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

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Research

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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.

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 specific facilitation 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.

Methods

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.

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 a number of 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.

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%

^ 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.

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]
	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.

'**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.

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%)

* 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.

Strategy category to overcome barrier*	Facilitation strategies within category	Most common barriers overcome using this strategy category (PRP) [a]
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%)

* 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.

Strategy category to overcome barrier*	Facilitation strategies within category	Most common barriers overcome using this strategy category (PRP) [a]
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%)

* 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.

Strategy category to overcome barrier*	Facilitation strategies within category	Most common barriers overcome using this strategy category (PRP) [a]
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 time-tabling (annual, monthly or weekly time tables) ● 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%)

* 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.

Strategy category to overcome barrier*	Facilitation strategies within category	Most common barriers overcome using this strategy category (PRP) [a]
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) ● Outlining 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%)

* 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.

Strategy category to overcome barrier*	Facilitation strategies within category	Most common barriers overcome using this strategy category (PRP) [a]
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.

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 of 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.

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.

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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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 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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