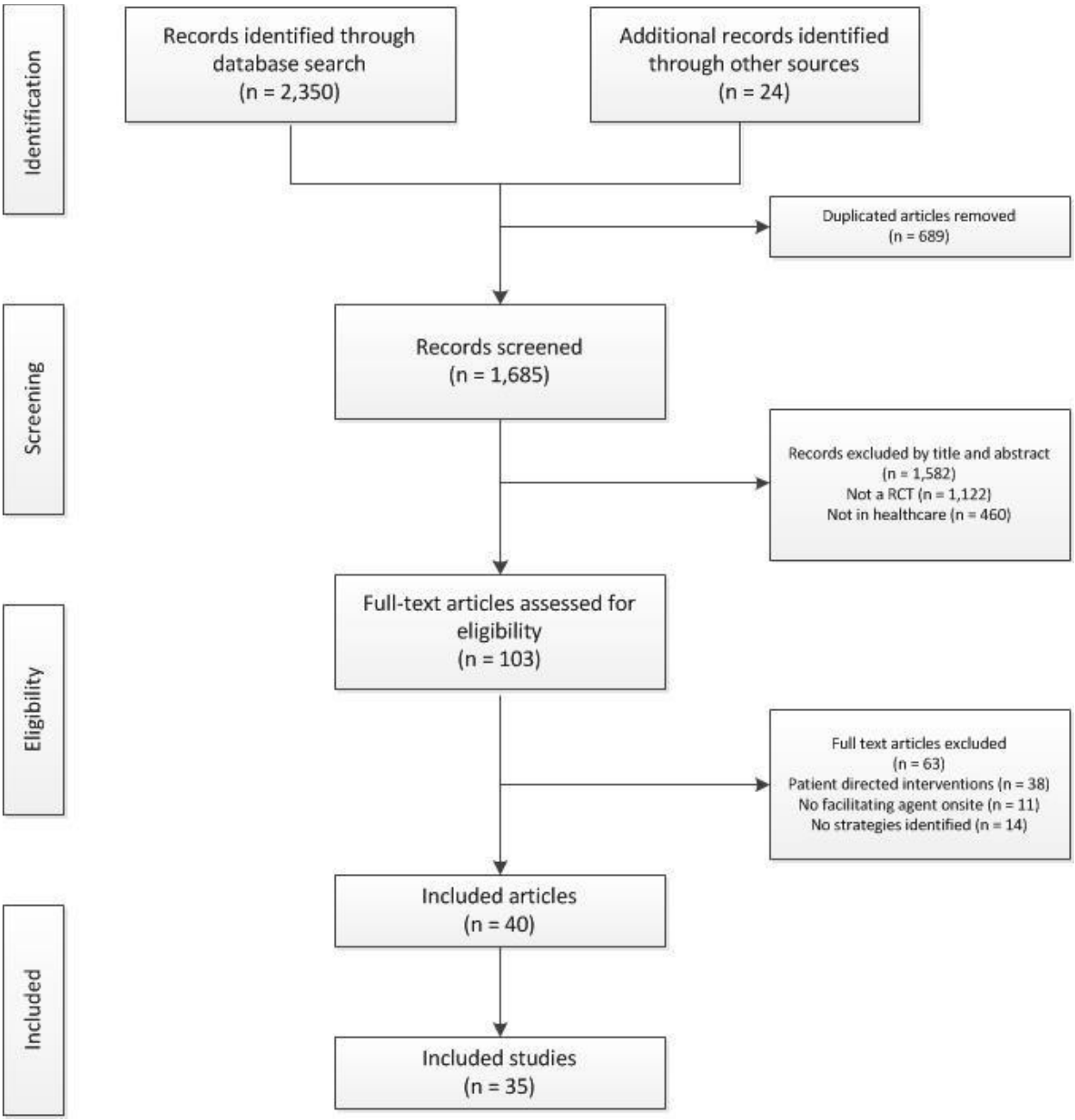
d) Mixed results, which were studies whose results showed a mixture of both significant and non-significant results across multiple measures.

The strategies were considered common when used in more than 50% of the studies.

Given the heterogeneity of the studies regarding participants, varying healthcare setting, strategies and outcome measures, no formal quantitative synthesis or meta-analysis could be conducted.

Results

The database search resulted in 2,350 articles. Additional records identified through other relevant sources (n=24) were added. After removal of the duplicates and initial screening by title and abstract, 103 full-text articles were then reviewed. Sixty-three of these articles were excluded, giving a total of 40 articles to be included for analysis. Lastly, records from the same study were linked together resulting in a final 35 studies. See Figure 1 for the flow diagram of the study selection.



The results reported in this review focus on major aspects of the facilitation intervention and the strategies used by facilitators to implement innovations in healthcare practices.

Study characteristics

Additional File 2 contains a summary of characteristics and outcomes from each of the 35 studies.

Outcomes reported

Of the 35 studies, 12 reported positive results, 3 reported non-significant results, 20 reported mixed results and none reported negative results.

Facilitation duration

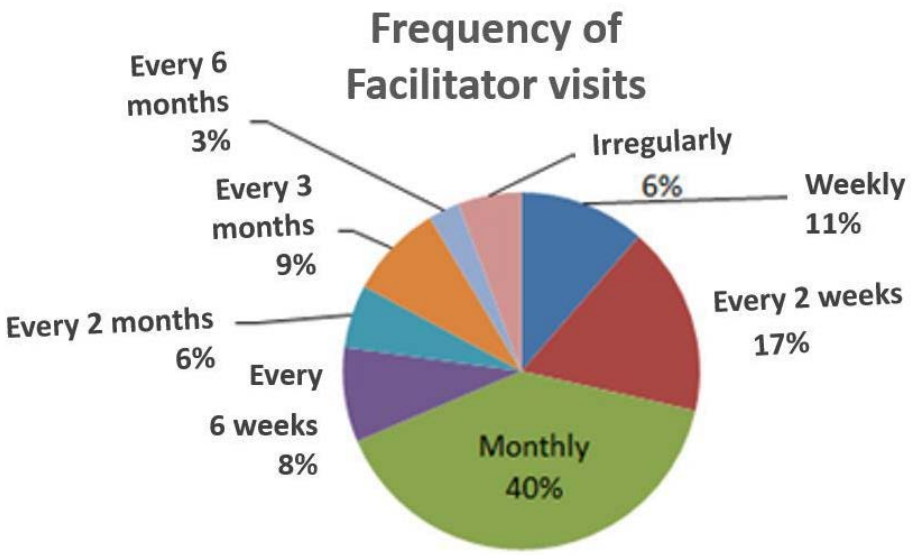
The duration of studies ranged from two weeks (Palter et al., 2016) to 36 months (Eriksson et al., 2013). Of the seven studies conducted for 19 months or more, 46% demonstrated positive results. Of the five studies that were undertaken in seven to eleven months, 40% showed positive results. Of the 11 studies that were conducted in six months or less, 36% showed positive results. Of the 12 studies conducted between 12-18 months, 25% showed positive results.

Facilitation focus

Facilitators within the majority (n=21) of the 35 studies focused facilitation on the entire group/team within the healthcare practice, whilst others focused only on certain individuals such as the practitioner (n=7). One study reported a task-focused facilitation approach (Houle et al., 2016) and the remaining studies (n=6) adopted multiple foci. The focus with the highest percentage of studies reporting positive outcomes was the group-focused approach at 42%.

Frequency of facilitator visits

In regard to the frequency in which facilitators visited the healthcare practice during the innovation implementation (Figure 2), 40% of studies reported monthly facilitator visits, and of these, 36% reported positive results. The study in which the facilitator conducted irregular (ad-hoc) visits (Van Beurden et al., 2012) reported non-significant results.



Training provided to facilitators

The majority of studies (n=27) reported that the facilitators were provided training prior to, or during the facilitation intervention. Two studies reported that no training was provided to the facilitators; both reported mixed results. The remainder of studies did not mention facilitator training.

Evidence-based processes/ frameworks/models used in the studies

A number of differing evidence-based processes/ frameworks/ models were utilised across the studies including: the coaching model (Palter et al., 2016), the continuous quality improvement model (Dickinson et al., 2015; Engels et al., 2006), evidence informed decision making (Dobbins et al., 2009), model of change (Frijling et al., 2002; Lobo et al., 2002), model of ethical reasoning (Johnston et al., 2007), PARiHS (Houle et al., 2016; J. Rycroft-Malone et al., 2012), the 7 S improvement model (J. Rycroft-Malone et al., 2012; Solberg et al., 1998) and reflective adaptive process (Dickinson et al., 2015).

Facilitation strategies identified

Fifty-one facilitation strategies were identified across the 35 studies and were listed according to the order in which they appeared in the studies (Table 3).

The most commonly used strategies identified in the order in which they appear in the studies

1) Conduct baseline audit and 2) Conduct post-audit feedback

Twenty-three of the 35 studies reported the use of both baseline audit and feedback as part of the facilitation process. Baseline audits were conducted in various forms such as: patient chart audits (Aspy et al., 2008); an assessment of practice communication, change and work culture (Dickinson et al., 2015); baseline participant questionnaires (Engels et al., 2006); and knowledge and attitude questionnaires (Johnston et al., 2007). Feedback was given to the entire team (Aspy et al., 2008; Due et al., 2014; Engels et al., 2006), to general practitioners individually (Frijling et al., 2002), to senior managers (Dobbins et al., 2009) or stakeholders (Eriksson et al., 2013) in various forms such as group discussions (Due et al., 2014), individualised reports (Eriksson et al., 2013) or performance gap analysis (Kinsinger et al., 1998).

3) Ask participants to identify barriers

Nineteen studies indicated that the facilitator asked participants to identify barriers to implementation of the innovation. One study reports that facilitators asked individual practitioners about the reservations they had regarding the innovation (Cockburn et al., 1992), another study reports that some facilitators utilised semi-structured interviews to allow staff to voice concerns (Houle et al., 2016), while other studies reported that facilitators discussed this with all participants as a group (Dobbins et al., 2009; Engels et al., 2006).

4) Utilise goal-setting

Twenty-three studies reported goal setting as a strategy. Two studies described their methods of setting goals: focusing on individual goals (Kauth et al., 2010), and identifying overall practice improvement goals (Margolis et al., 2004).

5) *Tailor approach according to needs of the practice*

Twenty-three studies indicated that facilitators tailored their approach to accommodate for the needs of the practice. One facilitator utilised the feedback from baseline data to support practice members to identify and prioritise a list of gaps and planned changes tailored for their personal circumstances (Lobo et al., 2002).

6) *Provide staff training*

Nineteen of the 35 studies indicated that staff were trained. Training was either conducted by the facilitator, an opinion leader (Hogg et al., 2008), or by the project team (Margolis et al., 2004). Staff training was either conducted prior to the facilitator visit (Kauth et al., 2010) or throughout the facilitator visits (Aspy et al., 2008; Lobo et al., 2002).

7) *Provide tools/ educational materials*

Twenty-five studies indicated that facilitators provided tools. These tools included: educational material for the participants (Cockburn et al., 1992) and for the patient (Harris et al., 2015), webinars and discussion forums (Dobbins et al., 2009), workbooks and checklists (Engels et al., 2006), brochures and posters (Kinsinger et al., 1998) and guidelines (Mold et al., 2014). Five of these studies mentioned that facilitators tailored tools and resources according to the needs of participants.

8) *Aid in making an improvement plan*

Eighteen studies indicated that the facilitator helped the practice construct an improvement plan.

9) *Assess progress and outcomes*

Fifty-seven percent of studies indicated that facilitators assessed progress and outcomes. Assessment occurred in a variety of ways, including evaluating staff performance (Lemelin et al., 2001), periodically conducting audits and feedback through a quality improvement cycle (Engels et al., 2006), evaluating patient satisfaction through surveys (Noel et al., 2014) or by

directly calling patients (Lemelin et al., 2001). Seven studies reported facilitators using the Plan-Do-Study-Act (PDSA) cycle (Dickinson et al., 2015; Eriksson et al., 2013; Gustafson et al., 2013; Kauth et al., 2010; Margolis et al., 2004; Mold et al., 2008; J. Rycroft-Malone et al., 2012). All studies reporting the use of the PDSA cycle reported positive or mixed results.

Appearance of the most common strategies in studies with positive outcomes

Table 4 highlights the nine most common strategies used ranked according to the frequency of their appearance in studies resulting in positive outcomes.

Combination of strategies used

In all 35 studies, facilitators used a combination of strategies rather than one strategy. Table 5 outlines the combination of the nine most common strategies used by facilitators in the 12 studies reporting positive results and the 3 studies reporting non-significant results. Nine of the twelve studies with positive results used both baseline audit and post-audit feedback. Fifty percent of the positive studies (n=6) used the following combination of strategies: baseline audit, post-audit feedback, goal setting, tailored approach and providing tools.

Discussion

Variations throughout facilitation interventions

Throughout the 35 studies, variations included the healthcare settings, innovations being implemented and outcome measures. The review findings also highlighted a number of different frameworks, models and processes used across the studies, affecting the methods used by facilitators in the implementation of innovations.

Facilitators also have a wide range of educational backgrounds, role descriptions and strategies (Petrova et al., 2010), with a high degree of autonomy in practice. The variation in context, outcome measures, and training methodology used across the studies, additional to the high degree of autonomy given to facilitators, deem the evaluation of facilitation interventions more difficult.

By specifying the strategies used during behavioural change trials, such as facilitation trials, researchers can better evaluate the fidelity of such interventions leading to more comprehensive evaluation of the strategies used. In practice, facilitators can be trained on the use of this evidence-based list of facilitation strategies for the implementation of an innovation in health care. If, however, it is not feasible for facilitators to use all 51 strategies, given short intervention time frames, limited resources and a limited budget, they can concentrate on the following nine recommended facilitation strategies. The recommendation of these nine facilitation strategies is based on the most frequently used strategies in studies that resulted in positive outcomes.

A list of evidence-based facilitation strategies

The following list may be used in the outlined order; it is, however, not a process to follow.

Conducting baseline audit allows facilitators to assess the context in which the innovation is to be implemented, while enabling facilitators, research teams and participants to better understand subsequent activities. This assessment provides valuable insights as an efficient and, at times, the only feasible way to assess certain implementation factors (Damschroder & Hagedorn, 2011). PARiHS also highlights the importance of assessing the context in which implementation occurs. To assess context, facilitators conduct an early in-depth assessment of both the participant and the organisation (Dobbins et al., 2009).

Findings from this review demonstrate that facilitators utilise quantitative and/or qualitative baseline measurements to assess factors such as the organisation, the process, the workflow and the participants involved. This assessment involves gaining a better understanding of participant knowledge, beliefs, cultures, concerns and attitudes. Tools used to conduct baseline audits included patient chart audits, practice process evaluations, participant interviews and/or surveys.

Whilst articles reported the use of a baseline audit, it is unclear to determine whether the facilitators “facilitated” this audit by asking others to conduct it, or if the facilitator conducted the audit themselves.

The combination of a formal audit and feedback is beneficial throughout the implementation process to promote learning and expertise in using the innovation (May & Finch, 2009). Other measures, such as 360-degree feedback have been utilised as an audit and feedback tool to increase participant skills in a variety of industries (Hazucha et al., 1993). A previously conducted review indicated that audit and feedback are most effective when delivered at least 'monthly', in both a 'verbal and written' format (Ivers et al., 2012).

A Cochrane literature review indicates that efforts to change professional practice have a lower likelihood of success unless barriers are identified and taken into account. Barriers may vary in different healthcare settings, groups of healthcare professionals or clinical tasks (Baker et al., 2010). It is worthwhile to note that two of the 18 studies whose facilitators used 'exploration of barriers' as a strategy reported non-significant results. (Shaw et al., 2013; Van Beurden et al., 2012) A closer look into their strategies shows that the facilitators did not report the utilisation of goal setting, consensus building or making an improvement plan. This demonstrates that perhaps identifying barriers without first agreeing upon goals and plans may be more counterproductive, as participants dwell on the negative aspects without coming to an agreement on an appropriate solution. These findings shed light on the importance of using specific combinations of strategies, versus using one stand-alone strategy.

The strategy of goal setting was reported in the highest percentage (47%) of studies with positive results. Having specific, clear and accepted goals affects individual performance by "directing attention, mobilising effort, increasing persistence and motivating strategy development" (Locke et al., 1981). However, in a team setting, clear goals can direct the team members' attention and action (Klein et al., 1990).

It is recommended that instruction should be offered with "both explicit goals and a specific action plan" (Ivers et al., 2012). This is in line with this review's findings that facilitators in a number of studies combined feedback and audit with strategies such as goal-setting, plan implementation and on-going feedback provision. When utilising goal setting, one study measured which of these goals were actually implemented, which could be used as a way to evaluate participant commitment and increase accountability (McBride et al., 2000).

Facilitators are reported to tailor advice and resources while enabling staff to adjust their roles to better accommodate the innovation undergoing implementation. Findings from a Cochrane literature review also indicated that tailored interventions can change professional practice (Baker et al., 2010).

When the facilitator identified a knowledge gap among participants in the healthcare practice, findings report that he or she provides staff training or invites a subject –matter expert to conduct the training. The successful adoption of an innovation requires extensive, specialised training to learn the principles underlying the innovation, in order to overcome knowledge barriers to use (Gallivan, 2001).

Provision of tools and educational material was the most used strategy. If a resource gap was identified, facilitators provided participants with tools, resources or educational material in accordance with the needs of the practice. The provision of tools and materials allowed practices to concentrate on improving care (Margolis et al., 2004).

The facilitators were also reported to aid the practice in designing an implementation plan towards the innovation. Throughout the studies facilitators encouraged participants to come up with their own plan, by first: providing participants with evidence-based knowledge (Dobbins et al., 2009; Margolis et al., 2004), helping them conduct cost-benefit analyses (Gustafson et al., 2013), aiding organisation of effective meetings (Lemelin et al., 2001; Mold et al., 2008), showing them how to conduct a Strength-Weaknesses-Opportunities-Threats analysis (Eriksson et al., 2013) and how to utilise flow-charts (Aspy et al., 2008; Gustafson et al., 2013; Hogg et al., 2008). This is in line with the description provided by Kotecha et al. of facilitators setting improvement goals, providing tools and facilitating quality improvement activities (Kotecha et al., 2015).

Continued provision of feedback helped to sustain motivation and focus on improvement (Stange et al., 2003). Facilitators used Plan-Do-Study-Act (PDSA) in seven of the studies, none of which demonstrated non-significant results. The use of a PDSA cycle led to improvements in team performance, communication and a decrease in number of problems

(Nakayama et al., 2010). This emphasises that feedback is an important component of most successful quality improvement interventions (Davis et al., 1995).

Characteristics of studies with positive results

Of the 35 studies analysed, none of the outcomes focused primarily on the facilitation intervention nor the facilitation strategies used. A correlation, therefore, cannot be made between the effectiveness of the facilitation strategies and the study outcomes. This is further complicated by the use of combinations of strategies, as there is no evidence for one single facilitation strategy that ensures positive study outcomes. Rather, the evidence presented is for combinations of strategies. For this reason, the authors of this review have not been able to measure the effectiveness of facilitation strategies used, but have instead focused on the frequency in which each of the most common strategies have appeared among studies with positive results (Table 4), to provide an insight into strategies that most commonly appeared in successful studies. Of the nine most common strategies, goal-setting, assessing progress and outcomes, and providing tools and educational materials, appeared most frequently in studies with positive results. These findings may help facilitators prioritise which strategies to focus on when implementing innovations in healthcare practice.

The duration of an intervention is an important aspect in ensuring the sustainability of the change. The National Health Service (NHS) in the United Kingdom found that 33% of quality improvement projects are not sustained upon evaluation one year after completion (Maher et al., 2010). A longer duration could help embed the change into the organisation and may be a contributing factor to the success of 46% of the studies conducted for 19 months or more.

Other characteristics in studies showing the highest frequency of positive results included; a group-focused facilitation approach, monthly facilitator visits and training provided to the facilitators prior to their placement in practice.

The exception study

It is important to point out one particular exception: one of the 35 studies (Liddy et al., 2015) utilised the majority of the above strategies, yet demonstrated non-significant results. The authors of this study attributed this to the suboptimal intensity of the intervention (where facilitators could not visit the practices as frequently as planned), a broad focus on multiple chronic conditions, and measurement challenges. This is in line with this review's findings, where studies that showed positive results focus on a single disease (Aspy et al., 2008; Cockburn et al., 1992; Eriksson et al., 2013; Modell et al., 1998) or a specific adoption measure (Engels et al., 2006; Lobo et al., 2002; Palter et al., 2016; Pattinson et al., 2005; Stange et al., 2003) rather than multiple measures.

Implications and future research

Researchers have indicated that a facilitator aids innovation implementation by identifying and addressing organisational, behavioural and climatic aspects (Damschroder & Hagedorn, 2011; Klein & Sorra, 1996; Michie et al., 2009). Findings from this review add further detail to this body of knowledge, while providing facilitators with a list of evidence-based strategies that can be utilised in practice. Researchers, implementation teams and organisations can harness this tool for the training of facilitators prior to their placement in a practice. It can also be used to train facilitators and to plan facilitation interventions. These findings pave the way to explore further facilitation strategies targeted at overcoming specific barriers to change and help develop a more evidence-based tool to recommend effective facilitation strategies. This can also set the foundation for an evidence-based change facilitation model that allows for a more efficient and effective process to implement and evaluate change facilitation.

Limitations

Although multiple databases were extensively searched using clear, specific and appropriate terms, the search may not have yielded all published relevant studies. For example, additional articles may be found in "grey literature". Authors of studies may not have reported all the strategies used by their facilitators during the trial, as this was not necessarily the primary focus

of the trial. In the instance where studies did not give enough detail on the facilitation strategies used, the authors were contacted, whilst some did come back with the relevant information, some did not. This is a clear limitation as the list of facilitation strategies could have been more extensive.

The heterogeneity in settings, innovations, strategies and outcome measurements make it difficult to measure the effectiveness of individual strategies. It would be highly beneficial for future research to explore the effectiveness of specific strategies using pre-defined outcome measures.

Conclusion

The identified strategies within this review contribute to further understanding how facilitators are currently implementing innovations in healthcare practice, and provides future facilitators with a list of evidence-based strategies to implement change via innovations. This review also provides researchers, organisations and implementation teams a starting point for planning and evaluating the effectiveness and fidelity of facilitation interventions, while opening a pathway for further research in exploring facilitation strategies used to overcome barriers to implementation.

Abbreviations

PROSPERO: Prospective Register of Systematic Reviews

PARiHS: Promoting Action on Research Implementation in Health Services Framework

EPOC: Effective Practice and Organisation of Care Group

Additional files

Additional File 1: Search strategy by database

Additional File 2: Summary of study characteristics

Additional File 3: Summary of strategies across the 35 studies with references

Figure legend

Figure 1: Flow diagram of study selection

Figure 2: Frequency of facilitator visits

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Table 1. Exclusion criteria and reasoning

Exclusion criteria	Reasoning for exclusion
Articles outside of health care.	The healthcare sector was chosen for this review to limit the scope of the search and determine what facilitators do in similar settings, with relatively similar outcomes.
Articles describing patient-directed innovations	This review looks at the implementation of an innovation at the organisational level.
Studies only conducting web and phone-based facilitation	Research shows that; "In-person communication is the richest medium because it establishes a personal focus and permits multiple information cues and immediate feedback" (Armenakis, Harris, & Mossholder, 1993).
Only one on-site visit by a facilitator	As implementation is a complex process (Damschroder et al., 2009), (K. J. Klein & Sorra, 1996), requiring continuous development, assessment and support for staff, simply visiting a healthcare practice or organisation once to provide a brochure or handbook has not been deemed sufficient for successful implementation (E. K. Proctor et al., 2009).
Papers not describing any facilitation strategies	As the aim of this review is to identify strategies used by facilitators

Table 2. Explanation of term

Term	Explanation	Example
Healthcare practice	The setting in which the study takes place where patients have direct access to staff.	Primary care practice, family practice, hospital, pharmacy.
Innovation	"The intentional introduction and application within a role, group, or organization, of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, or wider society" (West & Farr, 1990). For the purpose of this review, the innovation was introduced by the facilitator to the healthcare practice.	New guidelines, a new way of motivating patients, new technologies.
Intervention	The method used by the research team to implement the innovation into the healthcare practice.	Facilitation.
Facilitator	For the purpose of this review, the authors have considered a facilitator to be a person who facilitates the introduction, planning and implementation of the innovation into the healthcare practice.	Practice facilitator, coach, knowledge broker.

Facilitation	For the purpose of this review, the authors have looked at facilitation as "a technique conducted by facilitators to provide support to help individuals and groups realise what they need to change and how to make changes to implement an innovation into practice" (Dogherty, Harrison, & Graham, 2010).	Facilitation is a techniques used by facilitators to introduce new guidelines to a practice.
Facilitation strategies	Facilitation strategies are conducted by the facilitator to aid a team or individual in the implementation of the innovation within the healthcare practice. These can be tailored to suit the innovation being implemented but can be utilized across many innovations. For the purpose of this review, strategies conducted by facilitators were categorized into; 1) Aim of the strategy (what the facilitator aims to achieve from the strategy) and 2) Tools/ techniques used by the facilitator to achieve the strategy.	Assess practice performance through baseline practice audit using patient chart audits as a technique.

Table 3. Facilitation strategies used for the implementation of innovation in health care*

	Facilitation strategies
1	Provide tools/ educational materials
2	Baseline practice audit via patient chart audits or participant questionnaires/ surveys
3	Provide post-audit feedback to participants
4	Tailor approach according to practice needs
5	Assess progress and outcomes
6	Ask participants to identify barriers
7	Provide staff training
8	Aid in making an improvement plan
9	Utilise goal setting
10	Utilise consensus building
11	Provide ongoing feedback (verbal and written)
12	Identify an internal champion
13	Identify strategies
14	Promote group discussion
15	Participant surveys and questionnaires
16	Plan-Do-Study-Act (PDSA) Cycle
17	Identify priorities
18	Baseline self-evaluation
19	Ask participants to identify existing successes and strengths
20	Promote teamwork and collaboration
21	Tailor resources/ tools
22	Utilise flow-charting/ flow sheets
23	Conduct academic detailing
24	Overcome Information Technology issues including patient reminder systems
25	Ask participants to share ideas
26	Aid in overcoming challenges
27	Evaluate outcomes by assessing participant performance
28	Baseline participant performance evaluation

29	Encourage communication among participants
30	Ensure participant ownership of solutions
31	Promote experience and knowledge sharing
32	Promote sharing of responsibilities
33	Provide access to evidence-based knowledge
34	Evaluate outcomes through patient satisfaction surveys
35	One on one participant interviews and surveys
36	Comparison of practice audit results to network benchmarking
37	Promote critical reflection/ thinking
38	Conduct story-boarding
39	Organise team meetings
40	Utilise role-playing
41	Conduct a demographic analysis
42	Tailor staff roles
43	Conduct a cost-benefit analysis
44	Conduct a Strengths-Weaknesses-Opportunities- Threats (SWOT) analysis
45	Evaluate outcomes through patient telephone interviews
46	Use think aloud process
47	Create an organisational chart
48	Conduct brainstorming
49	Utilise skills practice
50	Model effective team meetings
51	Promote professional development

* Strategies ordered according to the frequency in which they appear across 35 Randomised Controlled Trials)

Table 4. The percentage of studies with positive outcomes in which the common strategies were mentioned

Strategy	Number of studies in which this strategy is mentioned	Percentage of studies with positive outcomes in which this strategy is mentioned
Utilise goal setting	17	47%
Assess progress and outcomes	20	45%
Provide tools/ educational material	25	40%
Conduct baseline practice audit	23	39%
Provide post-audit feedback	23	39%
Provide staff training	19	37%
Aid in making an improvement plan	18	33%
Tailor approach according to practice needs	23	30%
Ask participants to identify barriers	19	26%

Table 5. Combinations of strategies used across studies that showed positive and non-significant results

		Conduct baseline practice audit	Provide post audit feedback	Ask participants to identify barriers	Utilise goal setting	Tailor approach according to needs	Provide staff training	Provide tools / educational material	Aid in making improvement plan	Evaluate progress & outcomes
Studies with significant positive results (n=12)	(Aspy et al., 2008)	Y	Y		Y	Y	Y	Y	Y	
	(Cockburn et al., 1992)			Y		Y		Y		Y
	(Engels et al., 2006)	Y	Y	Y	Y	Y		Y	Y	Y
	(Eriksson et al., 2013)	Y	Y	Y					Y	Y
	(Lemelin et al., 2001)	Y	Y		Y	Y	Y	Y	Y	Y
	(Lobo et al., 2002)	Y	Y		Y	Y	Y	Y		Y
	(Margolis et al., 2004)	Y	Y		Y	Y	Y	Y	Y	Y
	(Modell et al., 1998)	Y	Y				Y	Y		
	(Mold et al., 2014)	Y	Y		Y			Y		Y
	(Palter et al., 2016)				Y				Y	Y
	(Pattinson et al., 2005)			Y		Y		Y		Y
	(Stange et al., 2003)	Y	Y	Y	Y	Y	Y	Y		
Studies with non-significant results (n=3)	(Liddy et al., 2015)	Y	Y		Y			Y	Y	Y
	(Shaw et al., 2013)			Y		Y				
	(van Beurden et al., 2012)			Y		Y	Y			

Y- Indicates that the strategy was used in the study.

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Chapter 3: Linking implementation barriers with facilitation strategies

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Data-driven approach for tailoring facilitation strategies to overcome implementation barriers in community pharmacy

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Abstract

Background: Implementation research has delved into barriers to implementing change and interventions for the implementation of innovation in practice. There remains a gap, however, that fails to connect implementation barriers to the most effective strategies and provide more tailored interventions during implementation. This study aimed to link implementation barriers to facilitation strategies during a study in community pharmacy and use a data-driven approach to predict the level of effectiveness of facilitation strategies to overcome these barriers.

Methods: Six Change facilitators facilitated a two-year change program aimed at implementing professional services across 19 community pharmacies across Australia. A mixed method approach was used where barriers were identified and coded according to implementation factors from the Consolidated Framework of Implementation Research, the Theoretical Domains Framework and the Integrated Checklist of Determinants of practice. Change facilitators trialled and recorded different facilitation strategies to overcome these barriers, until the barrier was resolved. To predict the effectiveness of these strategies a data mining approach named Random Forest was used to provide the highest level of accuracy.

Results: At the end of the program, 1,131 data points were recorded by change facilitators.

Upon analysis, 36 barriers were identified. The most frequently identified barrier was a 'lack of ability to plan for change' (n=184). A list of 111 change facilitation strategies were extracted from the data. These were coded into 16 facilitation categories according to the Taxonomy of Facilitation Strategies. The most effective strategy category to overcome an 'inability to plan for change' was to 'engage stakeholders by creating ownership' which had a Predictive Resolution Percentage of 84%.

Conclusions: Results from this study have provided a better understanding of implementation barriers in community pharmacy and a data-driven approach to predict the effectiveness of facilitation strategies to overcome these barriers. Tailored facilitation strategies may increase the rate of implementation of innovations in healthcare, leading to an industry that can confidently adapt to continuous change.

Keywords: Change facilitation, implementation factors, determinants, tailored interventions, facilitation strategies, pharmacy practice, change management, organisational change, machine learning, random forest.

Contribution to the literature

This paper contributes to the literature through:

- The use of innovative data-driven approaches to provide predictions of effective change facilitation strategies to be used during implementation of innovations.
- The link between barriers experienced during implementation, and effective change facilitation strategies to provide more effective tailored interventions during

implementation.

- The identification of ‘real-world’ barriers experienced in community pharmacy during implementation.
- Awareness and future use of an approach to understand and overcome implementation barriers for implementation projects throughout healthcare.

Background

Governments and health care practitioners share common goals to improve patients' clinical outcomes, quality of life and the rationale use of medicines [1]. To achieve such a goal, there has been an increasing international trend toward the delivery of professional services, in community pharmacy [2],[3]. A professional pharmacy service can be defined as:

> “An action or set of actions undertaken in or organised by a pharmacy, delivered by a pharmacist or other health practitioner, who applies their specialised health knowledge personally or via an intermediary, with a patient/client, population or other health professional, to optimise the process of care, with the aim to improve health outcomes and the value of healthcare.” [4]

Professional services conducted in community pharmacy vary significantly in their objectives and complexity. These services can include, the provision of drug information, provision of ‘pharmacist only’ or ‘pharmacy medicine’, clinical interventions, screening services, medication management services, preventive care services for patients with chronic conditions, participating in therapeutic decisions amongst others [5]. At an international level, community

pharmacies are slowly implementing these services into their routine practice; however, professional organisations, researchers and practitioners have recognised the need for external support during the implementation of such innovations in community pharmacy [6].

Pharmacy researchers have applied different implementation frameworks including the Promoting Action on Research Implementation in Health Services (PARiHS) framework. This framework presents successful implementation research as a function of the relationship between evidence, context, and facilitation [7]. Of the three, 'facilitation' has been proposed as a key role which not only affects the context in which change is taking place, but also aids participants in making sense of the evidence being implemented [8]. Utilising a 'change facilitator' (CF) has become a key component in supporting teams during the implementation of change in practice [8]. A CF can provide support to stakeholders to "realise what they need to change and how to make changes to incorporate [professional service] evidence into practice" [9]. A stakeholder refers to "any group or individual who can affect or is affected by the achievement of the organization's objectives" [10]

Roberts et al reported that pharmacists indicated implementation enablers such as 'external support/ assistance' as a critical requirement in the process of change [6]. Similarly, when adopting and implementing health literacy tools in pharmacy, researchers indicated that if pharmacists had the right external support, there could be important progress towards achieving their implementation goals [11].

For CFs to implement innovation such as professional pharmacy services, they will face a number of challenges when working with healthcare professionals 'as they each work in specific

social, organisational and structural settings involving factors at different levels that may support or impede change' [12]. Factors pertaining to a specific context can enable or inhibit successful implementation of innovation. Implementation researchers have extensively explored such factors and have referred to them as; 'constructs' [13], 'determinants of practice' [14, 15], barriers [16], enablers [17], facilitators [16], problems and needs, or disincentives and incentives [18], and "implementation factors" [19]. Throughout this paper, these factors will be referred to as implementation factors as it has a neutral connotation, and the name reflects the objective to be achieved i.e. implementing an innovation [19].

Implementation factors can act as barriers or enablers to implementation. For example, a factor from the CFIR [20] is 'knowledge and understanding of the innovation being implemented'. A lack of knowledge and experience would act as a barrier, while having knowledge and experience would act as a change enabler. Understanding when these implementation factors act as barriers, helps CF's determine more effective strategies to tackle these obstacles [21].

In addition to identifying the barriers to implementation, the CF needs to determine the appropriate strategies to overcome these barriers. Linking barriers with strategies is a concept that has recently been explored [22]. Researchers have previously highlighted that 'no single strategy appears to be sufficient to drive successful implementation' [15, 23, 24]. As each pharmacy team will experience different barriers, the strategies to overcome such barriers may also differ. This can lead to a time-consuming and often disheartening 'trial and error' approach, until the correct strategy is identified, and the barrier is overcome.

This ‘trial and error’ approach also relies on the CF’s experience and knowledge, and whilst change facilitation research has delved into describing the roles and traits of CFs [25–27], there remains a high degree of variability in facilitation delivery ‘due to the facilitators’ professional backgrounds, role setup and activities’ [28].

The majority of randomised controlled trials involving facilitation interventions, focus on the evaluation of patient outcomes or implementation outcomes [29]. This type of evaluation does not take into account the effectiveness of the facilitation process, or the effectiveness of specificfacilitation strategies used by CFs during implementation. The need for such information is crucial as 5-30% of trials of behavioural change are described in adequate detail [30], making it difficult to discern which components are essential during implementation. The lack of appropriate evaluation has been highlighted in pharmacy research, where evaluations are required for all aspects of implementation including “assessment of strategies and/or implementation program and overall measures to generate a level of implementation (implementation outcomes)” [1]. Determining the effectiveness of facilitation strategies, in specific contexts such as community pharmacy, will shed light into the essential activities required during the facilitation intervention, reduce the ‘trial and error’ approach that many CFs take, and ensure the delivery of tailored, evidence-based strategies in practice.

In 2012–13, as part of its commitment to building capability in pharmacy and positioning the profession for the future, the Pharmaceutical Society of Australia (PSA) conducted a trial to test the feasibility of a changed model of community pharmacy, in which the pharmacist is repositioned as a primary healthcare provider and the pharmacy as a healthcare destination

[31]. Following this trial, the PSA created a commercial program underpinned by the trial, called 'Health Destination Pharmacy' Program.

This study aimed to explore the implementation barriers stopping pharmacy teams from successful implementation of the Health Destination Pharmacy program and identify the most effective change facilitation strategies to overcome these barriers.

Methods

A mixed-method approach was used which included a qualitative analysis of the barriers and strategies used by CFs during a pharmacy change program and a quantitative analysis of the effectiveness (based on Predictive Resolution Percentage) of the strategies used.

A commercial pharmacy change program named 'Health Destination Pharmacy' was offered to community pharmacies in Australia from 2016 to 2018. The primary objective of the program was to reposition the pharmacist as a primary healthcare provider and the pharmacy as a healthcare destination [31]. This was to be done through a number of interventions, primarily through the increased provision of professional pharmacy services. The program included a CF supporting the pharmacy teams who signed up and paid for the program. The CF visited the pharmacy every three months for a two-year period and used change facilitation strategies to determine and overcome implementation barriers. To determine whether the strategies were successful, the CFs would indicate whether the barrier was overcome (resolved) or not overcome (unresolved).

Change facilitator experience and training

All CFs were registered pharmacists with experience in community pharmacy, to ensure that they could relate to the pharmacists and teams whom they were supporting during implementation. Since CFs had varying levels of facilitation and/or coaching expertise they were provided training prior to their allocation into the pharmacies. Training included;

- Previous pharmacy implementation research [32].
- The use of the Generic Implementation Framework (GIF) [1] to underpin the implementation process.
- Implementation barriers highlighted in the literature and existing frameworks such as CFIR [13], TDF [33], and TICD [34].
- Coaching models including the GROW model [35].
- The use of a data collection Microsoft Excel Spreadsheet.

Data collection and coding

CFs were asked to identify and record a) the implementation factors that acted as barriers, b) the facilitation strategies they used to overcome these barriers, c) at which visit they conducted the strategy, and whether the barrier was d) resolved or unresolved. If the barrier was unresolved by the next facilitator visit to the pharmacy, the CF's would use a different strategy or combination of strategies to overcome the particular barrier. This data was documented and sent after each visit to the research project manager.

The research project manager ensured consistency in the coding of the implementation barriers

according to implementation factors from the CFIR [13], TICD [34] and TDF [33] (Additional file 1). Facilitation strategies were categorised and coded according to the taxonomy of facilitation strategies [9] (Additional file 2).

Data analysis using the Data Mining Approach Random Forest

After testing several approaches to provide predictive data (see Additional file 3), Random Forest (RF) - a supervised classification method for predicting appropriate strategies for all barriers was used. Supervised classification uses historical data to train a machine learning model to predict future outcomes. All examples in the dataset were labelled with an outcome: "strategy works" (resolved) or "strategy does not work" (unresolved).

RF classification algorithm was chosen, due to its popularity in industry, explainability and accuracy, and its enhanced resistance to overfitting than the standard decision tree models (i.e., not generalising well to new instances). For example, Khalilia et al. [36] used RF to predict disease risk of individuals by analysing their medical diagnosis.

RF combines great numbers of decision trees trained randomly and equally from the dataset. To evaluate the classifier, 10-fold cross-validation [37] technique was adopted, where data was randomly split into ten groups (folds). For each group, we take this given group as a test dataset and the remaining nine groups as a training set. Then, we fit a model on a training dataset and evaluate it on the test set. We keep the evaluation score and discard the model. We repeat that procedure ten times. To get a performance of a model, we take the average of all ten evaluation scores. Note that although RF includes out-of-bag performance metrics which may

be seen as replacements for cross-validation, we used cross-validation as it makes sure that all samples will occur in training and testing sets.

Reporting of the most common implementation barriers and strategies

Pareto's principle states that, for many events, roughly 80% of the effects come from 20% of the causes, this principle has been proven effective in organisational decision making [38]. For this reason, the results focus on the top 20% of barriers, according to the frequency in which they appeared in the data.

Results

The nineteen pharmacies that participated in the change program were located across Australia and ranged in the number of prescriptions dispensed per year from a minimum of 23,954 to a maximum of 223,269 with an average of 93,239 prescriptions dispensed per year. The number of employees in pharmacies ranged from a minimum of two to a maximum of 46 staff members. Six CFs were allocated to the 19 pharmacies based on geographical location of the CF in accordance to the pharmacy.

1,131 data points were recorded on a Microsoft Excel spreadsheet by the CFs. Each data point indicated a) the factor that acted as barriers, b) the change strategy they had implemented to overcome this barrier c) at which visit they conducted the strategy and whether the barrier was d) resolved or unresolved. Upon analysis of the data points, 36 implementation barriers (additional file 1) and 111 change facilitation strategies were identified. The 111 facilitation strategies were coded and categorised according to the taxonomy of facilitation strategies [9]

(Additional file 2).

The Random Forest algorithm used was able to provide 96.9% accuracy into the most effective strategies to overcome specific barriers to change. Results of the algorithm rank the facilitation of strategies in order of effectiveness, with the most effective strategies having the highest Predictive Resolution Percentage (PRP).

Table 1 showcases the strategies used to overcome the seven most common implementation barriers highlighted by CFs across the 2-year study.

'**An inability to plan for change'** was the most commonly identified barrier. It was identified 184 times across 16 of the 19 pharmacies. This implementation factor is described by the TICD checklist as 'the extent to which the targeted healthcare professionals are able to plan necessary changes in order to adhere'. To overcome this barrier, the CFs used strategies to; 1. Engage stakeholders by creating ownership of the change, which had a predictive resolution percentage (PRP) of 84.23% 2. Equip stakeholders with training (PRP=83.30%) 3. Adapt area of focus to meet change needs (PRP=81.17%), and 4. Empower stakeholders to develop objectives and solve problems (PRP=80.64%).

'A lack of internal supporters to change' also known as internal change resistance was identified as a barrier 128 times in 18 of the 19 pharmacies. The TICD checklist describes this barrier as a lack of 'support provided by the staff members for the implementation of the change'. To overcome this barrier, the CFs used strategies to; 1. Engage stakeholders by creating ownership of the change (PRP= 78.29%) 2. Empower stakeholders to develop

objectives and solve problems (PRP=73.44%) 3. Create buy-in of the change among stakeholders (PRP=57.90%).

'A lack of knowledge and experience' was identified as a barrier 84 times across 18 of the 19 pharmacies. The TDF describes this implementation factor as 'the extent to which the targeted individuals have skills, knowledge and experience that they need to adhere'. When this implementation factor became a barrier i.e. a lack of knowledge and experience, the CFs used strategies to; 1. Create a collaborative environment conducive to change (PRP= 99.80%) 2. Equip stakeholders with training (PRP=93.44%).

'A lack of monitoring and feedback' was identified as a barrier 61 times across 14 of the 19 pharmacies. The TICD checklist explains this as 'the extent to which monitoring, and feedback are needed at an organisational level and available to sustain necessary changes'. When a lack of monitoring and feedback was identified by the CFs as a barrier, they used strategies to; 1. Feedback progress of implementation measures (PRP= 99.12%) 2. Ensure continuous monitoring of implementation measures (PRP= 68.09%).

'A lack of individual alignment with the change' was identified as a barrier 49 times across 14 out of the 19 pharmacies. The CFIR defines this as 'the degree of tangible fit between meaning and values attached to the change by involved individuals' own norms, values, perceived risks and needs.' When there was a lack of individual alignment with the change, the CFs used strategies to 1. Ensure stakeholders contribute to the change (PRP=98.79%) 2. Empower stakeholders to develop objectives and solve problems (PRP= 83.13%) 3. Create a case for change (PRP=82.86%) 4. Engage stakeholders by creating ownership of the change (PRP=

49.38%)

‘Undefined change objectives and lack of objective feedback’ was identified as a barrier 46 times across 16 of the 19 pharmacies. The TICD checklist explains this as ‘the degree to which implementation objectives have been defined, communicated and achieved by the members of the team’. To overcome this barrier, CFs used strategies to 1. ‘Engage stakeholders by creating ownership of the change’ (PRP= 82.33%) 2. ‘Empower stakeholders to develop objectives and solve problems’ (PRP= 80.55%), and 3. ‘Communicate the change to stakeholders’ (PRP=62.83%)

‘**A lack of time’** was identified as a barrier 43 times in 15 out of the 19 pharmacies. To overcome this barrier, CFs used strategies to 1. ‘Adapt area of focus to change requirements' (PRP=79.09%) 2. ‘Empower stakeholders to develop objectives and solve problems’ (PRP=62.25%).

While table 1 showcases the most common barriers (n=7) identified and the facilitation categories (n=10) used to overcome these barriers, table 2 breaks down the most effective categories (n=10) to showcase the specific strategies within each of the categories and the barriers which these categories overcame.

The facilitation category that was used to resolve the most barriers was ‘empower stakeholders to develop objectives and solve problems’. This category was used to overcome six barriers including: ‘an inability to plan for change’, a ‘lack of internal supporters for the change’, a ‘lack of individual alignment to the change’, ‘Undefined change objectives’, a ‘lack of

objective feedback' and a 'lack of time'.

Discussion

This study has shown Change Facilitation, not only as an intervention to aid in the implementation of innovation in practice, but as a way to unearth implementation barriers and determine the most effective facilitation strategies to overcome such barriers within a specific industry such as community pharmacy.

When surveyed or questioned regarding barriers to implementation, healthcare professionals may not provide an accurate representation of the true barriers in practice, but a perception or assumption of the barrier [39]. Having an external, objective third party, such as a CF, can more efficiently unearth real barriers and provide deeper insights into the reactions of teams during change implementation. An example of this, is that the challenges often posed by pharmacy teams when asked to implement innovations such as professional services is a 'lack of time'[39–41]. Whilst a 'lack of time' was raised as a barrier 43 times across the 19 pharmacies over the two-year program, however, in this study, this was not the most common barrier as recorded by CFs.

As identified in this study, the most frequently occurring barrier was the 'inability to plan for change', appearing in 16 out of the 19 pharmacies. The consistency of this barrier in pharmacies across Australia alludes to an overarching inability for pharmacists to adapt to change. Such a challenge has previously been highlighted with an emphasis for pharmacy education to address this barrier to implementation and build pharmacy students' ability to

adapt to change [42]. The ability to plan for change allows pharmacy teams to become more adaptable, which is a major factor in ensuring the sustainability of innovation such as professional services in community pharmacy [43]. For pharmacists in practice, this can be addressed by governing pharmacy bodies and by pharmacy owners equipping their teams with the right capabilities to plan for change and become more adaptable, this is crucial because for 'pharmacy practice is to survive as an active participant in emerging healthcare systems, pharmacy practice must change along with the rest of health care' [44].

It is important to note that the most effective change facilitation categories used to overcome the 'inability to plan for change' included helping teams 'engage stakeholders by creating ownership of the change', 'equipping stakeholders with training', helping teams 'adapt area of focus to meet change needs', and 'empowering stakeholders to develop objectives and solve problems'. Strategies in these categories included 'stimulating critical inquiry', 'utilising brainstorming techniques', 'utilising goal-setting', 'using consensus-building', 'shared decision making' and 'ensuring mutually beneficial solutions'. In addition, when looking at the facilitation category that resolved the most barriers, this was 'empower stakeholders to develop objectives and solve problems'- another category aimed at empowering teams to solve their own challenges and build their own plan for change.

A growing body of professional literature and academic research highlights that performance can be enhanced when actions are taken that result in empowering individuals [45, 46]. Empowering employees can encourage risk taking, innovation, and initiative [47]. High levels of empowerment are also more likely to promote individual team members' motivational states

even when there are minor relationship conflicts within the team [48]. Such knowledge can be used to educate pharmacy students, pharmacists and pharmacy owners to empower their teams during the implementation of innovations such as professional services.

When reporting on strategies used by CF's, it is important to recognise that CFs used a combination of strategies and that, even though some strategies were more effective than others, they were still used in combination with others. For example, to overcome 'the inability to plan for change', the most effective strategy predicted to resolve the barrier was to 'engage stakeholders by creating ownership of the change' which had a PRP of 84%, this, however, was closely followed with the strategy 'equipping with training' which had a PRP of 83% and closely after that was 'adapt area of focus to meet change needs' which had a PRP of 81%. CFs used all these strategies in combination in order to successfully overcome the 'inability to plan for change'. CFs must not isolate a change strategy and expect it to work by itself.

The challenge of evaluating facilitation strategies has previously been highlighted [30], with evaluation predominantly focusing on implementation or patient outcomes [29]. There is minimal focus on the granular strategies used by CFs during implementation of innovation and the link between barriers and strategies [22]. By providing CFs with a framework to record their change activities including the barriers they unearth and the specific strategies they use, data analytics can be used to enable the prediction of the most effective strategies, which can be extrapolated and proactively used during subsequent implementation studies. Such an approach, therefore, reduces the time spent trialling different strategies, resulting in a possible overall reduction of implementation timeframe.

Future application of this research

The data-driven approach, tailored facilitation approach used during this study can be applied to understanding common barriers to implementing innovation and the most effective change facilitation strategies to overcome these barriers in other industries outside of pharmacy.

Researchers in pharmacy practice need to further validate this tailored approach to ensure that implementation barriers uncovered during this study are consistent across community pharmacy and the effectiveness of the facilitation strategies is also consistent when implementing different innovations in community pharmacy.

Findings from this research can provide CFs with more evidence-based strategies to use during the implementation of innovations in community pharmacy and other healthcare industries.

Limitations

For increased predictive accuracy, data mining techniques require much larger data points. The decision tree approach was determined as providing the best accuracy given the limited number of data points collected by the end of the two-year program.

As only 19 pharmacies were involved in the change program, the degree of implementation of services in the participating pharmacies is not necessarily a true representation of the pharmacy industry. One can argue that such teams showed a distinct level of innovation and early adoption that may not be a true reflection of the pharmacy industry. Future research in this area may benefit from highlighting the impact of financial investment.

Limitations also apply to how the collected data was interpreted and coded by the research project manager, which is an inherent limitation to qualitative research. Limitations include research quality that is heavily dependent on the individual skills of the researcher and more easily influenced by the researcher's personal biases and idiosyncrasies [49]. A STROBE cohort study checklist can be found in additional file 4.

Conclusion

Results from the current study have provided a better understanding of implementation barriers in community pharmacy with the predominant barriers identified during this study, being an inability to plan for change, lack of internal supporters of the change and a lack of knowledge and experience regarding the change. The predicted effective strategies include those that aim to empower pharmacy teams to develop objectives and solve problems, engage teams by creating ownership, and equipping teams with training. This connection between implementation barriers and effective facilitation strategies unearthed by objective change facilitators will lead to more efficient and effective change implementation not only in community pharmacy, but other industries that need to adapt to change.

Additional files

Additional file 1: The 36 implementation barriers recorded by CFs, their frequency and definitions.

Additional file 2: The change facilitation strategies conducted by CFs, grouped into the 16 categories.

Additional file 3: The data analysis report by the Advanced Analytics Team at the University of Technology Sydney.

Additional file 4: STROBE Cohort study checklist

List of Abbreviations

CF: Change Facilitator

PARiHS: Promoting Action on Research Implementation in Health Services

TDF: Theoretical Domains Framework

CFIR: Consolidated Framework of Implementation Research

TICD: The Integrated Checklist of Determinants of practice

PSA: Pharmaceutical Society of Australia

PRP: Predictive Resolution Percentage

RF: Random Forest

Declarations

Ethics approval and consent to participate

The data collected through this commercial program is not an indication of the effectiveness of the program, but is intended to shed light into the activities conducted by CFs in practice.

Therefore, no conflict of interest is reported for this research. All participants of the program have been de-identified and have agreed for data to be collected and analysed for research purposes. No ethics approval was required as part of this research as this was a commercial program, which participants signed contracts for which included approval for the collection of de-identified data for research purposes. As the contracts include details of the participants and costs of the program, which is confidential information, we cannot add these as additional files.

Consent for publication

Not applicable

Availability of data and materials

The data that support the findings of this study are available from the corresponding author, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Pharmaceutical Society of Australia.

Competing interests

The authors declare that they have no competing interests

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contribute to the design, collection, analysis, interpretation or writing of this paper.

Authors' contributions

LM, VG, and SIB conceived and designed the analysis, LM collected the data from Change Facilitators throughout the two-year study. LM categorised the facilitation strategies. KM and SK performed the analysis of the data using statistical analysis and a data-driven approach called random forest. LM wrote the paper, while KM and SM contributed to the data-analysis of the method section. VG and SIB contributed to editing of the paper and provided final approval for the paper to be submitted.

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Tables

Table 1. Facilitation categories used to overcome common implementation barriers in community pharmacy

Most common barriers to implementing professional services in community pharmacy^	Strategy categories* used by Change Facilitators to overcome implementation barriers	The Predictive Resolution Percentage of the strategy category resolving the barrier (PRP)[a]
An inability to plan for change (n=184)	Engage stakeholders by creating ownership of the change	84%
	Equip stakeholders with training	83%
	Adapt area of focus to meet change needs	81%
A lack of internal supporters of the change (n=128)	Engage stakeholders by creating ownership of the change	78%
	Empower stakeholders to develop objectives and solve problems	73%
	Create buy-in of the change among stakeholders	58%
A lack of knowledge and experience related to the change (n=84)	Create a collaborative environment conducive of change	99%
	Equip stakeholders with training	93%
A lack of monitoring and feedback of the change (n=61)	Feedback implementation progress	99%
	Ensure continuous monitoring of implementation measures	68%

A lack of individual alignment with the change (n=49)	Encourage participation & facilitate discussions among stakeholders	99%
	Empower stakeholders to develop objectives and solve problems	83%
	Create buy-in of the change among stakeholders	83%
Undefined change objectives and lack of objective feedback (n=46)	Engage stakeholders by creating ownership of the change	82%
	Empower stakeholders to develop objectives and solve problems	81%
	Communicate the change to stakeholders	63%
A lack of time (n=43)	Adapt area of focus to meet change needs	79%
	Empower stakeholders to develop objectives and solve problems	62%

^ A total of 1131 barriers were identified across the 19 pharmacies throughout the two- year period.

* The strategy categories are adapted from the taxonomy of facilitation strategies by Dogherty et al., 2010.

[+]111 facilitation strategies were coded into 16 facilitation categories; the strategies within each of the above-mentioned categories can be found in table 2.

[a] Predictive Resolution Percentage is based on a data-driven approach named decision forest which used data collected by Change Facilitators indicating whether each strategy resolved the barrier or not.

Table 2. Facilitation strategies used by change facilitators to overcome common implementation barriers in community pharmacy.

Strategy category to overcome barrier*	Facilitation strategies within category	Most common barriers overcome using this strategy category (PRP) [a]
Empower stakeholders to develop objectives and solve problems	● Stimulate critical inquiry/ critical reflection ● Utilise think-aloud process ● Utilise brainstorming techniques ● Outlining opportunities presented by change ● Conduct a needs analysis ● Conduct a Strength, Weaknesses, Opportunities and Threats (SWOT) analysis ● Use prioritisation techniques ● Introduce goal setting (SMART goals) ● Use consensus-building/ Shared decision making ● Providing solutions/advice ● Create/ recommend the creation of a monthly or annual plan ● Ensure win/win goals (mutually beneficial solutions) ● Use an action planner tool ● Use a mind-mapping tool ● Discuss/ outline best practices	● An inability to plan for change (80.64%) ● A lack of internal supporters of the change (73.44%) ● A lack of individual alignment with the change (83.13%) ● Undefined change objectives and lack of objective feedback (80.55%) ● A lack of time (62.25%)
Engage stakeholders by creating ownership of the change	● Establish/ allocate roles ● Delegate responsibilities ● Allocate primary champion and/or supporting champions ● Define key performance indicators ● Ask for commitment to the agreed changes ● Encourage collaboration and teamwork ● Recommend or aid in conducting a performance review ● Allocate roles based on skills/ interests ● Emphasise the importance of delegating	● An inability to plan for change (84.23%) ● A lack of internal supporters of the change (78.29%) ● A lack of individual alignment with the change (49.38%)
Equip stakeholders with training	● Provide/ recommend skills/technical training ● Provide knowledge training ● Conduct/ recommend role-playing/ role modelling ● Bringing subject matter expert ● Refer to external formal education/ training ● Using case studies ● Use a staff scoping and training tool ● Encourage discussion of training topic as a group ● Create/ adapt training plan ● Determine training gaps ● Encourage self-learning (e.g reading of journals etc)	● A lack of knowledge and experience related to the change (93.44%) ● An inability to plan for change (83.30%)

Adapt area of focus to meet change needs	● Adapt task allocations by creating a roster to align with change ● Improve workflow by adapting layout to cater for change ● Adapt vision/ mission to align for change ● Review roles to align with change requirements ● Create timetabling (annual, monthly or weekly timetables) ● Adapt business strategy plan to the change ● Adapt image of organisation towards new changes ● Create/ adapt communication plan to new changes ● Adapt process/ procedures to new changes ● Encourage regular communication among participants to ensure everyone is aligned to new changes	● An inability to plan for change (81.17%) ● A lack of time (79.09%)
Create buy-in among stakeholders	● Ask about individual concerns regarding the change ● Address specific individual concerns related to the change ● Motivate group/individuals using stories ● Compare audit results to network benchmarking results ● Emphasise enhanced customer outcomes as opposed to poor practice ● Outline negative impacts to lack of implementation (using evidence / opinion) ● Outline benefits of implementation (using evidence / opinion)	● A lack of individual alignment with the change (82.86%) ● A lack of internal supporters of the change (57.90%)
Create a collaborative environment conducive to change	● Organise or conduct meetings (face-to-face) ● Lead virtual meeting (coach present digitally e.g. webinar or skype)	● A lack of knowledge and experience related to the change (99.80%)
Feedback progress of implementation measures	● Provide constructive feedback ● Acknowledge success/ recognise /celebrate achievements ● Provide ongoing encouragement	● A lack of monitoring and feedback regarding the change (99.12%)
Ensure stakeholders contribute to the change	● Acknowledge ideas ● Encourage knowledge/ experience sharing ● Involve others in the change process ● Acknowledge importance of individuals' roles	● A lack of individual alignment with the change (98.79%)

Ensure continuous monitoring of implementation measures	● Monitor financial impact ● Measure and monitor customer outcomes ● Monitor service provision ● Monitor Staff measures ● Emphasise ongoing monitoring by stakeholders ● Monitor agreed upon plan/ objectives ● Display progress chart	● A lack of monitoring and feedback of the change (68.09%)
Communicate the change to stakeholders	● Inform entire group of the change and objectives verbally ● Inform individuals of the change and objectives verbally ● Inform using a visual display such as poster ● Inform using a written document (email, letter etc).	● Undefined change objectives and lack of objective feedback (62.83%)

* The strategy categories are adapted from the taxonomy of facilitation strategies (Dogherty et al., 2010)

[a] PRP is the Predictive Resolution Percentage is based on a data analytics approach named random forest which uses data collected by Change Facilitators indicating whether the extent which the strategy is predicted to resolve the barrier.

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Chapter 4: Evaluation of tailored change facilitation interventions

Evaluation of tailored change facilitation interventions used during the implementation of a Minor Ailments Service in community pharmacy

Lydia Moussa, Shalom Benrimoj, Sarah Dineen-Griffin, Victoria Garcia-Cardenas

Abstract

Background

Change facilitators (CFs) are tasked with the implementation of complex innovations. Whilst facilitators may have the relevant training, there remains a high degree of autonomy in regard to the approach and specific strategies conducted by CFs during implementation. This often leads to additional time and resources wasted trailing various strategies and can lead to variability in outcomes from one CF to another. Healthcare industries such as community pharmacy have used CFs for the implementation of innovations such as professional pharmacy services in practice.

The aim of this study is to evaluate the effectiveness of a tailored change facilitation approach and to determine the most effective facilitation strategies to address implementation barriers during the implementation of a Minor Ailments Service (MAS) in community pharmacy.

Method

During a cluster randomised controlled trial to evaluate the clinical, humanistic and economic impact of a pharmacist-delivered Minor Ailments Service (MAS) in community pharmacy, an effectiveness-implementation hybrid study was also conducted. Community pharmacists in Australia participated in the study. The implementation evaluation focused on the change

facilitation intervention, where CFs visited pharmacies allocated to the intervention group to provide 1 hour face-to-face monthly visits consisting of support and on-site training. CFs were trained on, and used, a specific change facilitation approach underpinned by implementation evidence. The approach allowed CFs to explore implementation barriers specific to community pharmacy, use evidence-based facilitation strategies, and evaluate their strategies according to predefined effectiveness and implementation outcomes. Effectiveness outcomes related to data quality (appropriate recording), reach (patients recruited onto MAS), and service fidelity (appropriate recommendation). Implementation outcomes related to the effectiveness of the facilitation intervention in overcoming the identified implementation barriers. Barriers were numerically coded, according to a previous implementation study in community pharmacy. The CF strategies were categorised into 4 primary phases, 16 secondary categories, and 111 tertiary facilitation strategies. Evaluation of effectiveness was conducted on the 16 secondary categories, which involved isolating each category and determining the percentage at which each strategy resolved the implementation barrier, which gave each strategy a Resolution Percentage (RP) for each implementation barrier.

Results

CFs visited the 15 intervention pharmacies (delivering MAS) every month for eight months. CFs recorded 398 tailored interventions, each tailored intervention recorded included the effectiveness measure, the visit number, implementation barrier identified, the strategy used, and whether the barrier was resolved or unresolved. Longitudinal analysis of the tailored interventions demonstrated that 67% of the 398 tailored interventions were identified in the first 2 CF visits, of these, 75% of the implementation barriers were resolved in the same two

visits. Following analysis of the 398 tailored interventions, 22 implementation barriers were isolated. The 20% most frequently occurring barriers were: (1) a lack of prioritisation of the service (n=61); (2) a lack of internal supporters for the change (n=60); (3) Team processes not conducive to change (n=46), and; (4) a lack of knowledge and experience regarding the change (n=41). To overcome 'a lack of prioritisation of the service', the most effective facilitation strategy used was to 'communicate the change to stakeholders', which had an RP of 67%. To overcome 'a lack of internal supporters for the change', the most effective change facilitation strategy used was to 'Create buy-in among stakeholders' with an RP of 73%. To overcome 'team processes not conducive to change', the most effective change facilitation strategy used was to 'perform audits', with an RP of 100%. To overcome 'a lack of knowledge and experience regarding the change', the most effective change facilitation strategy used was 'to empower stakeholders to develop objectives and solve problems' with an RP of 100%.

Conclusion

Equipping CFs with a change facilitation approach allowed them to unearth and overcome the majority of implementation barriers in the first two visits. A tailored facilitation approach, therefore, allows for more efficient identification and resolution of implementation barriers and adoption of the innovation by stakeholders. Future research should look at the creation of a change facilitation framework to allow for wider application of this change facilitation approach.

Keywords: Implementation barriers, minor ailments service, community pharmacy, change facilitation, change facilitators, facilitation strategies, tailored interventions, determinants, change management, change facilitation in healthcare.

Background

The implementation of innovation in practice is complex and multifaceted [1, 2]. Frameworks such as the Promoting Action on Research in Health Services present successful implementation research as a function of the relationship between evidence, context and facilitation [3]. Of the three, 'facilitation' has been proposed as a key role which not only affects the context in which change is taking place, but also aids participants in making sense of the evidence being implemented [4]. A Change Facilitator (CF) can provide 'support to help individuals and groups realise what they need to change and how to make changes to incorporate evidence into practice' [5]. The use of CFs has been explored in a number of systematic reviews [6, 7] and has been used in a variety of different healthcare setting including nursing [8], general practice [9], ambulatory care [10], in the hospital setting [11], and has recently been explored in community pharmacy for the implementation of Professional Pharmacy Services [12]

An innovative Professional Pharmacy Service that has been explored internationally is a Minor Ailments Service (MAS). This has been implemented in the UK [13], and Canada [14] showing positive clinical outcomes [14–16]. The contextual application to the Australian Healthcare system, however, requires local data to ensure transferability [17]. While pharmacists providing self-care advice for minor ailments and referral is a well-established activity in Australian community pharmacy [18], there is no standardised approach to assessment and triage, no agreed protocols with general practitioners (GPs) for evidence-based management, no agreed referral pathways to appropriately refer patients to general practice or emergency department settings, no mechanisms to monitor or record patient interactions and no follow-up processes

in place [19]. A cluster Randomised Controlled Trial was therefore conducted in Australia to evaluate the clinical and humanistic outcomes of a MAS in Australia [17].

Previous research in community pharmacy indicated that pharmacists require external assistance during the implementation of professional services [20]. For this reason, CFs were deployed during the implementation of MAS to provide support and on-site training to pharmacy teams [17].

Pharmacy practice researchers have developed the Framework for the Implementation of Pharmacy Services (FISpH) [21]. The FISpH has been used in previous pharmacy implementation hybrid studies [22–24], and is well understood by stakeholders at policy, professional organization, pharmacy owner and employee staff level [25].

While CFs, had a pharmacy-specific implementation framework that allows them to have an overview of a structured implementation approach, they still, however, faced a number of challenges, including; a high degree of variability in facilitation delivery 'due to the facilitators' professional backgrounds, role setup and activities' [26]; a gap in knowledge of specific activities conducted by CFs in practice [5, 27, 28]; and the lack of a structured, yet dynamic approach to facilitation [7], all of which can lead to variability in implementation outcomes and additional time spent trialling a number of different strategies until they reach the desired outcomes [12, 29]. This hasled implementation researchers to explore the effectiveness of strategies used by CFs in order to reduce the time spent in trial and error of different facilitation strategies and the variability in outcomes from one CF to another [12].

The aim of this study is to evaluate the effectiveness of a tailored change facilitation approach and to determine the most effective facilitation strategies to address implementation barriers during the implementation of MAS in community pharmacy.

Method

Study design and setting

Previous studies looking at the effects of clinical interventions and implementation interventions have been referred to as effectiveness-implementation hybrid designs [22, 30]. The study focuses on the implementation aspect of the hybrid design and used data recorded by CFs during a MAS cluster randomised controlled trial (cRCT) in community pharmacy. The cRCT compared individuals receiving MAS to Usual pharmacist Care (UC). The duration of the trial was 8 months, conducted between July 2018–March 2019. The study protocol [31] and the trial outcomes have been previously published elsewhere [17].

Sites recruited were community pharmacies in the region covered by the Primary Health Network (PHN) of Western Sydney [32]. Community pharmacies were eligible to participate if located in the PHN with a pharmacist available to attend training. In total, 133 of 209 pharmacies in the designated area were contacted by telephone in alphabetical order until the required number of pharmacies were recruited. Following consent to participate in the study, pharmacies were sequentially numbered according to their order of acceptance into the study. They were randomised by using a computer-generated random number list with a ratio of 1:1 in Excel 2016 (Microsoft Corporation). As a result of the PHN recruiting the practices, there was

no data on refusal to participate. Study information was circulated to individual GPs ensuring they were fully aware of their role within the study before commencement [17].

Innovation to be implemented

To deliver the MAS standardised consultation, MAS group pharmacists were provided with: (1) a standardised consultation process for the pharmacist-patient intervention; (2a) HealthPathways: web-based evidence-based clinical care pathways specific to each minor ailment; (2b) HealthLink: a web-based secure messaging system allowing for bidirectional communication between the community pharmacist and the GP; (3) an accredited educational training program for pharmacists delivering MAS; (4) practice change support where a CF provided 1-hour monthly visits to the pharmacy consisting of support and on-site training.
In the control group, patients received usual pharmacist care on presentation to the pharmacy. Pharmacists in the UC group did not receive any of the interventions outlined above including CF support. However, they attended a 2-hour training workshop on data collection systems and recruitment [7].

Study participants

Two CFs were allocated randomly to the 15 intervention pharmacies and were tasked with visiting each of the pharmacies once per month for the duration of the study, or until the study outcomes were met. Patients were consecutively recruited by community pharmacies. Patients were eligible if: (1) aged 18 years or over; (2) requesting a medicine or self-selecting a medicine to treat symptoms (product-based presentation) and/or presenting with symptoms and directly asking for pharmacists advice (symptom-based presentation) for reflux, cough,

common cold, headache (tension or migraine), primary dysmenorrhoea or low back pain; (3) attending the pharmacy in person; (4) able to provide informed consent; and (5) willing to be contacted by telephone [17].

Implementation and facilitation approach

The implementation approach used in this study follows an implementation approach underpinned by the Generic Implementation Framework (GIF) [33]. The GIF was operationalized for community pharmacy as the Framework for the Implementation of Pharmacy Services (FISpH), and practically applied to design an implementation study [21, 25], such as the MAS study. CFs were trained to take pharmacy teams from exploration of the innovation, preparation or planning for its implementation, testing of the delivery of the MAS intervention by pharmacists with a small number of patients first, before implementing MAS for every eligible patient. As this was an eight-month trial, sustainability of the service could not be achieved.

To take pharmacy teams through all of the aforementioned phases, CFs were then trained on factors, strategies, and evaluations.

Factors pertain to implementation factors [2], which can act as enablers or barriers to implementation. Implementation factors were categorised according to those related to the system, local setting, pharmacy setting, individuals (or stakeholders), or the MAS service [21]. A list of implementation factors identified in a previous community pharmacy study [12] were provided to the CFs in a macro-enabled Microsoft Excel spreadsheet.

In this context, strategies pertain to change facilitation strategies to overcome implementation factors acting as barriers, or leverage implementation factors acting as enablers. A list of evidence-based change facilitation strategies were provided to the CFs in the same macro-enabled Microsoft Excel spreadsheet.

Evaluations refers to the evaluation of the facilitation intervention (implementation outcomes), and the data quality, reach, and service fidelity (effectiveness outcomes).

It is worthwhile noting the CFs were not given the tailored facilitation strategies, but a separate list of implementation factors, and list of facilitation strategies to choose from to overcome the implementation barriers identified. CFs were able to add implementation factors that were identified in practice, but were not on the list, and were able to add facilitation strategies that were used that may not have been on the list provided.

Change Facilitator Training

During the one-day training, CFs were trained by a pharmacy implementation and facilitation expert and academic, on the following evidence-based strategies, models and approaches:

- The Generic Implementation Framework (GIF) [33], which incorporates the stages of implementation and highlights the need to link factors, with strategies and evaluations for successful implementation.
- The Framework for the Implementation of Pharmacy services (FISpH) [25].
- Exploration of implementation barriers sourced from the Consolidated Framework of Implementation Research (CFIR) [34], the Theoretical Domains Framework (TDF) [35], the Tailored Implementation for Chronic Disease (TICD) Checklist [36] (Additional file 2).

- Evidence-based change facilitation strategies sourced from the literature [5, 7] and from a previous study in community pharmacy [12] (Additional file 1).
- Change Management models, including Kotter's 8-step change model and Hiatt's ADKAR model [37, 38].
- Human-Centered Design techniques to engage and empower stakeholders to take ownership of their planned changes [39].
- Maslow's hierarchy of needs for CFs to understand why resistance may be taking place [40].
- The Kubler Ross Change Curve for CFs to understand the emotions that are likely to be experienced by stakeholders during the change [41].
- The conscious competence learning model for CFs to understand how to take stakeholders from a point of unconscious incompetence to a point of unconscious competence [42].
- Coaching models including the GROW (Goal-Reality-Options-Will) model [43] to ensure CFs can take individuals from problem-finding to problem-solving.

Change Facilitation Approach and data collection by CFs

CFs were given a Macro-enabled Microsoft Excel sheet with a drop-down list of implementation factors and facilitation strategies to choose from. They were asked to record the following six details after each visit to the pharmacy. Details collected included: (1) pharmacy name; (2) visit number; (3) effectiveness outcomes (including service quality, reach and fidelity); (4) the implementation barrier identified. CFs were asked to record the barrier preventing the pharmacy team from reaching the specific implementation outcome; (5) the facilitation

strategy chosen. As part of the change facilitation framework, CFs were given a list of evidence-based facilitation strategies from which they were able to choose one or more strategies to overcome the implementation barrier (Additional file 1), and; (6) the resolution status. CFs were asked to record whether the implementation barrier was resolved or not.

Data coding and analysis

By supplying CFs with a macro-enabled Microsoft Excel Spreadsheet with a drop-down list of implementation barriers and facilitation strategies to choose from, this ensured consistency in the coding of the implementation barriers and facilitation strategies.

Reporting of the most common implementation barriers

Pareto's principle states that, for many events, roughly 80% of the effects come from 20% of the causes. This principle has been proven effective in organisational decision making [44]. For this reason, the results focus on the top 20% of barriers according to the frequency in which they appeared in the data.

Analysis of the effectiveness of the facilitation strategies

Facilitation strategies were coded into: (a) primary phases according to an adapted version of the change facilitation taxonomy [5]; (b) secondary facilitation categories, and; (c)tertiary facilitation strategies found in the literature and in previous community pharmacy research. The phases according to the change facilitation taxonomy indicate that change facilitators should: (1) plan for change; (2) lead and manage change; (3) monitor progress and ongoing evaluation, and; (4) evaluate change. The secondary facilitation strategies were categorised as

1.1, 1.2, 1.3, 2.1, 2.2, 2.3 etc. The tertiary facilitation strategies were coded as 1.1.1, 1.1.2 etc. For example, within phase 2, there was 2.5 which was 'Communicate the change to stakeholders', within this category, there was 2.5.1 which was 'communicate change verbally to the group'.

Analysis at the tertiary facilitation strategy level showed between 1-10 records, which is considered a small data set and is not reliable for statistical analysis. For this reason the second facilitation categories were analysed, in order to find the most effective category to overcome each implementation barrier. As there are many facilitation categories to overcome each barrier, the first step was to filter and concentrate on one implementation barrier. The second step was to isolate each facilitation strategy that was used for that implementation barrier. The third step was to calculate the Resolution Percentage (RP).

The following describes the formula used to calculate the RP; the resolved barriers using one facilitation category were divided by the total number of times that facilitation category was used to overcome that barrier, multiplied by 100. This produced a Resolution Percentage for each strategy category in relation to a specific implementation barrier. The most effective facilitation category for each barrier should have the highest Resolution Percentage, and also needs to be used in most cases.

CFs recorded barriers relating to the implementation outcomes of 'service quality', 'reach', and 'fidelity'. Service Quality was measured by the 'Appropriate recording of data by the pharmacist' and was defined as 'the quality, coherence of records of the MAS service completed by the pharmacist'. Reach was measured by the 'recruitment ability to reach monthly targets' and was defined as 'Pharmacist's capability to enrol patients and staff's ability to refer patients for MAS'. Fidelity was measured by the 'appropriate recommendations by pharmacists' and was defined as

'adequacy of the recommendations by the providing pharmacist ensuring appropriate use of Over The Counter products and appropriate referral following Health pathways'.

Longitudinal analyses of the CFs' tailored interventions at each visit

To determine whether the change facilitation approach increases the efficiency of tailoring the intervention, a longitudinal analysis was conducted to determine how many visits it took to identify and overcome the majority (more than 50%) of barriers. Facilitation strategies at each visit were isolated to determine the number and percentage of barriers uncovered by CFs at each visit and how many of these were resolved.

Ethics

Ethics approval was received from the Human Research Ethics Committee of the University of Technology Sydney (ETH17-1350). Community pharmacy sites, general practices and patients in the intervention group and control arms were provided a written information and consent sheet detailing study objectives and a description of the study. Written consent was obtained for all participants [17].

Results

The fifteen pharmacies that were part of the intervention group (delivering MAS) during the cRCT were located in the region of Western Sydney in Australia. The CF's recorded 398 tailored interventions during the eight-month study. Following analysis, 22 implementation barriers were identified, which can be found in additional file 2 with their definitions.

In total, 894 patients were recruited with 524 (59%) receiving MAS and 370 (41%) receiving UC.

Table 1. Common implementation barriers and effective facilitation strategies during implementation of a Minor Ailments Service in community pharmacies.

Implementation barriers (n=398)	Facilitation category used by Change Facilitators to overcome implementation barriers	Resolution Percentage (%)
Lack of priority of service implementation (n=61)	Communicate the change to stakeholders	67%
	Empower stakeholders to develop objectives and solve problems	63%
	Create buy-in of the change among stakeholders	41%
Lack of internal supporters for the change (n=60)	Create buy-in of the change among stakeholders	73%
	Engage stakeholders by creating ownership of the change	67%
	Empower stakeholders to develop objectives and solve problems	50%
Team processes not conducive to change (n=46)	Assist formal/ informal audits	100%
	Empower stakeholders to develop objectives and solve problems	80%
	Engage stakeholders by creating ownership of the change	80%
Lack of knowledge and experience regarding the change (n=41)	Empower stakeholders to develop objectives and solve problems	100%
	Assist with/perform a formal or informal audit	100%
	Equip stakeholders with training	94%

Table 2. Facilitation strategies used within each of the most effective facilitation categories

Facilitation category	**Facilitation strategies**
Communicate the change to stakeholders	• Inform entire group of the change and objectives verbally • Inform individuals of the change and objectives verbally • Inform using a visual display such as poster • Inform using a written document (email, letter etc)

Empower stakeholders to develop objectives and solve problems	● Stimulate critical inquiry/ critical reflection ● Utilise think-aloud process ● Utilise brainstorming techniques ● Outline opportunities presented by change ● Conduct a needs analysis ● Conduct a Strength, Weaknesses, Opportunities and Threats (SWOT) analysis ● Use prioritisation techniques ● Introduce goal-setting (SMART goals) ● Use consensus-building/ Shared decision making ● Provide solutions/advice ● Create/ recommend the creation of a monthly or annual plan ● Ensure win/win goals (mutually beneficial solutions) ● Use an action planner tool ● Use a mind-mapping tool ● Discuss/ outline best practices
Create buy-in of the change among stakeholders	● Ask about individual concerns regarding change ● Address specific individual concerns related to the change ● Motivate group/individuals using stories ● Compare audit results to network benchmarking results ● Emphasise enhanced customer outcomes as opposed to poor practice ● Outline negative impacts to lack of implementation (using evidence / opinion) ● Outline benefits of implementation (using evidence / opinion) ● Ask about concerns regarding the change

Engage stakeholders by creating ownership of the change	• Establish/ allocate roles • Delegate responsibilities • Allocate primary champion and/or supporting champions • Define key performance indicators • Ask for commitment to the agreed changes • Encourage collaboration and teamwork • Recommend or aid in conducting a performance review • Allocate roles based on skills/ interests • Emphasise the importance of delegating
Assist with/perform a formal or informal audit	• Use of observations • Use of questionnaires • Use of Interviews • Use of surveys • Conduct local demographic analysis • Conduct performance & self-evaluations
Equip stakeholders with training	• Provide/ recommend skills/technical training • Provide knowledge training • Conduct/ recommend role-playing/ role modelling • Bring a subject matter expert • Refer to external formal education/ training • Use of case studies • Use a staff scoping and training tool • Encourage discussion of training topic as a group • Create/ adapt training plan • Determine training gaps • Encourage self-learning (e.g reading of journals etc)

Overcoming the four most common implementation barriers

'A lack of prioritisation of the service' was an implementation barrier that was identified 61 times by CFs. This is defined in the CFIR as a lack of 'individual shared perception of the importance of implementation within the organisation'. To overcome this implementation barrier, CFs used twelve of the sixteen change categories. The most effective change categories were to; (1) communicate the change to stakeholders, which had a Resolution Percentage (RP) of 67%; (2) empower stakeholders to develop objectives and solve problems (RP=63%), and; (3) create buy-in of the change among stakeholders (RP=41%).

'A lack of internal supporters for the change' was an implementation barrier that was

identified 60 times by CFs. This is defined in the TICD checklist as a lack of 'support provided by staff members for the implementation of the change'. To overcome this implementation barrier, the CFs used 14 of the 16 change categories. The most effective change categories were to; (1) create buy-in of the change among stakeholders (RP=73%); (2) engage stakeholders by creating ownership of the change (RP=67%), and; (3) empower stakeholders to develop objectives and solve problems (RP=50%).

'Team processes not conducive to change' was an implementation barrier that was identified 46 times by CFs. This is defined in the TICD checklist as 'the way in which the team's activities are divided and coordinated amongst its staff, including how tasks are structured, how they are performed, in what order, how they are synchronised and how this affects the provision of service'. To overcome this implementation barrier, CFs used nine of the sixteen change categories. The most effective change categories were: (1) assist with/ perform formal or informal audits (RP=100%); (2) empower stakeholders to develop objectives and solve problems (RP=80%), and; (3) engage stakeholders by creating ownership of the change (RP=80%).

'A lack of knowledge and experience' was an implementation barrier that was identified 41 times by CFs. This is defined by The TDF as 'the extent to which the targeted individuals have skills, knowledge and experience that they need to adhere'. To overcome this implementation barrier, CFs used nine of the sixteen change categories. The most effective categories were to: (1) empower stakeholders to develop objectives and solve problems (RP=100%); (2) assist with/

perform formal or informal audits (RP=100), and; (3) equip stakeholders with training (RP=94%).

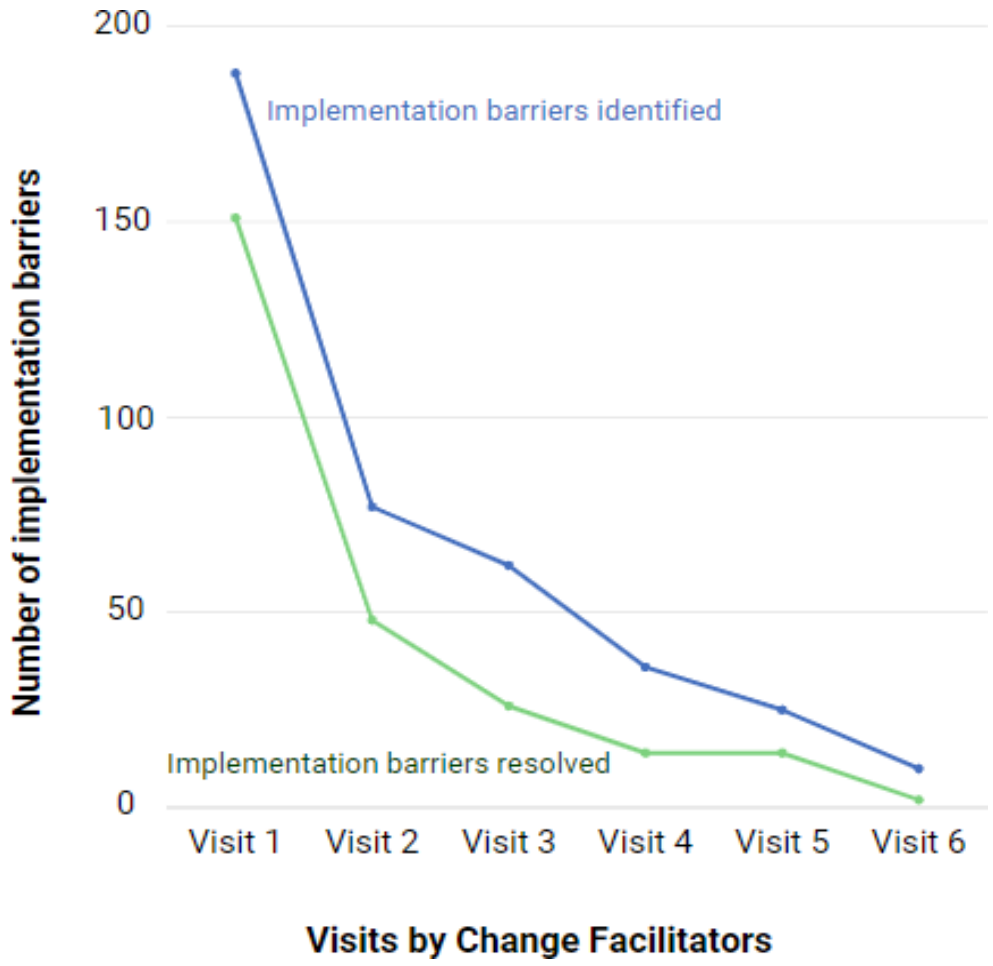
Longitudinal analysis of the CF interventions

Upon analysis of the implementation barriers identified and resolved across the visits, of the 398 tailored interventions recorded by CFs throughout the six visits, 67% (n=267) of the implementation barriers were identified in the first two visits, and of the 267 barriers, 75% (n=200) were resolved in the same two visits across all 15 intervention pharmacies.

Reduction in implementation barriers identified and resolved

The length of the project was eight-months, however, CFs only recorded implementation barriers in the first six visits (or six-months), with the barriers identified reducing over time as seen from figure 1.

Figure 1. Longitudinal analysis of the implementation barriers identified and resolved at each Change Facilitator visit.



Additional implementation factors and facilitation strategies used by CFs

Findings show that there were no additional implementation barriers or facilitation strategies added to the macro-enabled Mircrosoft Excel Spreadsheet lists provided to the CFs.

Discussion

Effectiveness of the tailored change facilitation approach

The change facilitation approach used in this study is underpinned by decades of pharmacy research. Such research includes frameworks specific to the implementation of Professional Pharmacy Services such as FISpH [21], and knowledge of enablers to promote implementation [20] such as the use of external support. This research also builds on existing change facilitation knowledge in healthcare practice [7] and community pharmacy [12], to provide a more effective tailored change facilitation intervention.

As seen in figure 2, CFs were able to identify 67% of the implementation barriers in the first two visits to the pharmacies and were able to resolve 75% of these barriers within those same two initial visits. This indicates that by providing CFs a list of implementation factors specific to community pharmacy and a list of effective, evidence-based change facilitation strategies, allows for early identification and resolution of implementation barriers and therefore a more efficient and effective tailored change facilitation approach [29]. It is also of interest to note the decline in detection and resolution of implementation barriers over time. This indicates that, when an external, objective CF is present, early detection and resolution of implementation barriers can be achieved, and monthly visits by a CF can sufficiently lead to the reduction of implementation barriers over time [6]. Such findings are in line with existing research that indicates that monthly CF visits have led to the most positive implementation outcomes [7].

As CFs have a large degree of autonomy during change implementation, the use of an approach such as this, is a more efficient approach to explore and uncover implementation barriers and utilise a variety of different evidence-based facilitation strategies, while enabling the evaluation of these strategies based on whether the barrier has been overcome. This equips CFS with a systematic, yet dynamic approach to navigate change implementation.

Implications of findings in community pharmacy and healthcare

As pharmacy teams start implementing services such as MAS, it is crucial to leverage findings from this research to pre-empt possible barriers, tailor strategies according to their effectiveness, and therefore improve implementation efficiency and effectiveness. With results showing that the most common implementation barrier was the 'lack of prioritisation of the service', and with the most effective facilitation category being to 'communicate the change to stakeholders', means that CFs need to start by implementation of MAS by engaging teams using clear and consistent communication. The challenge of communication during change implementation is a prevalent one, with researchers highlighting that communication often determining the success or failure of any major change program [45][45]. Studies in Business Management have shown that employees who perceived they received quality change communication reported being more open toward the change [46]. According to the facilitation strategies used within the category of 'communicate the change to stakeholders', there are a variety of different methods to communicate the change to stakeholders including; communicating to individuals, communicating to groups, using verbal communication, visual displays, and using written documentation such as emails and letters (table 3).

Similarities in implementation barriers and facilitation strategies across pharmacy and healthcare studies

Similarities in implementation barriers can be found in a previous implementation study in community pharmacy [12]. Both studies used different CFs and were conducted in different community pharmacies around Australia, yet there are similarities in the implementation barriers identified, including 'a lack of internal supporters for the change' and 'a lack of knowledge and experience regarding the change'. Both implementation barriers were in the top 20% of implementation barriers identified by CFs [12]. This highlights a consistency in the resistance of healthcare professionals such as pharmacy teams to the implementation of innovations [47, 48]. Such findings are not unique to community pharmacy but can be seen in an implementation study conducted in the hospital setting where 'stakeholder resistance' equated to 49% of identified barriers [49].

Across both implementation studies in community pharmacy, the most effective facilitation categories to overcome 'a lack of internal support for the change' were to 'empower stakeholders to develop objectives and solve problems', 'engage stakeholders by creating ownership of the change', and to 'create buy-in among stakeholders'. To overcome a lack of 'knowledge and experience regarding the change', the most effective facilitation categories across both studies was to 'equip stakeholders with training'. For example, if there is resistance across the pharmacy team to recruit patients onto a service such as MAS, rather than informing the team that they must do this, it was more effective to empower the team through the allocation of an internal champion to motivate the team to recruit patients on the service. Another example is if there inadequate recording of data by the pharmacist due to a lack of

knowledge and experience regarding the recording of the MAS intervention, rather than constantly informing the pharmacist that they are not adequately recording the data, it is more effective to equip them with any additional resource, skills, or knowledge they may need to improve their recording of the data.

Such findings indicate that a focus on empowering, engaging and equipping stakeholders, improves stakeholder adoption, by reducing resistance to change, increasing change knowledge while contributing to more effective outcomes [50–52]. Such strategies have been referred to in the literature as participatory co-design and have been used widely in healthcare to improve collaboration and innovation and adoption of change by stakeholders [53–56].

Stakeholder adoption and implementation of innovation therefore go hand in hand in order to ensure successful outcomes [57], as demonstrated by the higher recruitment of patients in the intervention group using these facilitation strategies [17].

It is also worthwhile noting that no additional facilitation strategies were recorded by CFs during the cRCT, which indicates that the strategies provided to the CFs from the previous implementation study were sufficient to overcome the barriers identified in other implementation initiatives in community pharmacy.

Application of findings in community pharmacy

For community pharmacy, this means that early interventions are especially important and effective (as shown in Figure 1) as a significant number of barriers can be identified and resolved with the first number of visits. Such findings also highlight the importance of engaging pharmacy teams through the change discussion and empowering them to solve

challenges themselves.

Specific facilitation strategies to conduct baseline audits and empower teams can be found in table 2.

CFs must realise, however, that the most effective strategies cannot be used in isolation but require tailoring to the context in which the intervention is taking place [36, 58]. This can be done by determining the implementation barrier and conducting a facilitation strategy to overcome this barrier. This is supported by the data which shows that some strategies yielded a Resolution Percentage of 100% when solving certain barriers yet yielded 0% to solve a different barrier. For example, the strategy 'engage stakeholders by creating ownership of the change' had an RP of 100% when overcoming barriers related to 'emotions' and 'individual stage of change' yet did not resolve the barrier related to 'patient recruitment ability'. Similarly, the strategy of 'equipping stakeholders with training' had an RP of 100% when overcoming the barriers of 'complexity' and 'resource use by staff', however, only resolved 33.3% of the barriers associated with 'team processes not conducive to change', for this barrier, what worked best was to 'assist in formal/informal audit' which resolved 100% of this barrier.

Future research

Future research should utilise this approach across different pharmacy and healthcare innovations to determine innovation-specific implementation barriers and tailored facilitation strategies. Future research should also develop this change facilitation approach into a change facilitation framework or model, for application in different settings and industries. CFs and implementation teams would also benefit from continued application of such an approach in various industries, to determine common implementation barriers, and effective facilitation

strategies during implementation.

Limitations

The data collected in this study was highly dependent on the identification of implementation barriers by CFs. Although they were pharmacists who were trained on implementation theory, models, and evaluation methods, most of them had not performed this role previously. To overcome this challenge, the CFs were asked to describe (in written format) the situation which led to their choice of the implementation barrier and facilitation strategy, in order to validate their choice.

Limitations also arise when using statistical analysis as in some cases, it's hard to provide proper recommendations. For example, a strategy with less occurrence could have 100% Resolution Percentage, which makes it difficult to determine whether it is better than another strategy with much higher occurrence and 98% Resolution Percentage.

Conclusion

Equipping CFs with a change facilitation approach that allows them to unearth implementation barriers, tailor facilitation strategies, and evaluate the effectiveness of these strategies, allows for more efficient and effective implementation outcomes. In community pharmacy, such an approach has enabled the early identification of the majority of implementation barriers (67%) and the resolution of 75% of these barriers in the first two months of the trial. This tailored change facilitation approach has also led to the identification of the most common barriers to implementation of the Minor Ailments Service including a lack of prioritisation of the service,

lack of internal supporters for the change, workflow that is not conducive to change, and a lack of knowledge and experience about the change. Through use of a tailored change facilitation intervention, CFs were able to address each of these implementation barriers using evidence-based facilitation strategies.

Additional files

Additional file 1: Facilitation strategies provided to the CFs during their training.

Additional file 2: Implementation barriers identified by CFs during the cRCT.

Abbreviations

CFs Change Facilitators

cRCT Cluster Randomised Controlled Trial

FISpH Framework for the Implementation of Pharmacy Services

GIF Generic Implementation Framework

GPs General Practitioners

PSA Pharmaceutical Society of Australia

MAS Minor Ailments Service

RP Resolution Percentage

TDF Theoretical Domains Framework

TICD The Integrated Checklist of Determinants of practice

UC Usual pharmacist Care

UK United Kingdom

Author contributions

LM, VGC, SDG, and SIB conceived and designed the analysis, LM collected the data from Change Facilitators throughout the eight-month study. LM categorised the facilitation strategies and performed the analysis. LM wrote the paper, while SDG contributed to the method section. VGC and SIB contributed to editing of the paper and provided final approval for the paper to be submitted.

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Chapter 5: Proposal of a Change Facilitation Framework

The 6E Change Facilitation Framework | A dynamic change framework to navigate implementation and adoption of innovations in healthcare and beyond

Lydia Moussa, Andrew Moussa, Shalom Benrimoj, Victoria Garcia-Cardenas

Abstract

Implementation of innovations is a complex process. The use of Change Facilitation has been deemed successful in bringing evidence into practice and in tailoring the innovation to the local context. Existing change models and implementation frameworks, however, face a number of challenges including; a) prescriptive models which do not allow for the tailoring of approaches according to specific organisational and stakeholder needs, b) high variability in implementation outcomes according to different change facilitators' backgrounds and training, and c) a challenge in balancing innovation implementation and stakeholder adoption (i.e. the project and people aspects of change).

This article proposes a Change Facilitation Framework underpinned by existing research. The Change Facilitation Framework aims to enable Change Facilitators to tailor their interventions according to implementation factors that exist in the domains/ context in which implementation is taking place. The framework allows Change Facilitators to evaluate their strategies based on the resolution of the implementation factor, while ensuring adoption of the innovation by the relevant stakeholders.The framework challenges the concept of a one-size fits all approach to implementation, as every setting is different with unique factors that can enable or inhibit implementation and requirestailored strategies to tackle such factors.

The Change Facilitation Framework proposes a dynamic, tailored organisational change

facilitationapproach that intertwines the implementation of an innovation and stakeholder adoption, therefore providing an approach for holistic implementation of innovations.

Keywords: Change Model, Change Framework, Change Management Model, 6E Change Facilitation Framework, Change Management, Planned Organisational Change Model, Implementation Framework, Change Facilitation, Change Facilitators, Change Manager, Project Management.

Background

Implementation of evidence into practice is complex and multifaceted, with the need to take into consideration varying factors across different domains and link these factors with the most effective strategies [1]. In healthcare, for example, researchers have highlighted the need to tailor implementation to 'specific social, organisational and structural settings involving factors at different levels that may support or impede change' [2].

Implementation science recognises that the process of implementation goes beyond simple dissemination of information, it requires the use of strategies that are more specific to the practice's setting [3]. An effective implementation intervention that has been used in healthcare is Change Facilitation [4–7]. A major component of change facilitation is a Change Facilitator (CF) who provides "support to help individuals and groups realise what they need to change and how to make changes to incorporate evidence into practice" [8]. CFs have been utilised in various healthcare disciplines including nursing [9], general practice [10], ambulatory

care [5], hospitals [11], and pharmacy practice [12]. Other titles given to CFs in healthcare include 'coaches' [13], 'knowledge brokers' [14], 'outreach visitors' [15], 'practice enhancement assistants' [10], and 'practice facilitators' [16]. In Business Management they are often referred to as 'Change Managers' [17], 'Change coaches' [18] or Change Agents [19].

There are, however, a number of challenges facing CFs during the implementation of innovation**.**

The lack of frameworks that link implementation factors to strategies to allow for tailoredinterventions

There are over 60 implementation frameworks in implementation science alone [20], yet a gap in the literature has been identified pertaining to the specific activities conducted by CFs in practice [1, 8] and a way of ensuring that such activities are tailored towards overcoming implementation barriers within a specific domain/context [1, 21, 22]. Whilst there are a number of researchers who have provided extensive lists of change facilitation strategies [8, 21, 23], a structured, prescriptive list of activities can be difficult for CFs to implement in practice as these are not tailored to the specific social, organisational and structural settings in which the innovation is being implemented [2]. In implementation science, there are also structured, prescriptive models which are referred to as process models [24], the aim of these models being to "describe and/or guide the process of translating research into practice" [24]. Examples of process models can be found in table 1.

In business management, such models are referred to as Planned Organisational Change Models (POCMs) [25], examples of POCMs can be found in table 1. Researchers in this field

have indicated that over the last 50+ years organisational change management has not fundamentally developed anything completely new [25], with many of the models being too linear and prescriptive in nature [26]. The problem with linear models is their lack of flexibility to deal with the vast assortment of problems and issues that may be experienced during change [27].

Where there is an abundance of prescriptive process models, there is also an abundance in diagnostic models. In implementation Science these have been referred to as "determinant frameworks" [24], which enable the exploration of factors that can act as enablers (positive) or barriers (negative) to the implementation of change [28]. Such factors have been referred to as; 'moderating factors' [28], 'factors' [29], 'constructs' [30], 'determinants' [31], 'elements' [32], 'frames' [33], and 'implementation factors [28] which is what they will be referred to throughout this article. Examples of determinant frameworks and diagnostic models in business management can be found in table 1.

Table 1. Examples of diagnostic versus prescriptive models across implementation science and business management

	Implementation Science	**Business Management**
Prescriptive models	Referred to as 'Process models' [24]; Examples; CIHR Model of Knowledge Translation [34], the K2A Framework [35], the Knowledge-to-Action Model [36], the Quality Implementation Framework [37], among others [24].	Referred to as 'Planned Organisational Change Models'[25] Examples; Lewin's 3-step change model [38], Kotter's eight step change model [39], Phases of planned change [40], Five step corporate transformation model [41], Kanter's 10 commandements among others [25].
Diagnostic models	Referred to as 'Determinant Frameworks'. Examples: The Consolidated Framework of Implementation Research [42], the Theoretical Domains Framework [43], the PAHRiS framework [44], the Active Implementation Framework [45, 46], among others [24].	Referred to as 'Planned Organisational Change Models'[25] Examples; 7S McKinsey model [47], ADKAR model [48], Leavitt's diamond ([49], The six box organisational model [50], among more [25].

As can be seen in table 1, there is an abundance in both prescriptive and diagnostic implementation models/ frameworks, there is, however, a gap in the literature regarding facilitation specific frameworks that allow CFs to both diagnose implementation factors, and prescribe/ recommend the most appropriate facilitation strategies, to allow for a more tailored facilitationapproach [28]. CFs therefore need a systematic yet dynamic framework that can be used for the implementationof innovation that not only allows them to diagnose the implementation factors, but to establish effective facilitation strategies.

High level of variability during the change facilitation intervention

CFs come from different professional backgrounds, varying levels of training, and use a variety of different models for implementation [7, 23]. According to a systematic review that explores change facilitation strategies, it was noted that across 35 randomised controlled trials, the CFs were trained on one of the following models/frameworks; the coaching model, the continuous quality improvement model, evidence informed decision making, model of change, model of ethical reasoning, Promoting Action or Research in Health Services (PARiHS), the 7S improvement model and reflective adaptive process [23]. By combining the variability in change facilitation backgrounds, training and the models/frameworks used, this can often lead to variability in implementation outcomes [23]. To reduce the level of variability by CFs, there is a need for a more systematic, facilitation-specific approach that CFs can use to ensure consistency in implementation from one CF to another.

Challenge of balancing adoption by stakeholders and meeting implementation measures

In healthcare, the need to combine implementation and adoption is deemed crucial for successful integration of an innovation into an healthcare organisation or practice [51–54]. While there is an array of frameworks and models focused on implementation of innovations (chapter 5, table 1.), an adoption gap has been noted in healthcare [55], with the need to look at organisational change management as a way to aid in adoption of innovations in healthcare [55–59]. Organisational change management is a business management discipline, and while there are an array of Planned Organisational Change Models (POCMs) in organisational change management, these do not adequately link to implementation, which is known in Business Management as Project Management [60]. This division has been a long-standing debate in

Business Management [60]. Project Management Methodologies are meant to enhance project effectiveness and increase chances of success [61]. Success criteria associated with Project Management Methodologies includes efficiency, cost, time, and quality [62]. This therefore does not include adoption by stakeholders. Models pertaining to adoption by stakeholders are the aforementioned POCMs. This division in management disciplines and methodologies has created challenges for the successful implementation of innovations [60], with researchers recognising that both project management are complementary and mutually supportive disciplines that contribute to the successful implementation of a wide variety of projects [63]. CF's therefore need a framework that links project management concepts to allow for the successfulimplementation of innovation, and change management concepts that allow for the successful adoption of the innovation by stakeholders [60, 64].

Evidence underpinning The Change Facilitation Framework and its use in community pharmacy

Pharmacy researchers have been looking at the most effective approaches to implement innovations such as professional pharmacy services in community pharmacy. In doing so, an enabler that was discovered was the need for external assistance during implementation [65].

Pharmacy researchers therefore deployed 'external assistance' in the form of CFs, for theimplementation of innovation such as professional pharmacy services in community pharmacy.

As CFs were deployed in community pharmacy to aid pharmacy teams in the implementation of professional services, more insight was needed to find out the most critical implementation barriers faced by CFs during implementation, and the most effective strategies

to overcome such barriers. A number of implementation studies were conducted in community pharmacy [12, 67], where CFs were asked to record a) the implementation factors identified during implementation, b) the facilitation strategies used by CFs, and c) whether the strategy used worked [67]. A systematic review was also conducted to identify evidence-based change facilitation strategies in the literature [23].

By combining the findings from the implementation study [67] and a systematic review conducted to determine change facilitation strategies in healthcare practice [23], a preliminary change facilitation approach was used during a cluster randomised control trial (cRCT) for the implementation of the Minor Ailments Service (MAS) in community pharmacy [68], which reported positive humanistic, clinical, and economic outcomes [68, 69]. CFs were provided a macro-enabled Microsoft Excel Spreadsheet with a drop-down list of 36 implementation factors specific to community pharmacy and 111 change facilitation strategies for CFs to use that were identified in a previous pharmacy research study [67]. The results from the MAS cRCT showed that CFs were able to uncover 67% of all implementation barriers in the first two visits (over two months) to the pharmacy, and of these implementation barriers, 75% were resolved in the

same two visits. The change facilitation approach used during the MAS cRCT led to the development of The Change Facilitation Framework.

The Change Facilitation Framework aims to provide CFs with a robust, tailored approach toincrease adoption of the innovation by stakeholders and ensure its implementation in healthcare and beyond.

Figure 1 showcases the robust, non-linear relationship between the different principles of the Change Facilitation Framework. It showcases the need for CFs to explore implementation factors, toestablish facilitation strategies linked and tailored to the implementation factors, and to evaluate implementation progress by going back to both the strategies conducted by CFs as well as the implementation factors uncovered.

Development of the 6E Change Facilitation Framework

1. The systematic review [23] highlighted 51 change facilitation strategies in the literature.
2. The two-year mixed method implementation study [67], highlighted additional facilitation strategies used by CFs in practice.
3. A draft of the 6E Change Facilitation Framework was designed.
4. The 6E Change Facilitation Framework was used in a c-RCT in pharmacy practice, as well as the strategies highlighted by the systematic review and the implementation study.
5. The 6E Change Facilitation Framework was finalised after positive outcomes from the c-RCT.

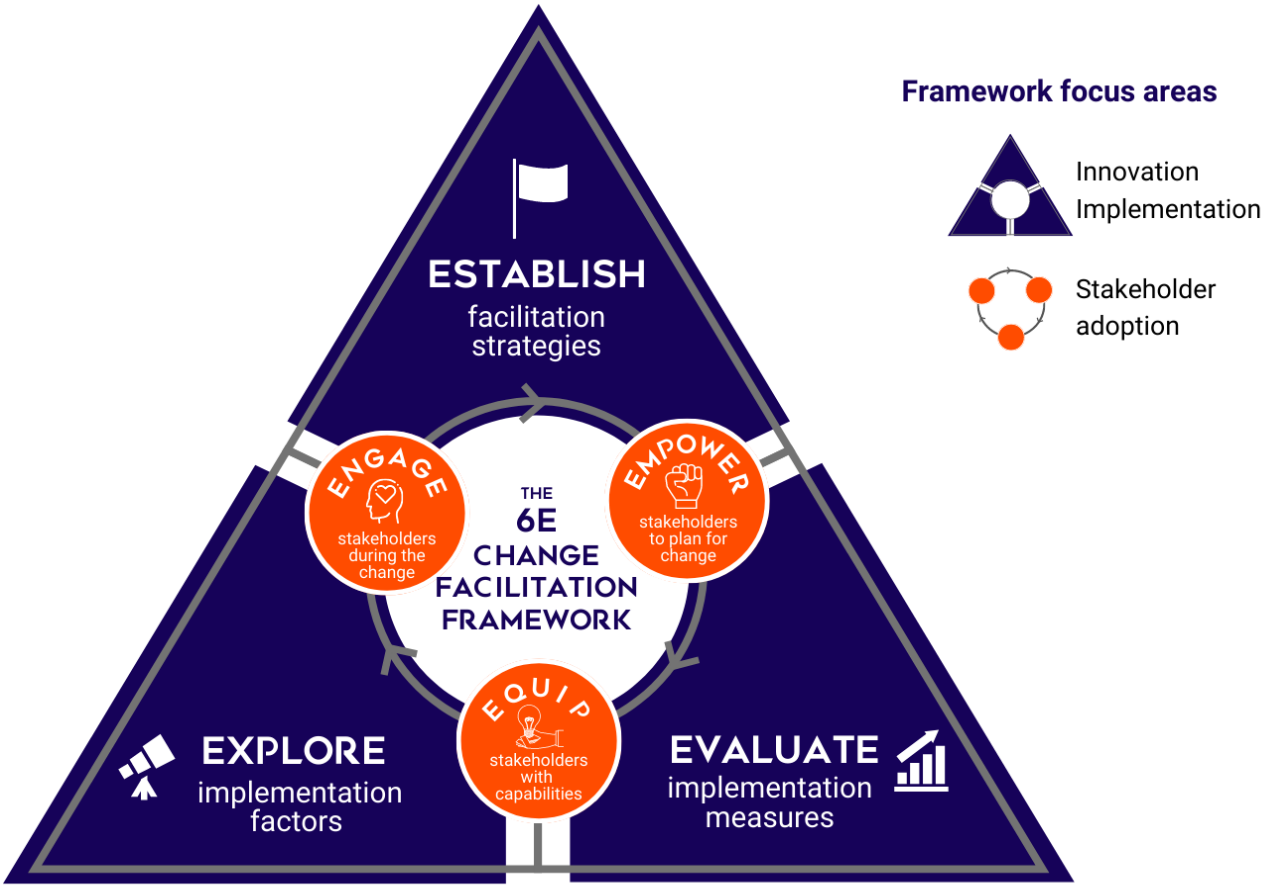

Figure 1. The 6E Change Facilitation Framework

Understanding the 6E Change Facilitation Framework

As seen in figure 1, there are six principles within the Change Facilitation Framework, and hence the title 'The 6E Change Facilitation Framework'. A principle is defined as: "a fundamental proposition that serves as the foundation for a system of belief or behaviour or for a chain of reasoning [70]." For this reason, the six principles serve as the foundation for actions and behaviours conducted by CFs to enable successful implementation and adoption of innovations. Another reason these are labelled as principles, rather than phases or steps, is that CFs do not have to move through them in a linear fashion, but allow formore dynamic movement according to the needs of the stakeholders and implementation progress, this is deemed a more realistic approach to the actual activities conducted by CFs in practice as all parts of the organisation do not necessarily move in unison [27, 71].

The interaction between the principles within the framework

The outer triangle of the framework focuses on the innovation being implemented, while the innercircle of the framework focuses on ensuring adoption by relevant stakeholders.

The outer triangle of the 6E Change Facilitation Framework

The outer triangle of the 6E Change Facilitation Framework, focuses on the innovation being implemented. CFs may start at any of the outer three principles. A CF can start at the evaluation principle, by conducting baseline audit prior to change implementation, they can then explore implementation factors that are contributing to the audit results and establish facilitation strategies based on the audit results. Alternatively, a CF can start by establishing a facilitation strategy that involves equipping stakeholders with knowledge training related to the innovation being implemented, they can then evaluate the knowledge acquired, and if this

strategy does not lead to positive implementation progress, the CF can explore implementation barriers inhibiting the uptake of knowledge and skills. Another option is for a CF to start at the explore principle, where they can explore implementation barrier that may prevent implementation progress, then establish a strategy to overcome the implementation barrier, then evaluate implementation progress. This flexible and dynamic approach allows CFs todeal with different priorities of implementation at different times as implementing change is complex and multifaceted [71].

The inner circle of the 6E Change Facilitation Framework

The Change Facilitation Framework highlights three principles that focus on the adoption of the innovations by stakeholders. Stakeholders include those people affected or impacted by the change at different levels of the organisational hierarchy and at different phases of implementation. Stakeholders include, but are not limited to, leaders who need to be engaged from the beginning of implementation as leadership support is crucial to gain access to the necessary resources for implementation and to signal to staff that the change is a priority [72]. Other stakeholders include managers [73], frontline staff [74], end-users [75], local champions and opinion leaders [76], and often policymakers [66].

Researchers in implementation science and business management refer to the stakeholder aspect of change implementation as a complex, systemic phenomenon that involves the interdependence of a multiplicity of variables, and therefore requires a dynamic approach that combines multiple aspects of change implementation [60]. One of the biggest hurdles during the implementation of an innovation is its acceptance by the stakeholders who are impacted by or involved in the implementation. Some stakeholders embrace change initiatives readily,

while others fight the change and deny its necessity [77]. In healthcare, adoption, especially by practitioners, is often a major barrier to implementation, such as that observed during the Healthcare IT systems in hospitals [78], adoption of electronic medical records [79], the use of data analytics in healthcare [80], adoption of health literacy tools in pharmacy [81], and adoption of professional pharmacy service in community pharmacy [67]. In Business Management, this is referred to as 'change resistance' and is highlighted as a major challenge during implementation of change across various industries such as education [82], engineering [83], General Practice [75], and hospitality [84].

Successful implementation, however, requires the participation of the stakeholders whom interventions would affect [66, 72]. For this reason, the three principles in the inner circle of the framework focus on stakeholder adoption. These principles are for CFs to; 'Engage stakeholders onto the change', 'Empower stakeholders to plan for change', and 'Equip stakeholders with capabilities'. These three principles were chosen based on their effectiveness in overcoming many of the implementation barriers in community pharmacy in two separate studies as seen in table 2. In addition to this, such principles are often highlighted in POCMs in business management [39, 48]. The cyclical nature of the inner three principles and their positioning within the heart of the triangle, not only is a metaphorical representation of stakeholders being at the heart of implementation, and that adoption should not be an afterthought but embedded throughout implementation. This also showcases that these principles should be conducted simultaneously with any of the three outer principles of the triangle that are related to the innovation being implemented. For example, to explore implementation factors, CFs can use strategies to engage stakeholders such as facilitating a face-to-face workshop to discuss their barriers pertaining to the innovation being implemented.

Similarly, CFs can use strategies to empower stakeholders to evaluate their implementation progress by facilitating the allocation of a change champion who can monitor and evaluate progress.

Description of the six principles of the 6E Change Facilitation Framework

Please note that the below principles are not in a sequential order.

Explore implementation factors

By understanding 'implementation factors' within a particular context, CFs can determine ways to overcome factors acting as barriers and leverage factors acting as enablers. By exploring both positive (enablers) and negative (barriers) aspects within a particular setting, this provides a more balanced view of the context in which the implementation is taking place.

CFs can explore implementation factors from the Consolidated Framework of Implementation Research [30], the Tailored Implementation of Chronic disease checklist [31], Theoretical Domains Framework [43], 7S Mckinsey Model [32], and other determinant frameworks [24]. An example of an implementation factor is 'knowledge and experience regarding the change'. This factor acts as an enabler when there are individuals who have knowledge and experience regarding the change and acts as a barrier when there are individuals who have no knowledge and experience regarding the change. When CFs recognise that 'knowledge and experience regarding the change' is acting as an implementation barrier, they can then move along the 6E Change Facilitation Framework to establish one or more facilitation strategies to overcome it. Examples of specific strategies used by CFs within each of the categories can be found in tables 3, 4, 5 and 6.

Establish facilitation strategies

Change facilitation strategies are strategies conducted by the CF that directly impact the other 5 principles. For this reason, this principle is at the apex of the triangle, as it affects all other principles. Change facilitation strategies can be established to tackle a highlighted implementation factor, or to improve implementation progress. For example, as seen in the table 2, to overcome the barrier of 'workflow not conducive to change implementation', a change strategy is to 'engage stakeholders by creating ownership of the change'. Examples of strategies within this category can be seen in in table 3, including 'allocating a primary champion', 'delegating responsibilities', 'encouraging teamwork and collaboration' among others.

Table 2. Examples of implementation barriers uncovered by CFs in community pharmacy and effective change facilitation categories to overcome these barriers

Implementation barriers* (Frequency of appearance^)	**Most effective facilitation categories to overcome implementation barriers across both studies**
A lack of internal supporters for the change (15%)	• Engage stakeholders by creating ownership of the change • Empower stakeholders to develop objectives and solve problems • Create buy-in among stakeholders • Ensure continuous monitoring of implementation measures • Feedback progress of implementation measures
A lack of priority for implementing the service (11.5%)	• Empower stakeholders to develop objectives and solve problems • Create buy-in among stakeholders
An inability to plan for change (8.5%)	• Engage stakeholders by creating ownership of the change • Adapt area of focus to meet change needs • Empower stakeholders to develop objectives and solve problems • Equip stakeholders with training
Workflow not conducive to change implementation (8%)	• Engage stakeholders by creating ownership of the change • Adapt area of focus to meet change needs • Equip stakeholders with training

A lack of knowledge & experience related to the change (6.5%)	• Create a collaborative environment conducive to change • Equip stakeholders with training
A lack of teamwork towards implementation of the service (5.5%)	• Engage stakeholders by creating ownership of the change • Empower stakeholders to develop objectives and solve problems
A lack of capacity (time) for the change (5%)	• Adapt area of focus to meet change needs • Empower stakeholders to develop objectives and solve problems
A lack of team communication regarding the change (4%)	• Create a collaborative environment conducive to change • Communicate the change to stakeholders
Changes not aligned to customer needs (4%)	• Align changes to local context/setting

A lack of awareness of the change (3%)	• Create a collaborative environment conducive to change • Communicate the change to stakeholders
A lack of leadership engagement (3%)	• Empower stakeholders to develop objectives and solve problems
A lack of individual alignment with the change (2.5%)	• Ensure stakeholders contribute to the change • Empower stakeholders to develop objectives and solve problems • Create buy-in among stakeholders • Engage stakeholders by creating ownership of the change
Insufficient resource use by staff (2.5%)	• Adapt area of focus to meet change needs • Create buy-in among stakeholders • Equip stakeholders with resource
Negative emotions towards the change (2%)	• Engage stakeholders by creating ownership of the change • Create buy-in among stakeholders
Structural characteristics not conducive to change implementation (2%)	• Adapt area of focus to meet change needs
A lack of self-efficacy regarding the change (1.5%)	• Equip stakeholders with training
Inadequate communication with patients (1.5%)	• Equip stakeholders with training • Create buy-in among stakeholders
A lack of external support (1%)	• Equip stakeholders with resources • Ensure continuous monitoring of implementation measures
A lack of financial incentives to implement the change (1%)	• Create buy-in among stakeholders • Empower stakeholders to develop objectives and solve problems • Ensure continuous monitoring of implementation measures
A lack of knowledge of own practice (1%)	• Interpret baseline data and provide feedback/ insights into performance gaps

* Implementation barriers identified during a two-year implementation study [67] and the MAS cRCT.
^ Average frequency of appearance was calculated by determining how often each barrier appeared in each study as a percentage and calculating the average between both percentages (total number of barriers identified across both studies n=1529)

Evaluate Implementation Progress

The 6E Change Facilitation Framework allows CFs to evaluate several areas of implementation. a) Toevaluate the effectiveness of their facilitation strategies, b) to evaluate whether the implementation factor was dealt with adequately, and c) to evaluate the overall progress of change implementation based on predefined implementation outcomes, such as those highlighted in table 3, under the facilitation category 'determine implementation outcomes'.

Evaluating the effectiveness of facilitation strategies - When facilitation strategies are established by the CFs, they can evaluate the effectiveness of strategies based on whether the implementation factor was resolved or not.

Evaluating whether the implementation factor is real or perceived - Studies in healthcare have indicated that when healthcare professionals propose an implementation barrier, it is often a perception rather than a reality [92], or there may be a different underlying cause to the perceived implementation barrier [28]. In addition, CFs can evaluate the reality of an implementation factor that is highlighted by stakeholders by trialling a number of different strategies to overcome the factor. If all strategies are ineffective, CFs can go back and explore other possible implementation factors or underlying causes that may be inhibiting implementation. For example, in community practice, 'a lack of time' is often the first implementation barrier highlighted by pharmacy teams when asked to implement innovation. In the two-year implementation study where CFs explored implementation barriers in pharmacy, the reality was that a 'lack of time' was not the number one implementation barrier, but rather 'the inability to plan for change' [67].

Evaluating overall implementation progress based on predefined implementation outcomes

By providing CFs with specific implementation outcomes, CFs are able to evaluate the overall progress of change implementation. For example, when used during the Minor Ailments Service Randomised Controlled Trial [12], CFs were given an implementation outcome of 'recruitment ability'. By exploring the implementation barriers that inhibited pharmacists from recruiting patients onto the service, CFs were able to establish facilitation strategies to overcome these particular barriers. If the recruitment target is not reached, CFs can assess the facilitation strategy they used, or go back and re-assess the implementation barrier that was highlighted.

Table 3. Examples of evidence-based strategies for the evaluation of implementation progress.

Facilitation category	Examples of facilitation strategies for the evaluation of implementation progress
	Financial results
	Service provision
	End-user outcomes
Determine / communicate	Service adoption
implementation outcomes	Customer recruitment
	Staff-related measures
	Quality of service
	Agreed-upon objectives
	Using observations

Perform formal / informal audits	By conducting interviews
	Through questionnaires
	By conducting a local area demographic analysis
	Conducting performance review
	Asking for self-evaluations
	Conducting a financial audit
	By using surveys
	Audit feedback via written report
Feedback audit results	Audit feedback via visual presentation
	Audit feedback via verbal presentation
	Monitor financial impact
	Customer outcomes
Ensure continuous monitoring of implementation outcomes	Service provision
	Staff measures
	Emphasise ongoing monitoring by participants
	Monitor agreed upon plan/ objectives
	Display progress chart
	Provide constructive feedback
Feedback progress of implementation measures	Acknowledge success/ recognise /celebrate achievements
	Providing ongoing encouragement
	Email
Ensure ongoing communication methods in place	Phone calls
	Face to face
	Teleconference
	Videoconference

Engage stakeholders onto the change

Engaging stakeholders at different levels including leaders, champions, frontline staff, and end-users, onto the change means ensuring consistent and clear communication, and stakeholders engaging onto the change journey. The challenge of communication in healthcare is a prevalent one, with studies showing that poor communication can lead to negative outcomes such as; discontinuity of care, compromise of patient safety, patient dissatisfaction and inefficient use of valuable resources, both in unnecessary investigations and physician work time as well as economic consequences [85]. Similarly, studies in Business Management have shown that employees who perceived they received quality change communication reported being more open toward the change [86]. There has also been an emphasis in organisational change literature on the need for wide participation in the change process to make organisational members feel more included, committed and in control of the situation as well as the need for wide dissemination of information together with openness, early notification and discussion, as seen in nursing [87]. Emphasis on the need for clear communication is also derived from research in pharmacy practice indicating that a lack of communication is amongst the most common barriers to change implementation [67]. An example of using this principle in practice is when overcoming a lack of alignment within a team, the CFs can engage team members by 'creating buy-in among stakeholders' and 'addressing their specific concerns regarding the change'. Table 4 highlights examples of evidence-based engagement strategies conducted by CFs in community pharmacy [67].

Table 4. Examples of evidence-based facilitation strategies to engage stakeholders onto the change

Facilitation Category	Examples of facilitation strategies to engage stakeholders onto the change
Communicate the change to stakeholders	Communicate verbally to group
	Communicate Verbally to individual
	Communicate using Visual displays (Poster)
	Communicate using written document (email, letter etc)
	Explain the change in detail
	Define the change objectives
Create a collaborative environment, conducive to change	Acknowledge ideas
	Encourage knowledge and experience sharing
	Involve others in the change process
	Acknowledge importance of participant roles
Encourage participation and facilitate discussions among stakeholders	Ask each person for their feedback regarding the change
	Encourage role modelling by leadership
Create buy-in among stakeholders	Address specific concerns
	Compare audit results to network benchmarking
	Emphasise enhanced customer outcomes as opposed to poor practice as reason for change
	Outline negative impacts (using evidence and/or opinion)
	Outline benefits (using evidence and/or opinion)
	Ask about concerns regarding the change
	Motivate using stories
Engage stakeholders by creating ownership of the change	Establish/ allocate roles
	Delegate responsibilities
	Allocate primary champion
	Create Key Performance Indicators (KPIs)

	Ask for commitment to the agreed changes
	Encourage collaboration and teamwork
	recommend or aid in conducting a performance review
	Allocate roles based on skills/ interests
	Allocate supporting champions
	Emphasise the importance of delegating

Empower stakeholders to plan for change

In business management, empowerment has been described as a means to enable employees, including managers, to make decisions [88], and offers the potential for optimising employee performance through a higher level of self-control [89]. Jones *et al.* stress the need to shift away from controlling to enabling, in order for employees to contribute more [90]. The concept of empowerment is also mentioned in the taxonomy of facilitation interventions as a way to foster team-building/ group dynamics [8].

Strategies conducted by CFs in this principle should aim to empower stakeholders to take ownership of solving challenges related to change implementation as well as planning for change implementation. For example, in community pharmacy, to overcome a 'lack of knowledge and experience relating to the change', CFs used strategies including 'enabling the development of objectives and problem-solving' by 'stimulating critical inquiry', 'using think aloud possess', and 'using brainstorming technique'. All of which were successful in overcoming that implementation barrier. An example of using this principle in practice, is when there is a lack of leadership engagement, the CFs can empower leaders to plan for the change by facilitating consensus building and shared decision making. Table 5 highlights examples of evidence-based empowerment strategies conducted by CFs in community pharmacy [67].

Table 5 Examples of evidence-based facilitation strategies to empower stakeholders to plan for the change

Facilitation Category	Examples of facilitation strategies to empower stakeholders to plan for change
Ensure stakeholders contribute to the change	Acknowledge ideas
	Encourage knowledge and experience sharing
	Involve others in the change process
	Acknowledge importance of participant roles
Empower stakeholders to develop objectives and solve problems	Stimulate critical inquiry/ critical reflection
	Use think-aloud process
	Conduct brainstorming
	Outline opportunities
	Facilitate a needs analysis
	Facilitate a SWOT analysis
	Conduct a Prioritisation activity
	Facilitate Goal setting (SMART Goals)
	Facilitate consensus-building/ Shared decision making
	Provide solutions/advice
	Help build a monthly or annual plan
	Ensure win/win goals (mutually beneficial solutions)
	Help build an action planner tool
	Help create a mind-mapping tool
	Discuss/ outline best practice
Adapt area of focus to	Adapt task allocations by creating a roster
	Facilitate layout adaptation

meet change needs	Adapt vision/mission of the business
	Recommend or facilitate role reviews
	Time-tabling (annual, monthly or weekly time tables)
	Adapt business strategy plan
	Adapt image of organisation towards new changes
	Create/ adapt communication plan to new changes
	Encourage regular communication among participants e.g daily huddles
	Adapt process/ procedures to new changes
	Utilise a meeting/ communication agenda
Align changes to local context/ setting	Align objectives to existing capabilities/ characteristics
	Align objectives to existing motivations/ passions
	Align services to local demographics
	Ensure changes are communicated to customers (verbally, letters, signage etc.)
	Ask customers about their needs
	Assess competition

Equip stakeholders with capabilities

Strategies here are aimed at equipping stakeholders with capabilities including knowledge, skills, and resources in order to ensure successful change implementation.

Equipping stakeholders with knowledge and skills through training is viewed as essential to promote learning and enhance on-the-job performance [91]. This is often referred to as 'knowledge and data management' [8], CFs in randomised controlled trials [23], and implementation studies, however, were recorded as providing or 'equipping' teams with new tools, rather than "managing" tools. Examples of equipping stakeholders with resources include; 'educational material', 'bibliographical resources' such as books, fact sheets, templates, brochures, posters or guides to make implementation easier [23].

Using the implementation barrier of 'a lack of knowledge and experience relating to the change'. An example of using this principle in practice is when teams are not adequately using available resources, the CFs can equip them with the knowledge and skills they need to use the available resources. Table 6 highlights examples of evidence-based strategies to equip stakeholders withsuch capabilities used in community pharmacy.

Table 6. Examples of evidence-based strategies to equip stakeholders with capabilities

Facilitation Category	Examples of facilitation strategies
Equip stakeholders with training	Skills/technical training
	Knowledge training
	Role-playing/ role modelling
	Training by subject matter expert
	Refer to external formal education/ training
	Using case studies
	Staff scoping and training tool
	Encourage discussion of training topic as a group (workshop)
	Create/ adapt training plan
	Determine training gaps
	Encourage self-learning (e.g reading of journals etc)
Equip stakeholders with resources	Gather information
	Assemble/provide reports
	Provide physical assistance e.g. during layout adaptation
	Provide bibliographical resources
	Advocate for resources
	Facilitate or conduct a cost-analysis
	Assess existing resource
	Reminder system (electronic or visual)

A framework to tackle three major challenges during the implementation of innovations

As previously mentioned, there is a need for a framework to; a) combine diagnostic and prescriptive concepts for a more tailored implementation approach, b) to reduce the high level of variability in implementation outcomes according to different change facilitators' backgrounds and training, and c) to balance the innovation implementation and stakeholder adoption (i.e. the project and people aspects of change).

The 6E Change Facilitation Framework aims to tackle these three challenges as it:

- Combines diagnosis of implementation factors that can act as enablers or barriers to implementation and allows CFs to establish tailored strategies to navigate these implementation factors.
- Allows CFs to go through all six principles in a dynamic, yet systematic way while providing CFs with detailed lists of evidence-based facilitation strategies to choose from for each of the six principles (tables 3,4,5, and 6). This ensures consistency in the activities of CFs regardless of the level of training and professional background of the CF.
- Allows CFs to focus on the implementation of the innovation depicted in the outer principles in the triangle, and simultaneously navigating stakeholder adoption which is depicted in the principles in the inner three circles of the framework, constantly reminding CFs that stakeholders are at the heart of the innovation and need to be engaged, empowered and equipped to ensure successful implementation.

Application and future research

Future CFs can use the 6E Change Facilitation Framework to navigate the implementation of innovation within and outside of healthcare. CFs can record factors related to the implementation of different innovations across varying contexts, which will help them identify ways to prevent, harness or overcome these factors in future implementation projects. For example, the most common implementation barrier highlighted during the implementation of professional services in community pharmacy in a two-year implementation study was 'the inability to plan for change', recommendations have been made to prevent this barrier by 'training pharmacy students, pharmacists and pharmacy owners on ways to plan for change' (Moussa et al., 2020a). Future research should aim to further validate the Change Facilitation Framework in other areas in and outside of healthcare.

Conclusion

The dynamic aspect of The Change Facilitation Framework highlights the notion that change is neither simple, nor linear. It emphasises the complexity of change implementation as multifaceted requiring the need to combine diagnosis, prescription of strategies, and evaluation. It also ensures there is a synergy between the implementation of innovations (project) and stakeholder adoption (people). When CFs are provided with The Change Facilitation Framework, they have a dynamic, yet systematic approach to ensure consistency in implementation outcomes, regardless of the CF background and level of training. As there is no one size fits all for implementing change, the 6E Change Facilitation Framework allows those implementing change to tailor their approaches and strategies according to the needs of different industries, organisations, and innovations to ensure successful implementation.

Abbreviations

CF: Change Facilitator

MAS: Minor Ailments Service

cRCT: Cluster Randomised Controlled Trial

POCMs: Planned Organisational Change Models

Author contributions

LM conceived the 6E Change Facilitation Framework and wrote the article. AM, VGC and SIB contributed to editing of the paper, and VGC provided final approval for the paper to be submitted.

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Chapter 6: Overall discussion, conclusions, and recommendations

Overall research discussion

Research summary

This chapter discusses the findings from the research work undertaken for this thesis. It focuses on describing how the research addressed objectives and the contributions it makes to existing knowledge and evidence in change facilitation research, community pharmacy and wider change implementation and business management research. It also highlights limitations and suggestions for future research. First, a summary of the overall work is provided, followed by the findings from the research, a discussion of these findings, and the implications for practice.

Change facilitation strategies in the literature

Implementation Science recognises that the process of implementation goes beyond simple dissemination of information, it requires the use of strategies that are more specific to the practice's setting [7]. For this reason, an implementation intervention that has been widely used in healthcare practice is change facilitation, a critical part of change facilitation is where a CF, 'provides support to help individuals and groups realise what they need to change and how to make changes to incorporate evidence into practice' [33]. Implementation researchers, however, have highlighted the need to better understand the activities conducted by CFs in practice. For this reason, a systematic review was undertaken mapping randomised controlled trials in which CFs were deployed for the implementation of innovation in healthcare practice. The aim of the systematic review was the identification and analysis of change facilitation strategies conducted by CFs during RCTs. The findings from the review highlighted 51 change facilitation strategies that had been used alongside RCTs. The most common change facilitation strategies were then mapped out to determine which strategies appeared in studies showcasing positive outcomes. The strengths of this paper lie in the establishment of a deeper understanding of the specific activities conducted by CFs in practice. The challenge highlighted by the systematic review, however, is that the change facilitation strategies throughout the RCTs were not separately evaluated, but only the overall outcome measures of the study were

evaluated. This makes it difficult for change facilitators to discern which components are essential and whether they are intended to be implemented [45, 51]. Recommendations from the systematic review focused on future evaluation of specific change facilitation strategies in relation to overcoming barriers associated with a particular context [43] for more specific evaluation of change facilitation strategies.

Linking implementation barriers with facilitation strategies

To improve patients' clinical outcomes, quality of life and the rationale use of medicines, innovations in pharmacy practice such as professional services in pharmacy practice [20, 21] are being implemented. Pharmacists, however, have identified the need for external assistance/ support [29] to ensure successful implementation. This led to the use of CFs during a commercial program run by a peak pharmacy body in Australia. For research purposes, CFs were asked to record data including a) implementation barriers they faced during implementation of professional pharmacy services, b) facilitation strategies they used to overcome these barriers c) at which visit to the practice the facilitation strategy or strategies were conducted, and d) whether the change strategies resolved the implementation barrier or not. This information was analysed using a Machine Learning approach called Random Forest to provide a prediction of the most effective facilitation strategies to overcome implementation barriers exhibited by pharmacy teams during the implementation of professional pharmacy services.

Results from the two-year implementation study brought to light 36 change barriers and 111 change facilitation strategies used to overcome such barriers. Chapter 3 focused on the 20% most common change barriers (n=7) which were; 1) an inability to plan for change 2) A lack of internal supporters for the change 3) A lack of knowledge and experience about the change 4) A lack of monitoring and feedback 5) A lack of individual alignment with the change 6) Undefined change objectives and lack of objective feedback and 7) A lack of time. Chapter 3 also highlighted the link between implementation barriers and the most effective facilitation strategies used to overcome them. The strength of this research is centered around the use of Machine Learning to provide CFs with more effective strategies to overcome specific

implementation barriers in practice. A limitation of this study, however, is that commercial pharmacy programs are often adopted by proactive, innovative teams who are likely to be more open to change. Research following this two-year implementation study needed to look at a more randomised cross-section of community pharmacy to see if these implementation barriers are also present in such pharmacies and whether these facilitation strategies would be equally effective.

Evaluation of tailored change facilitation interventions

A professional pharmacy service that has been explored internationally is a Minor Ailments Service (MAS). This has been implemented in the UK [52] and Canada [53] showing positive clinical, humanistic, and economic outcomes. To test such outcomes in Australia, a MAS cluster Randomised Controlled Trial (cRCT) was conducted [25, 27]. CFs were deployed in the intervention arm of the study to provide support and on-site training to pharmacy teams.

Intervention pharmacists delivering MAS were provided 1 hour face-to-face monthly visits by a CF at the pharmacy consisting of support and on-site training. CFs were trained on, and used, a tailored change facilitation approach, in which they were provided with 36 implementation factors and the 111 evidence-based facilitation strategies sourced from prior research (chapters 2 and 3). CFs were also provided predefined effectiveness outcomes specific to MAS. The predefined effectiveness outcomes related to service quality, reach and fidelity. Implementation outcomes focused the evaluation of the tailored change facilitation interventions. CFs were provided a macro-enabled Microsoft Excel Spreadsheet containing a drop-down list of possible implementation factors and facilitation strategies. Within the spreadsheet CFs recorded; a) the pharmacy name, b) the visit number, c) effectiveness measure, d) the implementation barrier identified, e) the facilitation strategy chosen, and f) whether the barrier was resolved or not.

CFs recorded 398 tailored interventions during an eight month period. Of these tailored interventions 67% of the implementation barriers were identified by CFs in the first two visits (across the first two months), out of these 75% were resolved in the same two visits. Following analysis, 22 change implementation barriers were isolated. The 20% most frequently occurring

barriers were: (1) a lack of prioritisation of the service (n=61); (2) a lack of internal supporters for the change (n=60); (3) team processes not conducive to change (n=46), and; (4) a lack of knowledge and experience regarding the change (n=41). To overcome 'a lack of prioritisation of the service', the most effective facilitation strategy used was to 'communicate the change to stakeholders', which had a Resolution Percentage (RP) of 67%. To overcome 'a lack of internal supporters for the change', the most effective change facilitation strategy used was to 'create buy-in among stakeholders' with a RP of 73%. To overcome 'team processes not conducive to change', the most effective change facilitation strategy used was to 'assist with/perform formal or informal audits', with a RP of 100%. To overcome 'a lack of knowledge and experience regarding the change', the most effective change facilitation strategy used was 'to empower stakeholders to develop objectives and problem-solve' with a RP of 100%.

Findings indicate that tailored change facilitation interventions can lead to CFs uncovering and addressing the majority of implementation barriers in their first two visits and can shed light into implementation barriers in a particular setting and the most effective facilitation strategies to overcome these barriers.

Proposal of a Change Facilitation Framework

Chapter 5 aimed to bring together findings from the previous 3 chapters including:

- The systematic review exploring change facilitation strategies used in healthcare practice.
- The implementation study that links change factors, with change facilitation strategies and change strategy evaluations.
- The feasibility of using a change facilitation framework during the implementation of an innovation such as the Minor Ailments Service in community pharmacy.

Chapter 5 proposed a non-linear, dynamic change facilitation framework that allows CFs to tailor their facilitation interventions, while focusing on both innovation implementation and adoption by stakeholders.

While the two studies (chapters 3 and 4) in this research were conducted in community pharmacy, the implementation factors and many of the facilitation strategies originated from an array of evidence- based frameworks and systematic reviews in healthcare [9, 11, 12, 33, 43, 45]. For this reason, the framework that was developed as a result of this research can be utilised for the facilitation of implementation of innovations across different healthcare practices, not only those specific to community pharmacy. The 6E Change Facilitation Framework (figure 3), provides CFs with a robust yet systematic approach to implement innovations in practice.

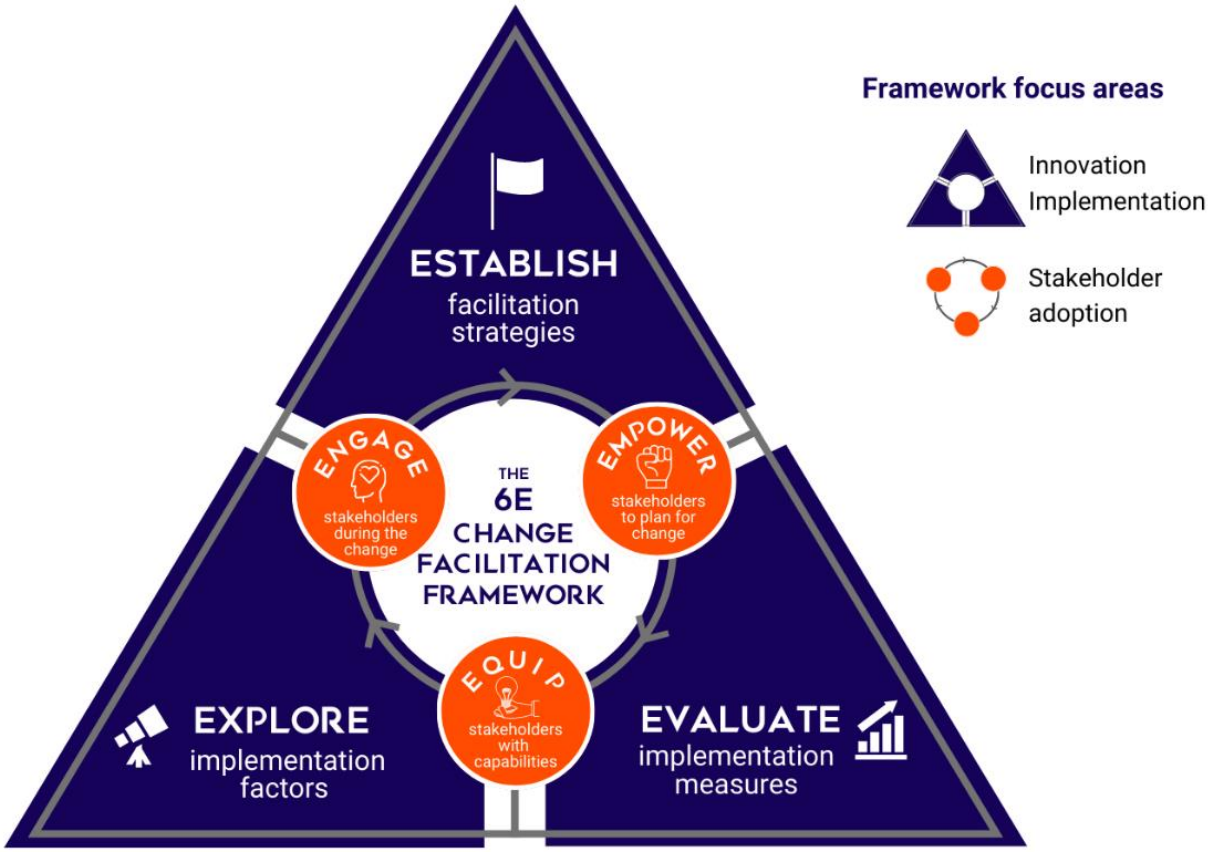

Figure 3. The 6E Change Facilitation Framework

The outer triangle of the framework focuses on the innovation being implemented. CFs can start at any of the outer three principles of the triangle. For example, CFscan start by exploring the implementation factors in a particular setting to understand the barriers or enablers for implementation. They can then choose to establish tailored facilitation strategies, after which they can evaluate these strategies in accordance with implementation progress.

Conversely, CFs can start by evaluating existing implementation progress, move towards exploration of implementation barriers inhibiting progress and then move towards establishing facilitation strategies to overcome such barriers.

The inner circle of the framework focuses on adoption of the innovation by stakeholders. The three adoption-focused principles are; 'Engage stakeholders onto the change', 'Empower stakeholders to plan for change', and 'Equip stakeholders with capabilities'. The use of these principles stems from the research conducted in community pharmacy, where the strategies that overcome the majority of implementation barriers were those aimed at 'empowering stakeholders', 'engaging stakeholders, and 'equipping stakeholders'. The position of these three principles means that they can be conducted simultaneously with any of the three outer points of the triangle that are related to the innovation being implemented. For example, to explore implementation factors, CFs may use strategies to engage stakeholders by facilitating a face-to-face workshop to discuss their concerns with the innovation being implemented. Similarly, CFs may use strategies to empower stakeholders to evaluate their implementation progress by facilitating the allocation of a change champion who can monitor and evaluate progress.

The development of the 6E Change Facilitation Framework as a triangle, rather than a stepped process, allows CFs to view and navigate change in a more dynamic manner, while providing a systematic approach that ensures tailoring and evaluation of strategies used. The need for a dynamic approach for CFs to use, comes after the analysis of CF activities during the MAS study (Chapter 4), which showed their movement and activities in practice did not match the phased approach recommended by the change facilitation taxonomy [33], but was more dynamic and nonlinear (Chapter 4).

Discussion

This research was conceived and undertaken at a time of significant changes to the healthcare landscape in Australia (Australia Government Department of Health). This discussion therefore highlights the use of Change Facilitation as an implementation intervention to assist with the implementation of such innovations in healthcare practice and The 6E Change Facilitation Framework to guide Change Facilitators during these implementations.

The use of change facilitation to implement innovation in healthcare practice

The efficacy and success of the use of change facilitation in healthcare has been proven across the literature [25, 35, 36, 54, 55]. Change facilitation has been used in guideline adoption [34], implementation of new technologies such as telehealth [56], system-wide organisational change in healthcare [57], implementing professional services in community pharmacy [25] and more. In addition to favourable outcomes due to change facilitation, a study showed the average cost per patient of change facilitation during a randomised controlled trial for the implementation of Minor Ailments was $0.07 AUD [27]. The same study showed that in conjunction with a referral pathway, appropriate recording and training, change facilitation also contributed to improved patient outcomes [25]. Such evidence emphasises the benefits that surround the use of change facilitation as an effective implementation innovation in healthcare practice and therefore the need for further research into optimisation of the change facilitation intervention.

As a way of advancing research in change facilitation, researchers require more in-depth knowledge of the "enabling techniques that influence change, what type of approach", and "the specific strategies used by facilitators to implement innovations" [32, 33]. Clarity on these enabling techniques and approaches is crucial in order to "discern which components are essential during implementation" [45].

In relation to the implementation of innovations such as Professional Pharmacy Services in community pharmacy, pharmacy researchers have investigated ways to implement innovations such innovations into practice. This led to the development of the Generic Implementation Framework [9], which demonstrated

the need to link factors, strategies and evaluations, there remained a gap, however, pertaining to the details of how CFs are to move from factors to strategies to evaluation of such strategies, as well as what barriers to look out for and how to overcome these barriers during implementation of Professional Pharmacy Services.

This thesis looks at tailored facilitation strategies used by CFs to overcome barriers during the implementation of innovation in healthcare practice, and provides CFs with a change facilitation framework, which can be used to enhance the change facilitation intervention.

The benefits of using an external change facilitator

Not only is the use of a CF beneficial to achieve successful implementation of innovation in healthcare practice, external CFs are also responsible for objectively unearthing implementation barriers, while using multifaceted interventions [55]. During the two-year implementation study (chapter 3) and the MAS study (chapter 4), external CFs with expertise in pharmacy were deployed during the studies. While asking pharmacy teams directly about their perceived barriers has some benefit, researchers have indicated that the barriers raised by healthcare professionals may not be an accurate representation of the true barriers in practice, but a perception or assumption of the barrier [58].

Allowing external CFs to record implementation barriers that they observe and experience during implementation, helps researchers and implementation teams gain a better understanding of 'real-world' challenges and interactions experienced in various settings. For example, while both the implementation study (Chapter 3) and MAS study (Chapter 4) used different CFs, conducted in different community pharmacies, and had different outcome measures, there were common implementation barriers recorded across both studies. The two implementation barriers that appeared in the most common 20% of change barriers across both studies were, a 'lack of internal support for the change' and 'a lack of knowledge and experience regarding the change'. This implies an overarching resistance to adoption of innovations, which has previously been identified as a barrier in pharmacy practice [18, 59, 60]. Understanding "real-world" change barriers allows researchers, implementation teams, policy makers, business owners and industry leaders to look for larger scale strategies to prevent and

overcome such barriers. In the aforementioned implementation barrier in chapter 3 of an 'inability to plan for change'. This barrier has previously been highlighted with an emphasis for pharmacy education to address this by building pharmacy students' ability to adapt to change [61–63]. For pharmacists in practice, this can be addressed by governing pharmacy bodies and pharmacy owners, through the delivery of continual professional development training, which is proven effective in initiating practice work changes, improving patient care, attitudes and values, among other benefits [64]. It has been noted that if 'pharmacy practice is to survive as an active participant in emerging healthcare systems, pharmacy practice must change along with the rest of health care' [61, 65, 66].

The importance of tailoring facilitation strategies to meet implementation factors in a particular setting

Understanding common implementation barriers related to a particular industry, helps determine more effective strategies to tackle these causes [67]. In both cases a number of strategies were conducted to overcome a 'lack of internal support for the change' and in both cases, the most effective strategies were to 'engage stakeholders by creating ownership of the change', 'empower development of objectives and problem-solving', and 'create buy-in among stakeholders' (chapters 3 and 4). All of these strategies allude to the empowerment, and engagement of individuals and teams, which is supported by a growing body of professional literature and academic research highlighting that performance can be enhanced when actions are taken that result in empowering individuals [68–71]. Empowering employees can encourage risk taking, innovation, and initiative [72], as well as increase knowledge sharing and enhance the team's performance [71]. Such knowledge can be used to educate pharmacy students, pharmacists and pharmacy owners to empower their teams during the implementation of innovations in practice. Specific strategies used by CFs to empower team inclusion, allowing stakeholders to develop their own objectives and solve problems, ensure stakeholders contribute to the change by sharing ideas, experiences, knowledge, acknowledging the importance of their roles, and more (chapter 5). Such strategies have been referred to in the

literature as participatory co-design and have been used widely in healthcare to improve collaboration and innovation from a wide range of stakeholders [73–76].

Deeper insight into specific facilitation strategies conducted by CFs

Findings in this thesis have contributed to filling the gap into the activities and strategies conducted by CFs during the implementation of innovations in healthcare practice. The systematic review (chapter 2) identified 51 change facilitation strategies extracted from the literature, while the two-year implementation study (chapter 3) shows the use of facilitation strategies tailored to the implementation barriers in the community pharmacy setting. With over 100 tailored facilitation strategies used by CFs in practice. The recorded facilitation strategies in chapters 2 and chapter 3, were then given to different CFs during the MAS study (chapter 4), to guide them during the implementation of MAS in community pharmacy. It is worthwhile noting the CFs were not given the tailored facilitation strategies, but a separate list of implementation barriers and facilitation strategies to choose from. It is also important to note that no additional facilitation strategies were recorded by CFs during the MAS study, which indicates that the strategies provided to the CFs from the implementation study were sufficient to overcome the barriers that were discovered during the MAS study. Results from this research have contributed to an increase in evidence-based change facilitation strategies, providing CFs with common implementation barriers to explore at an early stage of implementation as well as an extensive list of the most effective facilitation strategies to choose from (chapter 5).

The need for an approach that allows CFs to tailor interventions

A number of existing implementation frameworks and change models focus primarily on diagnosing the implementation factors in a particular setting, such frameworks are described as “determinant frameworks” [10], other frameworks or models focus on prescribing a set of strategies for implementation regardless of the setting [33, 77, 78]. There are, however, minimal implementation frameworks that allow for tailoring of strategies according to the implementation factors exhibited in a particular context [46]. A framework that enables such tailored interventions can increase the chance of successful implementation [13]. The concept

of tailoring an intervention according to the implementation factor is exhibited in the MAS study (chapter 4), where the most common implementation barrier recorded was the 'lack of prioritisation of the change'. To overcome this barrier, the most effective facilitation strategy was to "communicate the change" with a resolution percentage of 67%. This strategy, however, was not effective in overcoming other barriers such as 'a lack of internal support for the change', instead, the most effective strategy to overcome this barrier was to 'create buy-in among stakeholders'. Such findings emphasise that there is no "one-size-fits-all" single strategy for successful change implementation [42, 79–81], but the need for tailored intervention to overcome existing barriers to implementation. The combination of a tailored intervention and the use of change facilitation has been recommended for the implementationof other innovations such as antimicrobial stewardship programs in hospitals, as each hospital has a unique antibiogram, patient population, stewardship barriers, and champions that influence how an antimicrobial stewardship program can be successful [81]. Similarly, the concept of tailored intervention with follow-up (such as that conducted by CFs), has been proven effective in health behaviour change messaging [82] and in increasing screening mammography in urban areas [83].

The need for a framework that intertwines implementation with adoption

In healthcare, the need to combine implementation and adoption is deemed crucial for successful integration of an innovation into an healthcare organisation or practice [84–87]. While there is an array of frameworks and models focused on implementation of innovations (chapter 5, table 1.), an adoption gap has been noted in healthcare [88], with the need to look at organisational change management as a way to aid in adoption of innovations in healthcare [88–92]. Organisational change management is a business management discipline, and while there are an array of Planned Organisational Change Models (POCMs) in organisational change management, these do not adequately link to implementation, which is known in Business Management as Project Management [93]. There has been a long-standing debate in business management, regarding the separation in focus of the innovation being implemented (project management) and its adoption by stakeholders (change management) [93]**.** While all knowledge areas in the Project Management Body of Knowledge (PMBOK) are rooted in

controlling change, none of these areas specifically addresses the human elements of change [94]. In a study of 42 IT projects, researchers found that “technical-causal factors” accounted for 35% of project failure rate, while the remaining 65% were due to the people-related factors [95]**.** Researchers in business management refer to the people aspect of change implementation as a complex, systemic phenomenon that involves the interdependence of a multiplicity of variables, and therefore requires a dynamic approach that combines multiple aspects of change implementation [93, 95]. There is, therefore, a need for a framework that intertwines both the implementation of innovation (project) and its adoption by stakeholders (people).

A dynamic, multifaceted Change Facilitation Framework focusing on implementation, adoptionand tailoring of interventions

The 6E Change Facilitation Framework proposed in chapter 5, allows CFs to link implementation factors, facilitation strategies, and evaluations of implementation progress for a more tailored change facilitation intervention [13]. The framework combines concepts from “determinant frameworks” and “process models” [10], to allowfor both the diagnosis of existing factors and tailoring of strategies to achieve successful implementation. It also provides a more dynamic approach for CFs to move through implementation, which is more realistic than existing linear, stepped or phased approaches that typically exist in process models [96]. This framework also aims to fill the adoption gap in health [88], by combining principles that focus on both adoption by stakeholders and implementation of the innovation in practice.

Future application of the 6E Change Facilitation Framework

Further validation is required in the use of the 6E Change Facilitation Framework across various fields outside of community pharmacy as well as during the implementation of innovations other than Professional Pharmacy Services. Future research can also work towards transferring such a framework into a digitally enabled platform in which CFs can directly record their activities, implementation barriers and evaluation of their strategies. With innovative approaches used for this research such as Machine Learning, future work can look towards building larger datasets to enhance predictive models and scale these towards implementation

of industry-wide innovations.

Recommendations

Below is a summary of the previously mentioned recommendations

- The use of Change Facilitation as an intervention for the implementation of innovation in healthcare.
- The use of trained external CFs as objective parties who can unearth deep underlying implementation barriers and record and closely monitor progress.
- The need to tailor strategies according to implementation factors as there is no one-size fits all strategy for implementation.
- The need for additional knowledge of the activities conducted by CFs in practice through adequate recording and evaluation of these activities.
- The use of the proposed 6E Change Facilitation Framework as it allows the tailoring of strategies according to the setting and innovation and combines principles surrounding the implementation and adoption of innovations.

Conclusion

Change facilitation is an intervention that has been proven effective for the implementation of innovation in healthcare practice. The use of external Change Facilitators (CFs), not only allowed for objective discovery of implementation barriers related to specific settings, CFs were also able to tailor their facilitation strategies to overcome the specific implementation barriers. In doing so, over 100 facilitation strategies were generated from the research findings. Findings also highlighted common implementation barriers experienced in the community pharmacy context and the most effective change facilitation strategies to overcome such barriers using innovative machine learning approaches. Findings also indicated that there is no ‘one-size fits

all’ strategy and proposes the 6E Change Facilitation Framework which allows CFs to link diagnostic approaches with facilitation strategies while engaging, empowering and equipping stakeholders throughout the implementation journey.

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Appendices

List of abbreviations

CF	Change Facilitation
CFIR	Consolidated Framework of Implementation Research
COVID-19	CoronaVirus Disease - 2019 outbreak
cRCT	Cluster Randomised Controlled Trial
EPOC	Effective Practice and Organisation Care
FISpH	Framework for the Implementation of Pharmacy Services
GIF	Generic Implementation Framework
GPs	General Practitioners
GROW	Goals-Reality-Options-Will model
GSH	Graduate School of Health
MAS	Minor Ailments Service
ML	Machine Learning
PARiHS	Promoting Action Research in Health Services
PDSA	Plan-Do-Study-Act cycle
PHN	Primary Health Network
POCM	Planned Organisational Change Model
PRISMA	Preferred reporting items for systematic reviews and meta-analysis
PRP	Predictive Resolution Percentage
PSA	Pharmaceutical Society of Australia
RF	Random Forest
STROBE	Strengthening the Reporting of OBservational Studies
TDF	Theoretical Domains Framework
TICD	The Integrated Checklist of Determinants of practice
RP	Resolution Percentage
SMART	Specific-Measurable-Realistic-Timely goals
SWOT	Strengths-Weaknesses-Opportunities-Threats analysis
UC	Usual pharmacist Care
UK	United Kingdom
UTS	University of Technology Sydney

Authors' contributions

Paper 1: Change Facilitation Strategies Used in the Implementation of Innovations in Healthcare Practice: A Systematic Review.

LM, VG, and SIB conceived and designed the analysis, LM collected and summarised the data from the literature. LM analysed the effectiveness of the change facilitation strategies. LM wrote the paper. VG and SIB contributed to editing of the paper and provided final approval for the paper to be submitted.

Paper 2: Data-Driven Approach for Tailoring Facilitation Strategies to Overcome Implementation Barriers in Community Pharmacy

LM, VG, and SB conceived and designed the analysis, LM collected the data from Change Facilitators throughout the two-year study. LM categorised the facilitation strategies. KM and SK performed the analysis of the data using statistical analysis and a data-driven approach called random forest. LM wrote the paper, while KM and SM contributed to the data-analysis of the method section. VG and SB contributed to editing of the paper and provided final approval for the paper to be submitted.

Paper 3: Evaluation of tailored change facilitation interventions used during the implementation of a Minor Ailments Service in community pharmacy

LM, VGC, SDG, and SB conceived and designed the analysis, LM collected the data from Change Facilitators throughout the eight-month study. LM categorised the facilitation strategies and performed the analysis. LM wrote the paper, while SDG contributed to the method section. VGC and SB contributed to editing of the paper and provided final approval for the paper to be submitted.

Paper 4: The 6E Change Facilitation Framework | A dynamic change framework to navigate implementation and adoption of innovations in healthcare and beyond

LM, conceived the 6E Change Facilitation Framework and wrote the article. AM, VGC and SB contributed to editing of thepaper and VGC provided final approval for the paper to be submitted.

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Chapter 4

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Chapter 2 | Additional file 1

Additional file 1: Search strategies used in the systematic review

Source	Search terms for second search
PubMed	((“External Facilitator” OR “Facilitation” OR “Facilitator” OR “Coach” OR “Coaching” OR “External Coach”) AND ("Health Plan Implementation"[Mesh] OR "Regional Health Planning"[Mesh] OR "Implementation" OR “Change Implementation” OR "Diffusion of Innovation" OR "Knowledge transfer" OR "Knowledge exchange" OR "knowledge translation" OR “Knowledge management”[Mesh] OR "guideline implementation" OR "Evidence-based practice implementation" OR "Research implementation" OR “Implementation science”) AND ("Evidence-based practice" OR "Evidence-based" OR "Practice guidelines" OR "Research utilisation" OR "Practice development" OR "Professional development" OR “Organisational learning” OR “Organisational theory” OR “Organisational innovation” OR “Practice” OR “Quality Improvement” OR “Interpersonal relations” OR “Interprofessional relations” OR “Attitude of health personnel” OR "Information dissemination”[Mesh]))
Web of Science	TOPIC: (facilitation or coaching) AND TOPIC: (Implementation or knowledge transfer or change implementation) ANDTOPIC: (Evidence based practice or practice guidelines or organisational learning or practice or quality improvement or Information dissemination) Timespan: 1966-2017. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI, CCR-EXPANDED, IC.
Scopus	Facilitation or coaching AND Implementation AND Evidence based practice (Based on article title, abstract & keywords)

Chapter 2 | Additional file 2

Additional file 1: Summary of study characteristics

First author (Year) Country	Healthcare practice	Participant unit (Sample size)	Duration of intervention (months)	No. of arms within each study Description of arms	Facilitator title	Innovation being implemented/ targeted behaviour	Outcome category(ies)	Specific outcome(s) measured	Result of main outcomes; Significantly positive, significantly negative, Insignificant, Mixed, no P value reported
Aspy C et al. (2008) USA	General Practices	General Practices (16)	9	Two arms 1) Facilitation (I) 2) Usual care (C)	Practice Enhancement Assistants	Apply best practice research methodology to the problem of breast cancer screening	Patient-related	Mammograms offered to eligible patients and mammograms completed	Significantly positive Proportion of mammograms offered P=0.043 Proportion of patients with current mammograms P<0.015
Cockburn J et al. (1992) Australia	General Practices	General practitioners (GPs) (264)	2	Three arms 1) Personal delivery and presentation by an educational facilitation with a follow up visit six weeks later (I) 2) Delivery to the receptionist by a friendly volunteer courier with a follow up call six weeks later (I) 3) Postal delivery with a follow up letter six weeks later (C)	Educational facilitator	Use of intervention kit by general practitioners for patient smoke cessation	Adoption	Mean number of smoke cessation cards used by practitioners	Significantly positive P=0.0005

Dickinson L et al. (2015) USA	Primary care practices	Practices (40)	18	Three arms 1) Practice facilitation (PF) over 6 months using reflective adaptive process (RAP) (I) 2) PF for up to 18 months using a continuous quality improvement (CQI) approach (I) 3) Self Directed (SD) practices with model information and resources without facilitation (C)	Facilitator	Implementing the Chronic Care Model (CCM) to improve diabetes care	Combination	Multiple diabetes quality measures and change culture, chaos and work culture were measured	Mixed Overall : P<0.0001 RAP: P=0.03 CQI: P<0.0001
Dietrich A et al. (1992) USA	Ambulatory care practices	Practices (98)	3	Two arms 1) Facilitation (I) 2) Education alone (C)	Facilitator	Cancer early detection and preventive services	Combination	Mean rate of prevention service : Mammogram, clinical breast examination, breast self-examination recommendation, cervical cytology, stool occult blood, digital rectal examination, sigmoidoscopy, reduce fat recommendation, increase fibre recommendation, advise smokers to quit.	Mixed
Dobbins M et al. (2009) Canada	Public health departments	Public health decision makers (30)	12	Three arms 1) Access to online registry of research evidence (C) 2) A Knowledge broker (I) 3) Tailored messaging (I)	Knowledge broker	Promotion of healthy body weight in children	Adoption	Global EIDM outcomes & Healthy body weight policies and programs (HPPs)	Mixed
Due T et al. (2014) Denmark	General Practices	Practices (189)	9	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	COPD management	Patient - related	Self-reported annual check-ups for COPD and stratification for DM2	Mixed

Engels Y et al. (2006) Netherlands	Primary care practices	Practices (49)	5	Two arms 1) Facilitation (I) 2) Written feedback alone (C)	Outreach visitor	Team-based model for continuous quality improvement (CQI) on primary care practice management	Adoption	Mean number of improvement projects initiated 1) defined and 2) Successfully completed	Significantly positive 1) P<0.001 2) P<0.001
Eriksson L et al. (2013) Eriksson L et al. (2016)	Hospital-Neonatal health unit	Groups (44)	36	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	Neonatal health-Knowledge into practice (NeoKIP) to lower neonatal mortality	Patient- related	Neonatal mortality	Significantly positive P=0.0128
Frijling BD et al. (2002) Frijling BD et al. (2003) Netherlands	General Practices	Practices (124) General Practitioners (185)	21	Two arms 1) Facilitation (I) 2) Feedback reports alone (C)	Facilitator	Clinical decision making of general practitioners (GPs) for patients with diabetes.	Patient - related	2002 study- looks at 7 outcomes relating to diabetes care such as weight control, medication problems, blood pressure, foot examinations, eye examination and blood glucose control. 2003 study looks at 12 indicators for management of patients with hypertension, hypercholesterolemia, angina pectoris and heart failure	Mixed
Fu S et al. (2015) USA	VA Medical Centre	Clinicians (34)	3	Two arms 1) An MI champion, MI expert trainer, half a day workshop training & self-study materials. (C) 2) All the above plus 6 supplemental booster coaching sessions (I)	Coach	Motivational interviewing (MI) to address tobacco use	Adoption	Clinicians' motivational interviewing skills in the delivery of tobacco cessation care	Mixed
Gustafson D et al. (2013) USA	Addiction treatment clinics	Clinics (201)	18	Four arms 1) Group teleconferences (C) 2) Clinic-level coaching (I) 3) Learning sessions through face-to-face	Coach	Improvement collaborative in addiction treatment	Patient-related	Patient waiting time, number of new patients and patient retention	Mixed

				meetings (I) 4) Combination of all three (I)					
Harris M et al. (2015) Australia	General practices	General practitioners (GPs) and Practice Nurses (PNs) (122 at baseline and 97 at completion)	6	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	Guidelines for prevention of chronic vascular disease	Combination	Patient: Change is smoking status, alcohol intake, BMI, waist circumference, BP, Lipids, fasting blood glucose & CV risk Implementation: Change in self-reported frequency and confidence of GPs & PBs in assessment	Mixed
Hogg W et al. (2008) Canada	Family practice	Practices (22)	12	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	The provision of preventive care	Adoption	Preventive performance	Mixed
Houle S et al. (2016) Canada	Pharmacy	Pharmacies (10)	6	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	Medication Management services to patients	Adoption	Medication Management counts & the Alberta Context Tool (ACT)	Mixed Facilitation was deemed effective Medication Management counts decreased
Jaen C et al (2010) Nutting P et al. (2010) USA	Family practice	Practices (36)	26	Two arms 1) Facilitation (I) 2) Self-directed web-based tools (C)	Facilitator	Patient centred medical homes (PCMHs) looking at preventive care	Combination	Level of implementation of NDP model components & patient measures including; patients' access to care, care coordination, comprehensive care, personal relationship over time, global practice experience, service relationship satisfaction, patient empowerment, self-rated health status	Mixed Significant for level of implementation P=0.005 Not significant for patient outcomes

Johnston C et al. (2007) Canada	Hospitals - paediatric	Hospitals (6)	18	Two arms 1) Facilitation (I) 2) Usual care with regular audits (C)	Coach	Change attitudes and knowledge about pain in children	Combination	Pain management experience evaluation, Paediatric nurses' knowledge and attitudes survey regarding pain, analgesic administration before and after coaching	Mixed
Kauth M et al. (2010) USA	VA Medical Centre	Therapists (HCP's) (23)	8	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	Cognitive behavioural Therapy	Adoption	Therapists' use of CBT	Mixed
Kinsinger L et al. (1998) USA	Primary care practices	Practices (62)	12	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	Office system intervention to increase breast cancer screening	Combination	Level of implementation: Practice -level measures of office systems from a physician questionnaire Patient: Performance of breast cancer screening in last year for women age 50 years and older by chart review	Mixed
Lemelin J et al. (2001) Canada	Health service organisations	Practices (46 entered and 45 completed the trial)	18	Two arms 1) Facilitation (I) 2) Usual care (C)	Prevention Facilitator	Multiple preventive care including Cancer, BP, glucose, STD	Patient - related	Preventive performance calculated as a proportion of eligible patients who received 8 recommended preventive manoeuvres less the proportion of eligible patients who received 5 inappropriate preventive manoeuvres.	Mixed In absolute performance Appropriate manoeuvers P=0.008 Inappropriate manoeuvres P=0.019
Liddy C. et al. (2015) Canada	Primary care practices	Practices (84)	24	Two arms 1) Facilitation (I) 2) Usual care (C) *Stepped wedge cluster randomised trial	Facilitator	Improved Deliver of Cardiovascular Care IDOCC project	Patient - related	Mean adherence to indicators measured at the patient level	Not significant

Lobo et al. (2002) Netherlands	General Practices	Practices (124)	21	Two arms 1) Facilitation (I) 2) Usual care (C)	Educational outreach visitor	Cardiovascular preventive care	Adoption	The difference in deficiency scores (difference between ideal and actual practice in each aspect of organizing preventive care) before and after the intervention.	Significantly positive P<0.001
Margolis P et al. (2004) USA	Private paediatric and family practices	Practices (44)	24	Two arms 1) Facilitation (I) 2) Only publicly available material given (C)	Project team	Practice based continuing medical education to improve delivery of preventive care in children	Patient - related	Change in time of proportion of children aged 24-30 months who received aged appropriate care for four preventive services (immunisation, and screening for tuberculosis (TB), anaemia and lead)	Significantly positive P<0.05
McBride P et al. (2000) USA	Primary care practices	Practices (45)	12	Four arms 1) Conference only group (C) 2) Consultation group (I) 3) Prevention coordinator group (I) 4) Combined intervention group - with all the above (I)	Prevention coordinator	Preventive systems implementation in heart disease prevention services	Combination	Prevention goals set and implemented regarding; screening tool, management tools, smoking and cholesterol	Mixed
Modell M et al. (1998) UK	General Practices	Practices (26)	12	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	Screening for carriers of haemoglobin disorders by using a nurse facilitator	Patient-related	Number of screening test requests made	Significantly positive P<0.0001
Mold J et al. (2008) USA	Primary care practices	Practices (24)	6	Two arms 1) Facilitation (I) 2) Usual care (C)	Practice Enhancement Assistants	Preventive services in primary care practices	Combination	Adoption of Evidence based strategies and changes in rates of delivery of selected preventive services such as DTaP#4, MMR, HepB#3, Pneumovax, Mammography and CRC screen	Mixed

Mold J et al. (2014) USA	Primary care practices	Practices (43)	6	Four arms 1) Practice Facilitation (PF) alone (I) 2) Local learning collaborative alone (LLC) alone (I) 3) PF + LLC (I) 4) Usual care (C)	Facilitator	Implementation of Asthma guidelines	Patient - related	Assessment of; Asthma severity, environmental triggers, level of control, asthma action plan, asthma controller medications and asthma follow up visits	Significantly positive
Noel P et al. (2014) Parchman M et al. (2013) USA	Primary care practices	Practices (40 recruited 37 completed trial)	12	Two arms 1) Facilitation (I) 2) Usual care (C) * Stepped wedged cluster-randomised controlled trial	Facilitator	To improve the quality of diabetes care through activities & Chronic Care Model components (CCM)	Adoption	Percentage implementation of CCM activities	Mixed- Not significant according to Noel et al., Significant according to Parchman et al.
Palter V et al. [26] (2016) Canada	Academic teaching hospital	Surgeons (18)	0.5	Two arms 1) Facilitation (I) 2) Web tutorial only (C)	Peer coach	Laparoscopic suturing	Adoption	Performance of a laparoscopic stitch with extracorporeal knot	Significantly positive
Pattinson R et al. [50] (2005) South Africa	Hospitals	Hospitals (34)	8	Two arms 1) Facilitation and implementation package (I) 2) Implementation package alone (C)	Facilitator	Implementation of Kangaroo Mother Care	Adoption	Demonstration of evidence of practice through a grading system	Significantly positive
Rycroft-Malone J et al. [41] (2012) UK	Hospitals	Hospitals (19)	6	Three arms 1) SD plus web-based education package championed by an opinion leader (I) 2) SD plus a Plan-Do-Study-Act (PDSA) approach with a facilitator (I) 3) Standard Dissemination (SD) of a guideline package (C)	Facilitator	Strategies to decrease pre-operative fasting	Combination	Duration of fluid fast prior to induction of anaesthesia. Duration of food fast, patients' experience and stakeholders' experience.	Mixed Patient: Insignificant Organisational: Mixed
Shaw et al. [33] (2013) USA	Primary care practices	Practices (23)	6	Two arms 1) Facilitation (I) 2) Usual Care (C)	Facilitator	Improve colorectal cancer screening rates	Patient-related	Colorectal Cancer Screening	Not significant

Solberg L et al. [47] (1998) USA	Primiary care clinics	Clinics (44)	22	Two arms 1) Facilitation (I) 2) Usual care (C)	Consultant	Delivery of preventive services	Adoption	Number of prevention process/service components in place post intervention	Mixed
Stange et al. [48] (2003) USA	Family practice	Practices (77)	12	Two arms 1) Facilitation (I) 2) Usual care (C)	Facilitator	Preventive service delivery facilitation	Adoption	Global preventive service delivery rates at the 1-year follow-up	Significantly positive p= 0.015
Van Beurden I et al. [43] (2012) Netherlands	General practices	General practices (77) General practitioners (119)	8	Two arms 1) Facilitation (I) 2) Usual care and patients sent an information letter about alcohol consumption (C)	Facilitator	Improvement program on GPs' behaviour towards prevention of hazardous and harmful alcohol consumption	Combination	Patient: Number of eligible patients who received screening and advice. Level of implementation: GPs providing screening and advice	Not significant
Van Bruggen R et al. [29] (2008) Netherlands	General practices	General practices (30)	12	Two groups 1) Facilitation (I) 2) Usual care (C)	Facilitator	Implementation of locally adapted guideline on shared care for people with Type 2 diabetes	Patient-related	Patients seen, Blood pressure and body mass measurements performed, HbA1c% , blood pressure results, BMI, mean cholesterol and treatment satisfaction	Mixed

Chapter 2 | Additional file 3 | Supplementary File 3. Facilitation strategies used for the implementation of innovation in health care (in order of the frequency in which they appear across 35 Randomised Controlled Trials)

	Facilitation strategies	References
1	Provide tools/ educational materials	(Aspy et al., 2008; Cockburn et al., 1992; Dietrich et al., 1992; Dobbins et al., 2009; Due et al., 2014; Engels et al., 2006; Frijling et al., 2002; Fu et al., 2015; Gustafson et al., 2013; Hogg et al., 2008; Jaen et al., 2010; Kinsinger et al., 1998; Lemelin et al., 2001; Liddy et al., 2015; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Modell et al., 1998; Mold et al., 2008; Mold et al., 2014; Noel et al., 2014; Pattinson et al., 2005; J. Rycroft-Malone et al., 2012; Stange et al., 2003; van Bruggen et al., 2008)
2	Baseline practice audit via patient chart audits or participant questionnaires/ surveys	(Aspy et al., 2008; Dickinson et al., 2015; Dietrich et al., 1992; Dobbins et al., 2009; Due et al., 2014; Engels et al., 2006; Eriksson et al., 2013; Frijling et al., 2002; Hogg et al., 2008; Jaen et al., 2010; Johnston et al., 2007; Kinsinger et al., 1998; Lemelin et al., 2001; Liddy et al., 2015; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Modell et al., 1998; Mold et al., 2008; Mold et al., 2014; Noel et al., 2014; Solberg et al., 1998; Stange et al., 2003)
3	Provide post-audit feedback to participants	Aspy et al., 2008; Dickinson et al., 2015; Dietrich et al., 1992; Dobbins et al., 2009; (Due et al., 2014)Engels et al., 2006; Eriksson et al., 2013; Frijling et al., 2002; Hogg et al., 2008; Jaen et al., 2010; Johnston et al., 2007; Kinsinger et al., 1998; Lemelin et al., 2001; Liddy et al., 2015; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Modell et al., 1998; Mold et al., 2008; Mold et al., 2014; Noel et al., 2014; Solberg et al., 1998; Stange et al., 2003)
4	Tailor approach according to practice needs	(Aspy et al., 2008; Dietrich et al., 1992; Dobbins et al., 2009; Due et al., 2014; Engels et al., 2006; Frijling et al., 2002; Gustafson et al., 2013; Harris et al., 2015; Hogg et al., 2008; Houle et al., 2016; Jaen et al., 2010; Kinsinger et al., 1998; Lemelin et al., 2001; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Mold et al., 2008; Noel et al., 2014; Pattinson et al., 2005; Shaw et al., 2013; Solberg et al., 1998; Stange et al., 2003; van Beurden et al., 2012)
5	Assess progress and outcomes	(Cockburn et al., 1992; Dobbins et al., 2009; Due et al., 2014; Engels et al., 2006; Eriksson et al., 2013; Frijling et al., 2002; Gustafson et al., 2013; Harris et al., 2015; Kauth et al., 2010; Lemelin et al., 2001; Liddy et al., 2015; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Mold et al., 2008; Mold et al., 2014; Noel et al., 2014; Palter et al., 2016; Pattinson et al., 2005; van Bruggen et al., 2008)
6	Ask participants to identify barriers	(Cockburn et al., 1992; Dobbins et al., 2009; Engels et al., 2006; Eriksson et al., 2013; Gustafson et al., 2013; Hogg et al., 2008; Houle et al., 2016; Jaen et al., 2010; Kauth et al., 2010; McBride et al., 2000; Mold et al., 2008; Noel et al., 2014; Pattinson et al., 2005; J. Rycroft-Malone et al., 2012; Shaw et al., 2013; Solberg et al., 1998; Stange et al., 2003; van Beurden et al., 2012; van Bruggen, Gorter, Stolk, Verhoeven, & Rutten, 2008)
7	Provide staff training	(Aspy et al., 2008; Cockburn et al., 1992; Dietrich et al., 1992; Dobbins et al., 2009; Due et al., 2014; Fu et al., 2015; Jaen et al., 2010; Kauth et al., 2010; Kinsinger et al., 1998; Lemelin et al., 2001; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Modell et al., 1998; Mold et al., 2008; Noel et al., 2014; Solberg et al., 1998; Stange et al., 2003; van Beurden et al., 2012)
8	Aid in making an improvement plan	Eriksson et al., 2013; Frijling et al., 2002; Gustafson et al., 2013; Hogg et al., 2008; Kinsinger et al., 1998; Lemelin et al., 2001; Liddy et al., 2015; Noel et al., 2014; Palter et al., 2016; Solberg et al., 1998; Stange et al., 2003)
9	Utilise goal setting	(Aspy et al., 2008; Dietrich et al., 1992; Dobbins et al., 2009; Due et al., 2014; Engels et al., 2006; Frijling et al., 2002; Gustafson et al., 2013; Harris et al., 2015; Hogg et al., 2008; Jaen et al., 2010; Kauth et al., 2010; Kinsinger et al., 1998; Lemelin et al., 2001; Liddy et al., 2015; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Mold et al., 2008; Mold et al., 2014; Noel et al., 2014; Nutting et al., 2010; Palter et al., 2016; Solberg et al., 1998; Stange et al., 2003)
10	Utilise consensus building	(Aspy et al., 2008; Dietrich et al., 1992; Engels et al., 2006; Frijling et al., 2002; Hogg et al., 2008; Jaen et al., 2010; Kinsinger et al., 1998; Lemelin et al., 2001; Liddy et al., 2015; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Mold et al., 2008; Mold et al., 2014; Noel et al., 2014; Solberg et al., 1998; Stange et al., 2003)
11	Provide ongoing feedback (verbal and written)	(Aspy et al., 2008; Dickinson et al., 2015; Dobbins et al., 2009; Due et al., 2014; Frijling et al., 2002; Fu et al., 2015; Hogg et al., 2008; Kauth et al., 2010; Kinsinger et al., 1998; Lemelin et al., 2001; Liddy et al., 2015; Stange et al., 2003; van Bruggen et al., 2008)
12	Identify an internal champion	(Dobbins et al., 2009; Engels et al., 2006; Eriksson et al., 2013; Fu et al., 2015; Gustafson et al., 2013; Jaen et al., 2010; Lobo et al., 2002; Margolis et al., 2004; McBride et al., 2000; Solberg et al., 1998; Stange et al., 2003)
13	Identify strategies	(Dobbins et al., 2009; Frijling et al., 2002; Gustafson et al., 2013; Houle et al., 2016; Jaen et al., 2010; Liddy et al., 2015; Margolis et al., 2004; Mold et al., 2014; Solberg et al., 1998; van Beurden et al., 2012)

14	Promote group discussion	(Dobbins et al., 2009; Due et al., 2014; Eriksson et al., 2013; Liddy et al., 2015; Noel et al., 2014; Pattinson et al., 2005; J. Rycroft-Malone et al., 2012; Stange et al., 2003; van Bruggen et al., 2008)
15	Participant surveys and questionnaires	Aspy et al., 2008; Dickinson et al., 2015; Dietrich et al., 1992; Dobbins et al., 2009; Due et al., 2014; Jaen et al., 2010; Mold et al., 2014; J. Rycroft-Malone et al., 2012; van Beurden et al., 2012)
16	Plan-Do-Study-Act (PDSA) Cycle	(Aspy et al., 2008; Dickinson et al., 2015; Eriksson et al., 2013; Liddy et al., 2015; Mold et al., 2008; J. Rycroft-Malone et al., 2012)
17	Identify priorities	(Dobbins et al., 2009; Eriksson et al., 2013; Frijling et al., 2002; Lemelin et al., 2001; Lobo et al., 2002; Noel et al., 2014)
18	Baseline self-evaluation	(Engels et al., 2006; Lobo et al., 2002; Margolis et al., 2004; Palter et al., 2016; J. Rycroft-Malone et al., 2012)
19	Ask participants to identify existing successes and strengths	(Dobbins et al., 2009; Jaen et al., 2010; Palter et al., 2016; J. Rycroft-Malone et al., 2012; Stange et al., 2003)
20	Promote teamwork and collaboration	(Dobbins et al., 2009; Jaen et al., 2010; Noel et al., 2014; Palter et al., 2016; J. Rycroft-Malone et al., 2012)
21	Tailor resources/ tools	Dobbins et al., 2009; Harris et al., 2015; Kinsinger et al., 1998; Lemelin et al., 2001; Margolis et al., 2004)
22	Utilise flow-charting/ flow sheets	(Aspy et al., 2008; Gustafson et al., 2013; Hogg et al., 2008; Kinsinger et al., 1998; McBride et al., 2000)
23	Conduct academic detailing	(Aspy et al., 2008; Hogg et al., 2008; Lemelin et al., 2001; Margolis et al., 2004; Mold et al., 2014)
24	Overcome Information Technology issues including patient reminder systems	(Aspy et al., 2008; Hogg et al., 2008; Jaen et al., 2010; Lemelin et al., 2001; Modell et al., 1998)
25	Ask participants to share ideas	(Dobbins et al., 2009; Houle et al., 2016; Johnston et al., 2007; Mold et al., 2008)
26	Aid in overcoming challenges	Eriksson et al., 2013; Noel et al., 2014; J. Rycroft-Malone et al., 2012)
27	Evaluate outcomes by assessing participant performance	Lemelin et al., 2001; McBride et al., 2000; Noel et al., 2014)
28	Baseline participant performance evaluation	(Fu et al., 2015; Kinsinger et al., 1998; Lemelin et al., 2001)
29	Encourage communication among participants	(Noel et al., 2014; Shaw et al., 2013; Stange et al., 2003)
30	Ensure participant ownership of solutions	(Jaen et al., 2010; Mold et al., 2014; Shaw et al., 2013)
31	Promote experience and knowledge sharing	(Liddy et al., 2015; J. Rycroft-Malone et al., 2012)
32	Promote sharing of responsibilities	(Dietrich et al., 1992; Kinsinger et al., 1998)
33	Provide access to evidence-based knowledge	(Dobbins et al., 2009; Margolis et al., 2004)
34	Evaluate outcomes through patient satisfaction surveys	(McBride et al., 2000; Noel et al., 2014)
35	One on one participant interviews and surveys	(Houle et al., 2016; Stange et al., 2003)
36	Comparison of practice audit results to network benchmarking	(Aspy et al., 2008; Engels et al., 2006)
37	Promote critical reflection/ thinking	Fu et al., 2015; E. K. Shaw et al., 2013)
38	Conduct story-boarding	(Due et al., 2014; Gustafson et al., 2013)
39	Organise team meetings	(Lemelin et al., 2001; Mold et al., 2008)
40	Utilise role-playing	(Cockburn et al., 1992; Fu et al., 2015)
41	Conduct a demographic analysis	(Aspy et al., 2008; Due et al., 2014)
42	Tailor staff roles	(Kinsinger et al., 1998)
43	Conduct a cost-benefit analysis	Gustafson et al., 2013)
44	Conduct a Strengths-Weaknesses-Opportunities- Threats (SWOT) analysis	(Eriksson et al., 2013)
45	Evaluate outcomes through patient telephone interviews	(Lemelin et al., 2001)
46	Use think aloud process	(Johnston et al., 2007)
47	Create an organisational chart	(Stange et al., 2003)
48	Conduct brainstorming	(Liddy et al., 2015)
49	Utilise skills practice	(Fu et al., 2015)
50	Model effective team meetings	(Noel et al., 2014)
51	Promote professional development	(Dobbins et al., 2009)

Chapter 3| Additional file 1 | The description of the implementation factors identified by the Change Facilitators during the two-year study in pharmacy practice.

IMPLEMENTATION FACTOR	Frequency of appearance (n=1131)	DESCRIPTION OF IMPLEMENTATION FACTOR
Ability to plan change [1]	184	Planning associated with implementation of the change program*.
Internal supporters and opponents of the change [1]	128	Support provided by the pharmacy staff members for the implementation of the program. *(Ex.: help from peers or co-workers, time needed to provide the service, etc.)*
Knowledge/ experience [2]	84	The extent to which the targeted individuals have skills, knowledge and experience that they need to adhere.
Monitoring and feedback [1]	61	The extent to which monitoring and feedback are needed at organisational level and available to sustain necessary changes.
Individual alignment with the change (compatibility) [3]	49	The degree of tangible fit between meaning and values attached to the intervention by involved individuals, how those align with individuals' own norms, values and perceived risks and needs.
Objectives and feedback [1]	46	The degree to which implementation objectives have been defined, communicated and achieved by the members of the pharmacy. (*E.g.: Objectives for the provision of the program, objectives set to solve detected barriers, target number of patients).*
Time^	43	Amount of time devoted to implementation of the change.
Team communication^	42	Type, quantity, communication flow between the pharmacy's staff around the program.
Priority perception[1,3]	41	Perception shared by the pharmacy's workers about the importance of the implementation of the program in their own pharmacy.
Awareness of benefits of the change [1]	39	Level up to which the benefits of providing the program are seen by individuals *(E.g.: Improvement in results regarding health, higher satisfaction, increase in patient fidelity, improving relationships with physicians, "pull factor", etc.*)
Teamwork^	38	Abilities of the pharmacy's staff to work together as a group.
Workflow (Team processes) [1]	33	Way in which the pharmacy's activities are divided and coordinated amongst its staff, including how pharmacy tasks are structured, how they are performed, in what order, how they are synchronised and how this affects the provision of the program.
Perceived complexity of the change [3]	29	Difficulty perceived for the implementation of the program in the pharmacy, described by the duration, objectives and strategies required within the program.
Awareness of the change [1]	29	The extent to which the participants are aware of and familiar with the recommendations of the program.
Emotions towards the change [1]	28	The extent to which emotions affect adherence e.g. enthusiasm, frustration, cognitive overload, tiredness, regret.

Customer needs [1]	27	Real or perceived needs and demands of the patients and whether they are met by the change being implemented.
Resources availability [1]	26	Availability, quality & quantity of resources at the pharmacy to cater for customer needs.
Knowledge of own practice [1]	24	The extent to which the targeted healthcare professionals are aware of their own practice in relationship to recommended practice.
Structural characteristics [3]	22	Pharmacy design, age, size and maturity in relation to the provision of the program.
Leadership engagement [3]	22	Commitment, involvement, capability and responsibility of the head of the pharmacy towards implementing the program.
Financial incentives (service profitability [1]	19	The extent to which individuals have financial incentives or disincentives to adhere (e.g. ability to earn a profit from the program)
Self- efficacy [1,3]	19	Provider's self-beliefs to achieve the objectives established to provide and implement the program.
Culture [3]	17	Expectations and shared values of all the pharmacy's members.
Physicians' knowledge and beliefs^	17	Perception and knowledge of physicians on the necessity of providing the program through pharmacists.
Individual characteristics [3]	13	Qualities, features or personalities of the participants that will act as enablers or become barriers when implementing the program.
External support [1,3]	11	Measure to which a pharmacy receives the external support required for practice change. *(E.g.: Facilitator, clinical sessions organised by PSA.)*
Communication with patients^	10	Participantⁿ skills when communicating with patients during the program.
Individual identification [3]	9	How individuals perceive the organisation and their relationship, job satisfaction and degree of commitment with that organisation.
Resource use by staff^	6	Level of use of the adequate bibliographical / technological resources to implement the program.
Individual stage of change [3]	3	Stage at which each participant sits in relation to the evolution and progress of the program over time *(Precontemplation Contemplation Preparation Integration Maintenance).*
Readiness indicators [3]	3	Indicators inside of the pharmacy that show its commitment to the implementation of the program.
Patient awareness and perceptions^	3	Patient awareness of the change and availability of marketing material to capture the patients' attention.
Relationship with surrounding physicians [3]	2	Working relationships established between the pharmacy and its pharmacists and physicians within its surroundings.
General business planning ^	2	The extent to which leadership/team alter the strategic direction of the business.
Recruitment ability^	1	Participants' capability to enrol patients onto the various professional services.
Competitor pressure^	1	The extent to which competition is affecting the pharmacy.

^Implementation factors relating to the program or suggested by the Change Facilitators.

ⁿ Participants refers to those pharmacy teams who participated in the program, this includes pharmacists, pharmacy technicians, pharmacy assistants and other team members.

* The program refers to the two-year 'Health Destination Pharmacy' program.

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Chapter 3 | Additional file 2 | Coded change facilitation strategies recorded by CFs during a two year implementation study

Primary category*	Secondary category*		Tertiary category^
1. Awareness of need to change (Highlighting a need for practice change)	**1.1 Interpret baseline data and provide feedback/ insight into performance gaps**	**1.1.1**	Audit feedback via written report
		1.1.2	Audit feedback via visual presentation
		1.1.3	Audit feedback via verbal presentation
	1.2 Assist with/ perform a formal/ informal practice audit	**1.2.1**	Observations
		1.2.2	Interviews
		1.2.3	Questionnaires
		1.2.4	Surveys
		1.2.5	Patient chart audits
		1.2.6	Financial analysis
		1.2.7	Performance evaluation
		1.2.8	Self-evaluations
		1.2.9	Local area demographic
2. Preparing participants for change	**2.1 Create a collaborative environment conducive to change**	**2.1.1**	Organising meetings (no coach present)
		2.1.2	Leading meetings (coach present on premises)
		2.1.3	Leading virtual meeting (coach present digitally e.g. webinar or skype)
	2.2 Encourage participation & facilitate discussions among stakeholders	**2.2.1**	Ask each person for their feedback regarding the change
		2.2.2	Encourage role modeling by leadership
	2.3 Ensure stakeholders contribute to the change	**2.3.1**	Acknowleldging ideas
		2.3.2	Encouraging knowledge and experience sharing
		2.3.3	Involve others in the change process
		2.3.4	Acknowledge importance of participant roles
	2.4 Create buy-in among stakeholders	**2.4.1**	Addressing specific concerns
		2.4.2	Comparison of audit results to network benchmarking
		2.4.3	Emphasising enhanced customer outcomes as opposed to poor practice as reason for change
		2.4.4	Outlining negative impacts (using evidence)
		2.4.5	Outlining negative impacts (using opinion)
		2.4.6	Outlining benefits (using evidence)
		2.4.7	Outlining benefits (using opinion)
		2.4.8	Asking about barriers to change

		2.4.9	Motivate using stories
	2.5 Communicate the change to stakeholders	**2.5.1**	Verbally to group
		2.5.2	Verbally to individual
		2.5.3	Visual display (Poster)
		2.5.4	Written document (email, letter etc)
		2.5.5	Explain the change
		2.5.6	Define the change objectives
3. Planning for/ managing change	**3.1 Empower stakeholders to develop objectives and solve problems**	**3.1.1**	Stimulating critical inquiry/ critical reflection
		3.1.2	Think-aloud process
		3.1.3	Brainstorming
		3.1.4	Outlining opportunities
		3.1.5	Needs analysis
		3.1.6	SWOT analysis
		3.1.7	Prioritisation
		3.1.8	Goal-setting (SMART)
		3.1.9	Consensus-building/ Shared decision making
		3.1.10	Providing solutions/advice
		3.1.11	Monthly or annual plan
		3.1.12	Ensuring win/win goals (mutally beneficial solutions)
		3.1.13	Action planner tool
		3.1.14	Mind-mapping tool
		3.1.15	Discuss/ outline best practice
	3.2 Adapt area of focus to meet change needs	**3.2.1**	Adapt task allocations by creating a roster
		3.2.2	Layout adaptation
		3.2.3	Vision/ mission adaptation
		3.2.4	Role reivew
		3.2.5	Time-tabling (annual, monthly or weekly time tables)
		3.2.6	Adapt business strategy plan
		3.2.7	Adapt image of organisation towards new changes
		3.2.8	Create/ adapt communication plan to new changes
		3.2.9	Encourage regular communication among participants e.g daily huddles
		3.2.10	Adapt process/ procedures to new changes
		3.2.11	Utilise a meeting/ communication agenda

	3.3 Align changes to local context/ setting	**3.3.1**	Aligning objectives to exisiting capabilities/ characteristics
		3.3.2	Aligning objectives to existing motivations/ passions
		3.3.3	Aligning services to local demographics
		3.3.4	Communicate changes to customers/ physicians (verbally, letters, signage, marketing etc)
		3.3.5	Ask customers about their needs
		3.3.6	Assess competition
	3.4 Engage stakeholders by creating ownership of the change	**3.4.1**	Establishing/ allocating roles
		3.4.2	Delegating responsibilites
		3.4.3	Allocating primary champion
		3.4.4	Key performance indicators
		3.4.5	Ask for commitment to the agreed changes
		3.4.6	Encourage collaboration and teamwork
		3.4.7	Performance review (recommend or aid in conducting)
		3.4.8	Allocate roles based on skills/ interests
		3.4.9	Allocate supporting champions
		3.4.10	Emphasise the importance of delegating
	3.5 Equip stakeholders with training	**3.5.1**	Skills/technical training
		3.5.2	Knowledge training
		3.5.3	Role-playing/ role modelling
		3.5.4	Bringing subject matter expert
		3.5.5	Refer to external formal education/ training
		3.5.6	Using case studies
		3.5.7	Staff scoping and training tool
		3.5.8	Encourage discussion of training topic as a group (workshop)
		3.5.9	Create/ adapt training plan
		3.5.10	Determine training gaps
		3.5.11	Encourage self-learning (e.g reading of journals etc)
	3.6 Equip stakeholders with resources	**3.6.1**	Gathering information
		3.6.2	Assembling/providing reports
		3.6.3	Practical assistance
		3.6.4	Providing bibliographical resources
		3.6.5	Advocating for resources
		3.6.6	Cost-analysis (resources)

		3.6.7	Assess existing resource
		3.6.8	Reminder system (electronic or visual)
4. Monitoring of change	**4.1 Ensure continuous monitoring of implementation measures**	**4.1.1**	Monitor financial impact
		4.1.2	Customer outcomes
		4.1.3	Service provision
		4.1.4	Staff measures
		4.1.5	Emphasise ongoing monitoring by participants
		4.1.6	Monitor agreed upon plan/ objectives
		4.1.7	Display progress chart
	4.2 Feedback progress of implementation measures	**4.2.1**	Provide constructive feedback
		4.2.2	Acknowledge success/ recognise /celebrate achivevements
		4.2.3	Providing ongoing encouragement
	4.3 Ensure ongoing communication method in place	**4.3.1**	Email
		4.3.2	Phone calls
		4.3.3	Face to face
*Categories adapted from the taxonomy of facilitation strategies by Dogherty et al.			
^Facilitation strategies conducted by Change facilitators during the implementation study by Moussa et al.			

Additional File 3

Paper: **Data-driven approach to tailoring change facilitation strategies to overcome implementation barriers | A study in community pharmacy**

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Any questions regarding this supplementary file, please contact Professor

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1. Data Analysis methodology – CRISP methodology

In this paper, the approach that will be followed from the perspective of data analysis is called Cross-Industry Standard Process for Data Mining (CRISP-DM) [X1X]. It provides a user-friendly framework that structures and explains the process of mining knowledge from data.

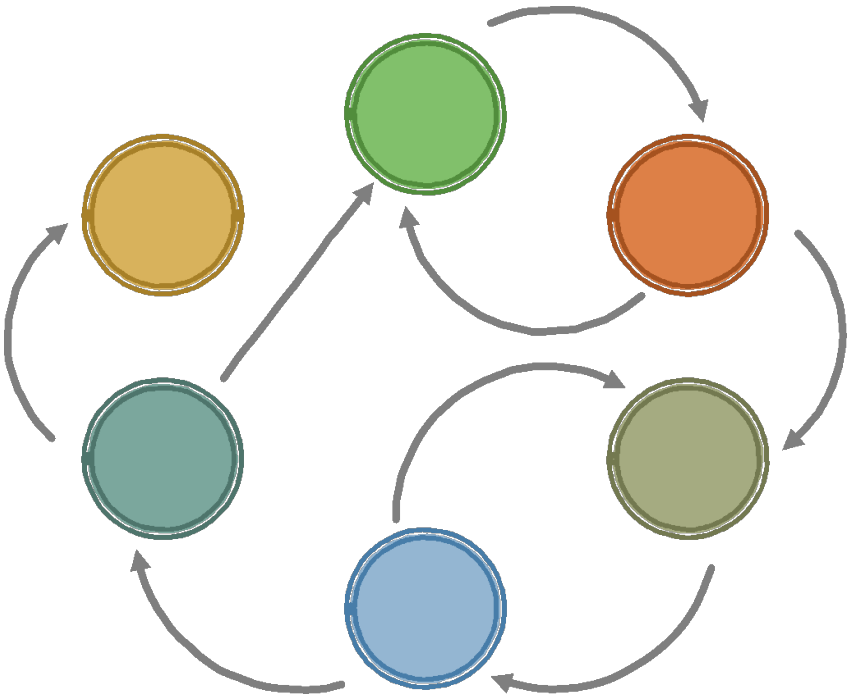

Figure 1 CRISP-DM Methodology

CRISP-DM consists of six steps as presented in Figure 1. In the first, **business understanding** phase, it is very important to elicit and analyse the needs of the stakeholders. The problem to be solved, its context and success criteria have to be defined as they are the basis to set up a plan to follow. Once the goal of the analysis is known, the next step is to **understand the data** where data is collected and properties of data are examined. During that step, also the quality of data is assessed as it will affect the outcome. Next, during **the data preparation stage**, the appropriate selection and cleaning of data takes place. Basic analysis of selected data that will be used further on is performed. In the **modelling phase**, based on data understanding and its characteristics, modelling technique is selected. Depending on the available options for a given problem, more than one technique might be tested and their results are verified in the **evaluation stage**. If the business needs are met the results are presented in a **data presentation phase** which concludes the process. Of course, the whole process is iterative so there are few feedback loops that enable the return to the previous stages and redo certain elements of the process.

2. Context Understanding and Problem Statement

This project analyses a real dataset from the pharmacy industry. Pharmacy practice is a significant component of the healthcare system in Australia and is constantly changing.

During the implementation of innovation in pharmacy practice, many barriers may arise. Hence, how to overcome these barriers becomes quite important.

The dataset's provider requires a recommendation system of strategies for barriers that arise. The practical data has many limitations which causes difficulties for the analysis. It is common that

datasets collected from real businesses have problems. In our case, the dataset is insufficient and unbalanced. We reviewed many related work to find out the best way to overcome problems arised from analyzing this kind of dataset.

The report focuses on a certain case, so the method may not be suitable in other cases. While the data type may not be the same as the data type in other cases, so the method tools may not be suitable in other cases. There are other method tools that can help improve the performance in further analysis.

The project aims to analyse the data to find the relationship between barriers and strategies. If there is a barrier, what strategies can fix them. The project also addresses the topics to filter the strategies with high effectiveness. Finally, the project tries to use classification methods to find which may be the best strategy corresponding to a certain barrier.

3. Data Understanding and Data Preparation

1. Data description

The dataset consists of 1131 records collected from six change facilitators across Australia during a 2-year pharmacy change program.

The data included different types of barriers that prevent the change facilitators from implementing change in the pharmacy setting. In the given dataset, strategies have been separated into three categories from brief to detailed. The primary level of categorisation of the strategies has four phases: (i) Awareness of the need to change, (ii) Preparing participants for change, (iii) Planning for managing change, and (iv) Monitoring of change. The secondary level of categorisation of the strategies has 16 facilitation categories and the tertiary level of categorisation of the strategies has 111 different types of strategies. These have been used by facilitators to deal with appropriate barriers. The dataset also provides the result of whether the issues have been resolved. Table 1 provides a summary of the data set that was provided to us for analysis.

Table 1. The given data set was provided

Attribute	Description
Pharm no.	Integers from 1-19. Each different number represents a different pharmacy facility that provides the data.
Barrier code	Possible barriers to why the barriers are appearing.
Strategy (P.S.T) code	Each strategy code represents a strategy that is applied to solve a given barrier. Strategies are sorted by three categories, Primary strategy category (P), Secondary strategy category (S) and Tertiary strategy category (T).

Primary strategy category (P)	The first category of strategies.
Secondary strategy category (S)	The secondary category of strategies.
Tertiary strategy category (T)	The tertiary category of strategies.
Result achieved	Whether the strategy resolved the barrier or not.
Visit No.	The visit in which this strategy was conducted.

2. Data understanding

To get a preliminary understanding of the given dataset, we chose to analyze the dataset from a statistical perspective. Statistics is a mathematical description of a data collection, which could potentially present hidden patterns of attributes. In our case, statistical analysis could help us to know the distribution of the data set.

Due to the classified structure, there are three categories of the strategies. In the first category, there are only 4 different values, which have few logical relationships for analysis. At the same time, In the data description, the amount of the third category of strategies is too many. In the statistical analysis, the distribution of them is even. The analysis of them also has a little logical relationship. Therefore, in the report, the analysis chooses to use statistical analysis to analyze the data first.

While, each second category of strategies appears dozens of times, which seems to have relationships with the barriers column. It is better to analyze the second category of strategies first.

SMALL DATA SET

The data contains 1131 records, the amount of the third level of categorisation of the strategies is 111. For each third category strategy, there are only about 10 records, while some of the third category strategies only have 1 or 2 records.

UNBALANCED DATA

The value in the target attributes shows unbalanced distribution. The ‘Unresolved’ value only occupies 159 records of the whole, about 14%, while the rest are all ‘Resolved’ occupying about 86% of the whole data. The unbalanced distribution in the target column leads to low efficient prediction. In the software, the model will simply predict all the results as ‘Resolve’, the major value of the attribute, and get a high accuracy rate as well.

4. Modelling and Evaluation

1. Statistical analysis

As it was shown in the data understanding section the best level to analyse the strategies is level 2. The main purpose of analyzing the second level of strategies is to find which is the best strategy corresponding to each barrier. For each barrier, there are many strategies used, while the Resolution Percentage in the result column may not be the same. The best strategy should have the highest Resolution Percentage, and also needs to be used in most cases. The first step is to filter and concentrate on one barrier. Then, the second step is to have a look at the Resolution Percentage of each strategy. In the end, the report collects and generates a table of those strategies which have the highest Resolution Percentage and are used in most cases.

The table generated seems good for business. If there is a barrier happening in a new case, the Change Facilitator can use the table to find what is the strategy suggested to deal with it. The further work can make the result of the table into the system of users, once the Change Facilitator chooses or imports the barrier or barriers faced, the system can output the recommended strategy to them.

While in the process of selecting and comparing the secondary category of strategies, the analysis encounters some problems, which are very common in real world business cases. In the generated table, it can be seen that many results do not meet the expectation.

One problem is that there are many strategies that have similar Resolution Percentages in many cases. For example, for barrier '7', it has 65 records, while many strategies all have 100% Resolution Percentage like '2.1', '2.4', '2.5', '3.2', '3.5', '3.6'. In this situation, the analysis can not point out which of them is the best for the recommendation, so the table keeps them all. In the further work, one option is to choose '3.5' which has the most records, 23 times of the whole 65 records. Another option is to use a method to find which of them is better than others.

Another problem is that the chosen strategies only occupied a small percentage of the whole records. For example, for barrier '24', the strategy '2.4' has the highest Resolution Percentage, while others are all unsatisfied. The strategy '2.4' only has 6 records of the whole 17 records, about ⅓, which may not be representative. In this situation, the analysis can hardly promote the result.

In some cases, strategies with a low Resolution Percentage occupy a high percentage of the whole record, while each of the other strategies with high Resolution Percentage only occupy a low percentage. For example, in barrier '3', it only has one record, strategy '3.4'. But the strategy has only one Unresolve result. In this situation, the analysis lacks recommendation, but only supports the strategy '3.4' and its result for reference. The same problem occurs many times in the dataset. Some strategies have a low Resolution Percentage, but occupy the majority rate of the records.

While providing recommendations based on statistical analysis, there is a controversial way of choosing strategies in some cases.

Table 2. Example of challenges associated with statistical analysis

Barrier Code	Secondary Strategy Category	Sample amount/ solved amount
15.0	3.5	56/59

	2.1	10/10
	Others	14/15
	Total	80/84

As shown in table 2, 84 cases of dealing with the barrier of barrier code 15 are recorded. While strategy 3.5 appears 59 times with 56 times solved, strategy 2.1 appears 10 times with 10 times solved. So the Resolution Percentage is 94.9% vs 100%. Although strategy 2.1 seems to have a better Resolution Percentage, its sample amount is far less than strategy 3.5.

Therefore, it's hard to say which strategy is better. We believe that there could be a function curve that describes the pattern of how people in the pharmacy industry choose regarding the number of occurrences and the Resolution Percentage.

An assumption is that we can gather the preference information from people in the pharmacy industry and generate a function curve based on the preference information. In this case, we can give the best recommendation based on the sample amount's scale and the Resolution Percentage ratio.

Figure 2 Resolution Percentage vs. Strategy amount

As shown in Figure 2, the X-axis is the ratio value between the amount of strategy A and B, while the Y-axis is the ratio value between the Resolution Percentage of strategy A and B. The curve is behalf of the case that strategy A is equal to strategy B. If the point is below the curve, strategy A is better than strategy B. If the point is above the curve, strategy B is better.

Conclusion for statistical analysis

The generated table from statistical analysis basically meets the requirement. The pharmacy managers can use the table to deal with new barriers of events. While there are some drawbacks in the table mentioned above, these issues may not barrier problems but may make users confused about the way to deal with new barriers. The next step of the analysis focuses on the problem of how to select the best strategy if many strategies have the same Resolution Percentage.

2. Random forest

As the problems mentioned in the statistical analysis, the report tries to find the best strategy for many barriers. The research chooses several methods to achieve the goal. One way is to predict the result of each strategy and barrier to find which has a better result, so when in the next time, in a new barrier, if managers use this strategy, they can have a high rate to overcome the barrier. The best way is to use a classification analysis method to make a prediction.

In business, companies often use the Random Forest to make predictions. Random forest is one of the best classification methods, and it is much better than the Decision Tree method. Random forest combines great numbers of analysis trees trained randomly and equally from the dataset. The theory of building a random forest contains training and testing steps. In the training step, the method uses the majority of the dataset to build the algorithms, which have a high relationship to target result. In this step, it builds large numbers of trees and then evaluates separately and averages them to compute the estimate. After that, the method uses the rest of the data to test the workflow, and find the accuracy of the prediction. The best advantage of using random forest is that it is stable, which has less overfitting to other classification methods.

In a previous paper, the authors (Khalilia et al. 2011) used the Random Forest to predict disease risk of individuals by analyzing their medical diagnosis. They also compared different methods and faced imbalanced data. The result met their expectation, and they predicted 8 disease categories. While, in another paper, Random Forest was used to predict business performance from small and Swiss companies(Muller et al. 2017). The sample is more related to how to choose strategies. The content and background of these papers are similar to this case. It identifies the validity and reliability of using the Random forest in this analysis.

WORKFLOW

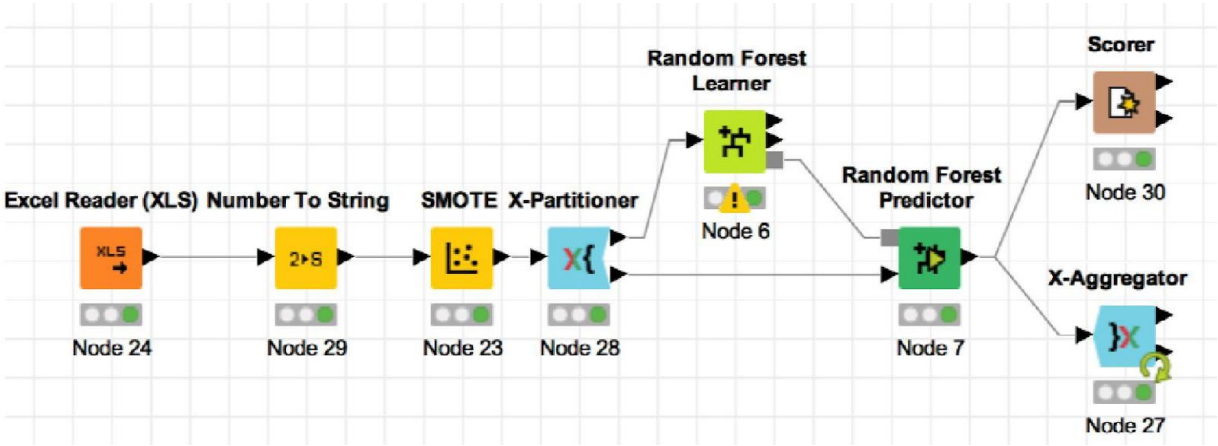

Figure 3 Workflow diagram 1 for Random Forest analysis

BALANCING THAT DATA

As it was shown in the data understanding section, the classes are very unbalanced.

The first reason for the problem is that the Unresolved results only occupy a small part of the whole results. Bebarrier in the 'result achieved' column of original data, the value 'Resolve' occupied about 86%, 7 times Unresolved. The Random Forest method may recognize the prediction calculated as the majority of the original data set and ignore the importance of the minority part of the value in the target column.

This is a typical problem that happens in business, which is called unbalanced data or imbalanced data. The problem is prevalent in machine learning. Most machine learning classification algorithms are sensitive to unbalance (Witten et al. 2016). An unbalanced dataset will bias the prediction model towards the more common class (Glander 2017). When a classification algorithm trained on such data is applied to a test data set that is also unbalanced, the classifier will produce a very optimistic accuracy estimate. Many articles show the problem rises attention of researchers. Cieslak et al. point out that it is necessary to generate new method based on existing algorithms to lower the effect of unbalanced data in their article, while other articles all apply new tools to fix the bias (Cieslak and Chawla 2008). Ye and Rick discussed and supported several methods to fix the problems including resampling the training set, using K-fold Cross-Validation in the right way, ensembling different resampled datasets, resampling with different ratios and so on (Ye and Rick, 2015). In the analysis of Khoshgoftaar et al. , the authors tried to compare ensemble and data sampling which is better to fix the unbalanced data (Khoshgoftaar et al., 2015). The findings show that both Select-Bagging with Naive Bayes and Random Forest with 100 trees are recommended for imbalanced datasets.

FINAL RUN

The workflow for the final prediction is shown in Figure 4. All nodes about Cross-Validation has been removed. This is bebarrier the use of it is to make sure that while dividing the dataset into training part and test part, just in case of extreme cases, like a great part of training dataset is

'Solved'. Since we are making real predictions on all combinations of barriers and strategies, we no longer need to cut the original dataset. Instead, all original dataset is imported as training dataset from the above Excel Reader (XLS) node. What we put into the below Excel Reader node is a new table we generated, with all possible combination of strategies and barriers listed. The final output from the Random Forest Predictor should tell us the detailed probabilities of each combination.

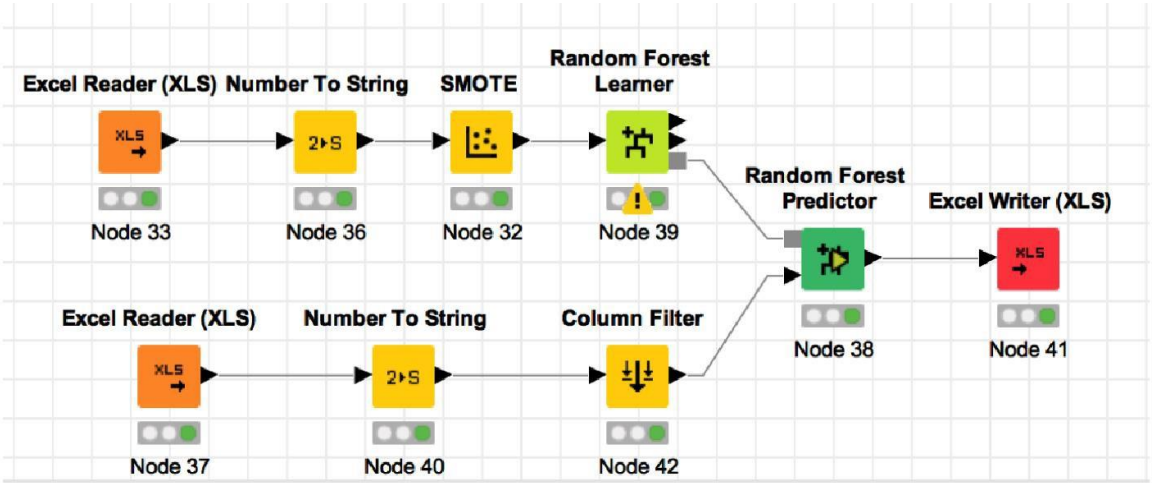

Figure 3.15

Figure 4 Workflow diagram 2 for Random Forest analysis

After using the model, the test uses a ''Excel writer' node to output a result which contains all the results predicted and their possibilities.

In this case, their possibilities are between 0 to 1. There are both possibility rates of Resolved and Unresolved. If the possibility rate of Resolve is higher, so the strategy is better and suggested to the barrier. In the previous statistical table generated, there are many coordinated strategies. Though the result in the original data set is Resolve, the possible rate of the Resolve may not be 100%. The output can support a better explanation of each result in this way.

For example, in barrier A, strategy X and strategy Y have the same Resolution Percentage in the statistical table, 100%. The output from the model can show the possible rate of each record. The average of the possibility rate of Resolution can be calculated. If the Predictive Resolution Percentage of strategy A is 99% , higher than strategy B, so the output points out strategy A is better.

5. Discussion and Recommendations

Since the provided dataset is quite insufficient, we decided to keep the initial recommendations while providing recommendations based on the modelling as well. Therefore, we provided two kinds of recommendations.

RECOMMENDATION BASED ON STATISTICAL ANALYSIS

The recommendation by statistical analysis provides the best-recommended strategy based on the given dataset. The dataset is rather sufficient, although it can provide recommendations, it doesn't provide a detailed recommendation (Table 2). It only presents which strategies appear more in the dataset with their Resolution Percentage. In this case, the recommendation is not clear.

RECOMMENDATION BASED ON RANDOM FOREST ALGORITHM

The recommendation based on Random Forest Algorithm provides a better perspective to analyze the dataset. In recommendation based on statistical analysis, different strategies recommended for one barrier may have the same Resolution Percentage- which leads to a dilemma, which one is the actual better one. The application of Random Forest Algorithm utilises hidden relations between 'Resolved achieved' and other and contributes to making 'prediction' of the 'Resolved achieved' attribute. In this case, the values of other attributes are fully utilized. Differences between those strategies with the same Predictive Resolution Percentages appear. e.g. In the first recommendation, barrier code 11 has two recommended strategies (Table 3). Strategy 2.5 has more sample amounts with a slightly low Resolution Percentage. In recommendation based on Random Forest Algorithm, it shows that with the contribution of other attributes, strategy 2.5 actually has a higher Predictive Resolution Percentage (Table 3), meaning strategy 2.5 is the better choice.

Table 3. Results using statistical analysis versus results using Random Forest

Barrier Code	Secondary Strategy Category	Sample amount/ solved amount	Resolution Percentage (using statistical analysis)	Predictive Resolution Percentage (using Random Forest)
11.0	2.5	16/18	88.89%	87.72%
	2.1	9/10	90.00%	85.65%

In this project, we provided two kinds of recommended strategies using two ways of analysis. The recommendation from statistical analysis cannot provide a precise recommendation in some cases, a possible solution is to conduct a satisfaction curve based on user research, so that the recommendations could be narrowed down to one. Since we don't have the data for this, this is a suggestion for future research.

Another solution, which is our second recommendation, is using a Random Forest Algorithm to generate a more precise Predictive Resolution Percentage for each strategy according to each

barrier. This might be the potentially best way to solve this problem. However, due to the insufficient data volume, there are some cases that we still cannot provide precise recommendations, but the result is better than just applying statistical analysis.

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Chapter 3 | Additional file 4 | STROBE Checklist

Additional File 4

STROBE Statement—Checklist of items that should be included in reports of ***cohort studies*** pertaining to the paper titled **"Data-driven approach for tailoring facilitation strategies to overcome implementation barriers in community pharmacy"**

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	7
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	7
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Additional file 3
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Page 8 & additional file 3
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, explain how loss to follow-up was addressed	
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9
		(b) Indicate number of participants with missing data for each variable of interest	

		(c) Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	Report numbers of outcome events or summary measures over time	9
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (*b*) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	9-10
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9-10
Discussion			
Key results	18	Summarise key results with reference to study objectives	10-12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14-15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for exposed and unexposed groups.

Chapter 4 | Additional file 1 | The Change Facilitation Strategy list provided to CFs during the MAS study

The coded change facilitation strategies recorded and conducted by Change Facilitators during a two year implementatin study in community pharmacy			
Primary category*	**Secondary category***		**Tertiary category^**
1. Awareness of need to change (Highlighting a need for practice change)	**1.1 Interpret baseline data and provide feedback/ insight into performance gaps**	**1.1.1**	Audit feedback via written report
		1.1.2	Audit feedback via visual presentation
		1.1.3	Audit feedback via verbal presentation
	1.2 Assist with/ perform a formal/ informal practice audit	**1.2.1**	Observations
		1.2.2	Interviews
		1.2.3	Questionnaires
		1.2.4	Surveys
		1.2.5	Patient chart audits
		1.2.6	Financial analysis
		1.2.7	Performance evaluation
		1.2.8	Self-evaluations
		1.2.9	Local area demographic
2. Preparing participants for change	**2.1 Create a collaborative environment conducive to change**	**2.1.1**	Organising meetings (no coach present)
		2.1.2	Leading meetings (coach present on premises)
		2.1.3	Leading virtual meeting (coach present digitally e.g. webinar or skype)
	2.2 Encourage participation & facilitate discussions among stakeholders	**2.2.1**	Ask each person for their feedback regarding the change
		2.2.2	Encourage role modeling by leadership
	2.3 Ensure stakeholders contribute to the change	**2.3.1**	Acknowleldging ideas
		2.3.2	Encouraging knowledge and experience sharing
		2.3.3	Involve others in the change process
		2.3.4	Acknowledge importance of participant roles
	2.4 Create buy-in among stakeholders	**2.4.1**	Addressing specific concerns
		2.4.2	Comparison of audit results to network benchmarking
		2.4.3	Emphasising enhanced customer outcomes as opposed to poor practice as reason for change
		2.4.4	Outlining negative impacts (using evidence)
		2.4.5	Outlining negative impacts (using opinion)
		2.4.6	Outlining benefits (using evidence)

		2.4.7	Outlining benefits (using opinion)
		2.4.8	Asking about barriers to change
		2.4.9	Motivate using stories
	2.5 Communicate the change to stakeholders	**2.5.1**	Verbally to group
		2.5.2	Verbally to individual
		2.5.3	Visual display (Poster)
		2.5.4	Written document (email, letter etc)
		2.5.5	Explain the change
		2.5.6	Define the change objectives
3. Planning for/ managing change	**3.1 Empower stakeholders to develop objectives and solve problems**	**3.1.1**	Stimulating critical inquiry/ critical reflection
		3.1.2	Think-aloud process
		3.1.3	Brainstorming
		3.1.4	Outlining opportunities
		3.1.5	Needs analysis
		3.1.6	SWOT analysis
		3.1.7	Prioritisation
		3.1.8	Goal-setting (SMART)
		3.1.9	Consensus-building/ Shared decision making
		3.1.10	Providing solutions/advice
		3.1.11	Monthly or annual plan
		3.1.12	Ensuring win/win goals (mutally beneficial solutions)
		3.1.13	Action planner tool
		3.1.14	Mind-mapping tool
		3.1.15	Discuss/ outline best practice
	3.2 Adapt area of focus to meet change needs	**3.2.1**	Adapt task allocations by creating a roster
		3.2.2	Layout adaptation
		3.2.3	Vision/ mission adaptation
		3.2.4	Role reivew
		3.2.5	Time-tabling (annual, monthly or weekly time tables)
		3.2.6	Adapt business strategy plan
		3.2.7	Adapt image of organisation towards new changes
		3.2.8	Create/ adapt communication plan to new changes
		3.2.9	Encourage regular communication among participants e.g daily huddles

		3.2.10	Adapt process/ procedures to new changes
		3.2.11	Utilise a meeting/ communication agenda
	3.3 Align changes to local context/ setting	**3.3.1**	Aligning objectives to exisiting capabilities/ characteristics
		3.3.2	Aligning objectives to existing motivations/ passions
		3.3.3	Aligning services to local demographics
		3.3.4	Communicate changes to customers/ physicians (verbally, letters, signage, marketing etc)
		3.3.5	Ask customers about their needs
		3.3.6	Assess competition
	3.4 Engage stakeholders by creating ownership of the change	**3.4.1**	Establishing/ allocating roles
		3.4.2	Delegating responsibilites
		3.4.3	Allocating primary champion
		3.4.4	Key performance indicators
		3.4.5	Ask for commitment to the agreed changes
		3.4.6	Encourage collaboration and teamwork
		3.4.7	Performance review (recommend or aid in conducting)
		3.4.8	Allocate roles based on skills/ interests
		3.4.9	Allocate supporting champions
		3.4.10	Emphasise the importance of delegating
	3.5 Equip stakeholders with training	**3.5.1**	Skills/technical training
		3.5.2	Knowledge training
		3.5.3	Role-playing/ role modelling
		3.5.4	Bringing subject matter expert
		3.5.5	Refer to external formal education/ training
		3.5.6	Using case studies
		3.5.7	Staff scoping and training tool
		3.5.8	Encourage discussion of training topic as a group (workshop)
		3.5.9	Create/ adapt training plan
		3.5.10	Determine training gaps
		3.5.11	Encourage self-learning (e.g reading of journals etc)
	3.6 Equip stakeholders with resources	**3.6.1**	Gathering information
		3.6.2	Assembling/providing reports
		3.6.3	Practical assistance
		3.6.4	Providing bibliographical resources

		3.6.5	Advocating for resources
		3.6.6	Cost-analysis (resources)
		3.6.7	Assess existing resource
		3.6.8	Reminder system (electronic or visual)
4. Monitoring of change	**4.1 Ensure continuous monitoring of implementation measures**	**4.1.1**	Monitor financial impact
		4.1.2	Customer outcomes
		4.1.3	Service provision
		4.1.4	Staff measures
		4.1.5	Emphasise ongoing monitoring by participants
		4.1.6	Monitor agreed upon plan/ objectives
		4.1.7	Display progress chart
	4.2 Feedback progress of implementation measures	**4.2.1**	Provide constructive feedback
		4.2.2	Acknowledge success/ recognise /celebrate achivevements
		4.2.3	Providing ongoing encouragement
	4.3 Ensure ongoing communication method in place	**4.3.1**	Email
		4.3.2	Phone calls
		4.3.3	Face to face
*Categories adapted from the taxonomy of facilitation strategies by Dogherty et al.			
^Facilitation strategies conducted by Change facilitators during the implementation study by Moussa et al.			

Chapter 4 | Additional file 2 | The 22 Implementation factors acting as barriers identified by CFs during the MAS study

Additional file 2 | The description of the implementation factors uncovered by the Change Facilitators during the cRCT

IMPLEMENTATION FACTOR	Frequency of appearance (n=398)	DESCRIPTION OF IMPLEMENTATION FACTOR
Priority perception[1,3]	61	Perception shared by the pharmacy's workers about the importance of the implementation of the program in their own pharmacy.
Internal supporters and opponents of the change [1]	60	Support provided by the pharmacy staff members for the implementation of the program. *(Ex.: help from peers or co-workers, time needed to provide the service, etc.)*
Workflow (Team processes) [1]	46	Ways in which the pharmacy's activities are divided and coordinated amongst its staff, including how pharmacy tasks are structured, how they are performed, in what order, how they are synchronised and how this affects the provision of the program.
Knowledge/ experience [2]	41	The extent to which the targeted individuals have skills, knowledge and experience that they need to adhere.
Resource use by staff^	32	Level of use of the adequate bibliographical / technological resources to implement the program.
Time^	25	Amount of time devoted to implementation of the change.
Teamwork^	24	Abilities of the pharmacy's staff to work together as a group.
Perceived complexity of the change [3]	19	Difficulty perceived for the implementation of the program in the pharmacy, described by the duration, objectives and strategies required within the program.

Customer needs [1]	19	Real or perceived needs and demands of the patients and whether they are met by the change being implemented.
Leadership engagement [3]	13	Commitment, involvement, capability and responsibility of the head of the pharmacy towards implementing the program.
Team communication^	12	Type, quantity, communication flow between the pharmacy's staff around the program.
Structural characteristics [3]	8	Pharmacy design, age, size and maturity in relation to the provision of the program.
Awareness of the change [1]	8	The extent to which the participants are aware of and familiar with the recommendations of the program.
Emotions towards the change [1]	7	The extent to which emotions affect adherence e.g. enthusiasm, frustration, cognitive overload, tiredness, regret.
Communication with patients^	6	Participantⁿ skills when communicating with patients during the program.
Self- efficacy [1,3]	5	Provider's self-beliefs to achieve the objectives established to provide and implement the program.
Ability to plan change [1]	4	Planning associated with implementation of the change program*.
External support [1,3]	2	Measure to which a pharmacy receives the external support required for practice change.
Resources availability [1]	2	Availability, quality & quantity of resources at the pharmacy to cater for customer needs.
Knowledge of own practice [1]	2	The extent to which the targeted healthcare professionals are aware of their own practice in relationship to recommended practice.
Relationship with surrounding physicians [3]	1	Working relationships established between the pharmacy and its pharmacists and physicians within its surroundings.
Financial incentives (service profitability [1]	1	The extent to which individuals have financial incentives or disincentives to adhere (e.g. ability to earn a profit from the program)

^ Implementation factors found in previous community pharmacy research

ⁿ Participants refers to those pharmacy teams who participated in the program, this includes pharmacists, pharmacy technicians, pharmacy assistants and other team members.

* The program refers to the two-year 'Health Destination Pharmacy' program.

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End of thesis