Original Research Paper

# Unravelling facilitation complexity in community pharmacy: A pragmatic tool for implementation strategy selection

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## ARTICLE INFO

## ABSTRACT

Introduction: Pharmacy practice is becoming increasingly patient-centric with the development of community pharmacy services. Their implementation appears to be affected by causal relationships and interdependencies of determinants. To address these determinants, change agents need to select, operationalise strategies, and measure their impact. However, there is little real-world guidance on efficiently selecting strategies tailored to determinants.
Objectives: The aims of this study were to (1) explore the relationships between determinants and implementation strategies identified during the implementation of a Minor Ailment Service in Spanish community pharmacies and (2) develop a visual tool that links implementation strategies tailored to specific determinants for change agents to use during the facilitation process.
Methods: The study employed a mixed methods approach within a three-year pragmatic type 3 hybrid effectiveness-implementation design. Data collection was facilitated by change agents, who utilised on-site and remote communication methods. The objectives of the change agents were to identify determinants, design and operationalise tailored implementation strategies. These data were documented and transformed into Sankey diagrams.
Results: Ten change agents systematically documented 4236 determinant-strategy relationships in 92 pharmacies. The most common primary determinant domain they identified was "intervention characteristics" (n = 1843, 43.5 %). The most common secondary determinant domain was "characteristics of the individuals involved" (n = 3069, 72.5 %). The most common strategy category was "other" (n = 1808, 42.7 %). A Sankey diagram tool was developed to allow change agents to receive feedback on the effect of their strategies and select appropriate future implementation strategies.
Conclusions: The findings of this study inform the development of future visual tools for assisting change agents during the facilitation process. Sankey diagrams act as a generic and real-time tool, which will reduce the complexity inherent to the facilitation activity. This will facilitate prospective implementation researchers to

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plan implementation interventions and train change agents more efficiently, thereby optimising the change management process.

## 1. Introduction

The development of healthcare innovations holds the potential for enhanced effectiveness and safety in delivering patient-oriented services and enhancing patient care.[1–4] There is an increasing recognition of the capacity of community pharmacists to alleviate the current burden on the healthcare system.[5–7] Since community pharmacies are easily accessible primary care locations, there is emerging health policy that is positioning community pharmacists as providers of primary health care services. Thus, pharmacy practice is increasingly evolving to be more patient-centric.[8–10] For instance, in the United Kingdom, the prevalence of emergency department and general medical practice consultations pertaining to minor ailments, amenable to treatment in community pharmacies, are 5 %–13 %, respectively, incurring a financial burden amounting to £1.1 billion.[11] Self-care and self-medication are the preferred approaches for managing these minor ailments, which can be addressed through community pharmacy via minor ailment services (MASs) to help reduce the number of cases that might otherwise add to the growing demands on general practitioners and hospitals.[12–14] MASs are designed to provide fast and convenient access to treatment for these common health issues. Community pharmacists working within these services are trained to assess symptoms, provide professional advice and, when appropriate, supply medications or refer patients to other healthcare professionals.[15–17] These policies have proven highly cost-effective, while also increasing patient safety through the proper use of non-prescription medications and referrals.[12,14,18] Evaluations of MASs have also identified high levels of patient satisfaction and service utilisation.[19,20] In Spain, unlike in countries such as the United Kingdom, the service is limited to treating ailments like common colds and dyspepsia that can be managed with over-the-counter medications, although it also allows patients to self-select a product as an entry point to the service.[17,21,22]

The implementation of these new practices requires substantial structural modifications and an in-depth understanding of the implementation determinants at play within pharmacy.[23–27] In an effort to comprehend the intricacies of implementation across diverse settings, these elements are commonly articulated into broad classifications and included into determinant frameworks,[28] such as Promoting Action on Research Implementation in Health Services (PARIHS)[29–31] and the Consolidated Framework for Implementation Research (CFIR).[25,26] Additionally, the implementation process appears to be influenced and further complicated by multilevel factors, causal relationships, and intricate interdependencies between these elements.[32,33]

In the context of implementation, individuals aiming to instigate change should systematically evaluate determinants influencing the implementation process and outcomes, to increase both their impact and the rate of implementation.[34] Such assessments are typically conducted by a formally appointed individual, known as a change agent. Other terms used for this role include coaches, knowledge brokers, and practice facilitators.[35] This figure often receives specialised training for their role, which involves providing guidance and support to individuals or teams responsible for adopting a particular innovation.[25,36,37] These agents play a crucial role in the implementation of innovations, constituting the operational aspect of modifying practices.[38]

In order to address determinants, change agents apply implementation strategies which are defined by the Cochrane Effective Practice and Organisation of Care (EPOC) taxonomy as 'interventions designed to bring about changes in healthcare organizations, the behaviour of healthcare professionals or the use of health services by healthcare recipients'.[39] (pp1-2) Successful implementation strategies require a comprehensive understanding of the determinants influencing the implementation outcomes and an informed evaluation of the anticipated effectiveness of a specific strategy within a given context.[40,41] Therefore, these individuals must be adequately trained in implementation processes. Although tools such as the CFIR-ERIC matching tool[42] have been published, there is little real-world guidance on selecting and determining outcomes of implementation strategies tailored to specific determinants, especially when the contextual factors and the timeframe are taken into consideration.[42–45] This gap may have arisen from a lack of comprehensive reporting of determinants and implementation strategies in the literature.[38,46,47] Furthermore, change agents predominantly work in qualitative environments, focussing on data such as perceptions and experiences. Providing them with data in a quantitative manner could help them facilitate implementation more efficiently.[48–50] There is therefore a need to develop relatively simple, contextual, and timeframe specific tools using designated taxonomies. These tools should be easily interpretable and applicable in order to assist change agents with broad educational and discipline backgrounds in efficiently choosing implementation strategies. Moreover, for ease of use, the tools should present large amounts of data in a visual system, in real time, as the implementation process proceeds. Hence, this paper aimed to (1) explore the relationships between determinants and implementation strategies identified during the implementation of a MAS in community pharmacy and (2) to develop a visual tool that links implementation strategies tailored to specific determinants for change agents to use during the facilitation process.

## 2. Methods

### 2.1. Research design

The research was carried out over three years, using a mixed methods approach within a pragmatic type 3 hybrid effectiveness-implementation design.[51] This design enables the simultaneous evaluation of both clinical and implementation outcomes in a single study, with a stronger focus on assessing implementation outcomes, while still monitoring clinical effectiveness.[51] In this manuscript, only implementation results are reported.

### 2.2. Study participants

Community pharmacies across 45 Spanish provinces were enrolled in a nationwide study aimed at implementing a MAS. In order to maintain the study's pragmatic approach, the sole inclusion criterion was the pharmacy owner and pharmacy staff's consent to participation.

### 2.3. Implementation innovation

The innovation comprised of a MAS, (i.e. an intervention between community pharmacists and patients presenting with minor ailments). The service included the following elements: a service protocol[17] and an online platform (SEFAC eXPERT®) that integrated a step-by-step approach with embedded clinical protocols.[52,53] The minor ailments included in the study are listed in Additional File 1. After ten days, the pharmacists documented the patient follow-up information on the online platform.

### 2.4. Implementation intervention

The CFIR was used as the guiding framework for change agents to identify and classify determinants into four domains: "intervention characteristics" related to the innovation being implemented, "outer

setting" which refers to external factors, "inner setting" related to the implementation environment, "characteristics of individuals" concerning those delivering the innovation, and "process of implementation", which covers determinants tied to the implementation process itself.[25] Dogherty's taxonomy of facilitation activities was used to classify the implementation strategies operationalised by these individuals during the facilitation process.[54] Both of these taxonomies were adapted and broadened with the domain "other" to encompass additional categories tailored to implementation scenarios specific to community pharmacy settings. Subsequently, the research team translated the adapted and expanded taxonomies into Spanish. It should be emphasised that, whilst the CFIR and Dogherty employ the terms "constructs" and "facilitation activities" to denote individual categories, throughout the duration of the study, the research team opted for the terminology "determinants" and "implementation strategies". The term "determinant" aligns with Nilsen's (2015) standardised terminology in implementation science, which categorises theories, models, and frameworks addressing these factors as "determinant frameworks". Likewise, "implementation strategy" was chosen over "facilitation activities" to reflect the widely accepted taxonomy.[28,38,55,56]

In order to simplify the change agents' facilitation process for the identification of determinants and design of implementation strategies, the research team developed a change agent guide. In addition to the adapted, expanded and translated CFIR and Dogherty taxonomies, this guide included a series of practical examples for each determinant and strategy, which were specific to the reality of the implementation of community pharmacy services. This change agent guide is available in Additional File 2.

### 2.5. Change agent training and intervention

Change agents were registered pharmacists employed by a pharmacy board or serving as volunteers for the Spanish Society of Clinical, Family and Community Pharmacy (SEFAC). Volunteers for the SEFAC received non-monetary compensation, including opportunities to submit conference abstracts and fully covered expenses for relevant conferences. The change agents were not recruited or selected by the research team, rather, they were assigned by the organisations to support this project. Each agent underwent a mandatory didactic and case-based educational programme, consisting of between 12 and 18 hours of training. This training addressed frameworks in implementation science, the study protocol, general concepts of the MAS, clinical protocols, SEFAC eXPERT® platform training,[53] interprofessional and patient communication skills, and the role and responsibilities of change agents. This training was subsequently reinforced during monthly follow-up meetings with the change agents.

The change agent – pharmacist intervention consisted of (1) initial pharmacist training for the MAS provision, (2) educational outreach visits and remote contacts with the participating pharmacies, (3) identification of implementation determinants, (4) design and operationalisation of implementation strategies to address the identified determinants, and (5) ongoing follow-up and monitoring of the participating pharmacists. For this process and data collection, change agents were trained in the use of an electronic data collection notebook (EDC) and the SEFAC eXPERT® online platform,[53] specifically designed to provide guidance on their interaction with pharmacists, determinant identification, and implementation strategy design and operationalisation. Additional information on the training received by change agents is available in Additional File 3.

### 2.6. Data collection

Change agents were allocated to the pharmacies that had consented to participate based on their geographical proximity to each pharmacy's location. The final sample size was determined by the number of pharmacies for which the change agents identified determinants. Data

collection was undertaken through the on-site verbal interaction with the participating pharmacists or remote communication methods, such as telephone calls, videoconferences, and instant messaging services. During these interactions, change agents sought to gain a comprehensive understanding of existing determinants acting as barriers and the cause-effect relationships between them. Henceforth in this paper, the term "barrier" is classified as "primary determinant", whilst "cause" is classified as the "secondary determinant". The change agents, whether on-site at the pharmacy, during a remote interaction with the pharmacists or during EDC recording, designed and operationalised implementation strategies to address these determinants.

Therefore, the typical sequence of data collection interactions between the change agent and pharmacists encompassed three stages: (1) identification of the primary determinant (barrier), (2) identification of a secondary determinant (cause) associated with the primary determinant via a cause-and-effect relationship, and (3) design of an implementation strategy to address these determinants. Each determinant was classified into the CFIR's domains (stages 1 and 2) and, for implementation strategies, into Dogherty's categories (stage 3).

Subsequently, change agents used the change agent guide to code and record this information in the EDC. The EDC encompassed a pre-established list of determinants and implementation strategies. Change agents had the flexibility to either choose one of the identified determinants and implementation strategies within the adapted and broadened CFIR[25] and Dogherty[54] taxonomies or add another if none were deemed applicable. The EDC also incorporated a section for providing additional qualitative data to describe the determinants and implementation strategies. Furthermore, the change agents recorded the date of the visit and specified whether the determinant pertained to the entire pharmacy or to a specific pharmacist. The change agents evaluated the outcome of the strategy by following up with the pharmacy. They then documented and categorised each strategy as "in process" (outcome not yet determined), "successful" (determinant overcome), or "unsuccessful" (determinant not overcome) based on the information gathered during that follow-up contact. No specific timeline was set for the follow-up and depended on the change agent's experience or the pharmacy's availability.

In order to ensure data validity, a member of the research team continuously reviewed the entries of the EDC system and provided feedback to the change agents. Subsequent to the conclusion of the study, this researcher validated the change agent's coding by reviewing the qualitative information documented in the database. In some instances, necessary entries were reclassified.

### 2.7. Data analysis

The qualitative dataset was segregated into three distinct groups, one representing instances characterised by the successful resolution of determinants through the operationalisation implementation strategies ("strategy successful"), another representing cases where the strategies proved ineffective ("strategy unsuccessful"), and a third encompassing instances with strategies designated as pending ("strategy in process") or featuring missing data. Frequencies were then calculated for each group to facilitate quantitative analysis.

The sequences of each change agent's data entries were translated into flows or transitions between nodes, from determinants to strategies, with the width of a transition based on the number of data entries linked by that transition. Sankey diagrams were selected on the basis that they allow for the visual representation of large amounts of data organised into multiple stages or variables, alongside data on flow volumes.[57] The diagrams document and illustrate the relationship between the primary determinants (barriers), the secondary determinants (causes) and the implementation strategy categories. The bandwidth of the depicted flows is directly proportional to the frequency of relationships between the two determinant domains and the strategy categories. Data were processed using R version 4.3.2 and RStudio version 2023.12.0 Build
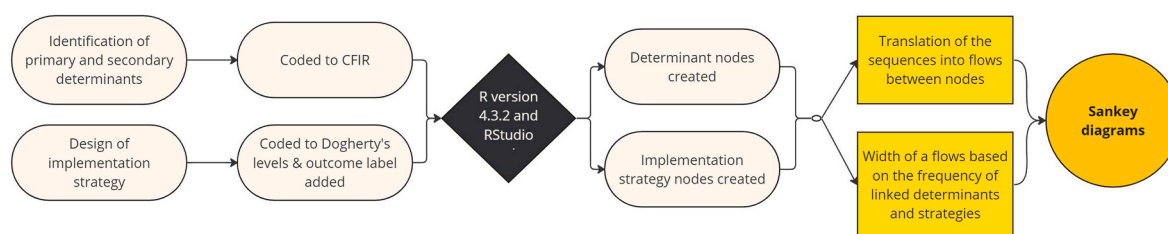
**Fig. 1. Data analysis process** (description: figure describing the process carried out when analysing the data).

369. The data analysis process has been visually represented in Fig. 1.

## 3. Results

Ten change agents systematically documented 4236 determinant-implementation strategy relationships pertaining to 92 participating pharmacies. These sites were geographically distributed across Spain and the number of pharmacists employed exhibited moderate variability, ranging from a minimum of one to a maximum of five (mean 2.0, SD = 1.0).

The most common primary determinant (barrier) domain identified by the change agents was "intervention characteristics" (n = 1843, 43.5 %) (i.e. attributes of the minor ailment service), and the secondary determinant (cause) domain "characteristics of the individuals involved" (n = 3069, 72.5 %) (i.e. actions and behaviours of the pharmacists involved in the implementation process). The most common strategy category was "other" (n = 1808, 42.7 %).

A leading relationship emerged between the two determinant domains and the strategy category, designated as "intervention characteristics", "characteristics of the individuals involved", and "other", respectively (Table 1). This association encompassed 21.6 % (n = 915) of the entirety of the data. Furthermore, almost half of this relationship (n = 435, 27.2 % of the successful strategy group) demonstrated favourable outcomes, indicating instances where the implementation strategy successfully overcame the identified determinants. Another frequent relationship for successful strategies, which was identified in 345 instances (21.5 % of the successful strategy group), was the relationship between both determinant domains "intervention characteristics" and the strategy category "other". Similarly, for the determinant domains "intervention characteristics", the implementation strategy "planning for change" (i.e. increasing pharmacists' awareness of a need for change and assisting with developing a plan for implementation) was

identified 110 times (6.9 % of the successful strategy group).

However, across the group of unsuccessful implementation strategies, the most common relationship between the determinant domains and strategy category materialised as "process of implementation" (i.e. formal and informal activities inherent to the implementation process, for example, the challenges involved in identifying and engaging patients eligible for the MAS or in securing implementation champions), "characteristics of the individuals involved" and "planning for change", representing a proportion of 22.7 % (n = 189) of the unsuccessful associations. Furthermore, an alternative relationship involving these two domains and the strategy "leading and managing change" (i.e. fostering team building and group dynamics and providing project-specific support such as resources and tools for change) was identified on 126 occasions (15.1 %).

### 3.1. Sankey diagrams

Within the dataset, a group representing instances with successful resolution of determinants consisted of 1602 cases, whereas the group where operationalised strategies failed to overcome the determinants comprised 833 cases. Additionally, the group encompassing instances with implementation strategies categorised as pending or featuring missing data points accounted for 1801 cases. Subsequently, Sankey diagrams were generated for the first two groups (Figs. 2 and 3), outlining the individual strategies employed in the "others" category. Sankey diagrams with more detailed results are available in Additional File 4.

A substantial proportion of change agents were able to successfully overcome primary determinants (barriers) within the "intervention characteristics" domain (Fig. 2). These determinants were mainly linked to a secondary determinant (cause), either within the same group or encompassed in the "characteristics of individuals" domain, as

**Table 1**

**Most common determinant-implementation strategy relationships to implementing a MAS** (description: table depicting the most prevalent relationships between determinants and implementation strategies in the context of minor ailment service implementation).

| Top 50 % of Determinant – Implementation Strategy Relationships | | | | |
|---|---|---|---|---|
| Primary determinant (Barrier) | Secondary determinant (Cause) | Implementation strategy | Frequency | % |
| Intervention characteristics | Characteristics of the individuals involved | Other | 915 | 21.6 |
| Process of implementation | Characteristics of the individuals involved | Planning for change | 436 | 10.3 |
| Intervention characteristics | Intervention characteristics | Other | 348 | 8.2 |
| Characteristics of the individuals involved | Characteristics of the individuals involved | Other | 294 | 6.9 |
| Process of implementation | Characteristics of the individuals involved | Leading and managing change | 269 | 6.4 |
| Top 50 % of Successful Determinant – Implementation Strategy Relationships | | | | |
| Primary determinant (Barrier) | Secondary determinant (Cause) | Successful implementation strategy | Frequency | % |
| Intervention characteristics | Characteristics of the individuals involved | Other | 435 | 27.2 |
| Intervention characteristics | Intervention characteristics | Other | 345 | 21.5 |
| Intervention characteristics | Intervention characteristics | Planning for change | 110 | 6.9 |
| Top 50 % of Unsuccessful Determinant – Implementation Strategy Relationships | | | | |
| Primary determinant (Barrier) | Secondary determinant (Cause) | Unsuccessful implementation strategy | Frequency | % |
| Process of implementation | Characteristics of the individuals involved | Planning for change | 189 | 22.7 |
| Process of implementation | Characteristics of the individuals involved | Leading and managing change | 126 | 15.1 |
| Characteristics of the individuals involved | Characteristics of the individuals involved | Other | 84 | 10.1 |
| Characteristics of the individuals involved | Characteristics of the individuals involved | Planning for change | 84 | 10.1 |
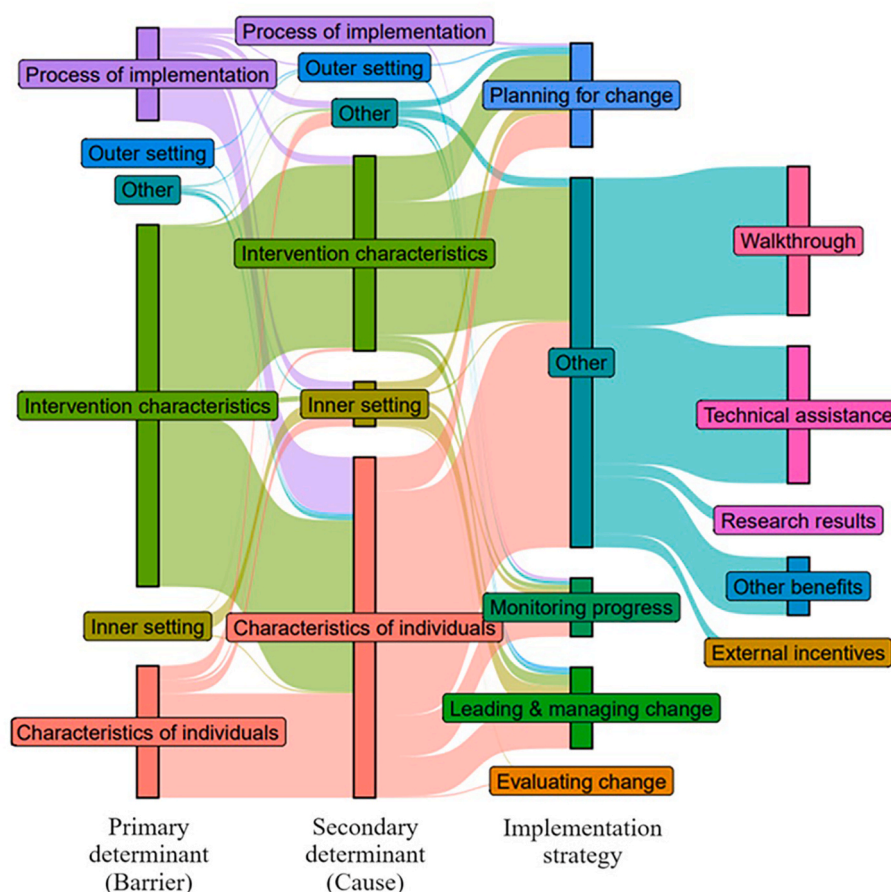
**Fig. 2. Sankey diagram for successful strategies** (description: Sankey diagram illustrating the relationship between successful strategies and their determinants).

evidenced by the comparatively thicker transition leading to these determinant domains. The strategy category "other" emerged as a recurring strategy, successfully operationalised to overcome these determinants, substantiated by both denser transitions leading to this specific node and the node diameter. Once again, after examining the transition flows' and nodes' widths, we can ascertain that "walk-through" (i.e. guidance through the MAS consultation) and "technical assistance" (i.e. troubleshooting technical issues encountered within the online platform) were the two most frequently employed implementation strategies.

Within the group of implementation strategies that were found to be unsuccessful, the primary determinant domains (barriers) characterised by the broadest nodes were "process of implementation" and "characteristics of the individuals involved" (Fig. 3). Through analysing the broader flow transitions, it can be deduced that both domains were predominantly linked to the secondary determinant (cause) domain "characteristics of the individuals involved". Concerning the implementation strategies employed, a study of the transition associated with this secondary determinant domain (characteristics of the individuals involved) revealed that the strategy categories "planning for change" and "leading and managing change" were being commonly operationalised. Additionally, these two implementation strategy categories were characterised by the broadest nodes, and consequently presented, overall, the highest prevalence of failure. When specifically examining the individual strategies categorised under "other" it is evident that all the nodes exhibit widths that closely resemble each other. However, upon analysing the flow width, it becomes apparent that "research results" (i.e. communication of results from external studies) and "other

benefits" (i.e. highlighting of further advantages associated with the innovation) are the predominant implementation strategies.

## 4. Discussion

Implementation of a MAS in community pharmacy is influenced by many determinants, ranging from organisational factors to individual characteristics of providers and patients.[25,26,32,58] In order to ensure the effectiveness of the facilitation process, it is crucial to select appropriate implementation strategies tailored to address specific determinants within a given context.[59–62] However, this is a complex process for which there is limited evidence.[56,63–65] Through this research, several key determinant and implementation strategy relationships that significantly impact the implementation process have been identified. Furthermore, this research has demonstrated the potential to develop visual tools for real time use by change agents involved in implementing innovations within healthcare environments. The findings highlight that these tools could play a pivotal role in guiding change agents towards selecting effective implementation strategies that can successfully overcome identified barriers, considering both contextual and temporal factors.

### 4.1. Determinants and implementation strategy relationships

This research is one of the first to study the cause-and-effect relationship between different determinants, which limits our ability to extensively compare our findings to other studies. However, our results show that "characteristics of the individuals involved" made up over 70
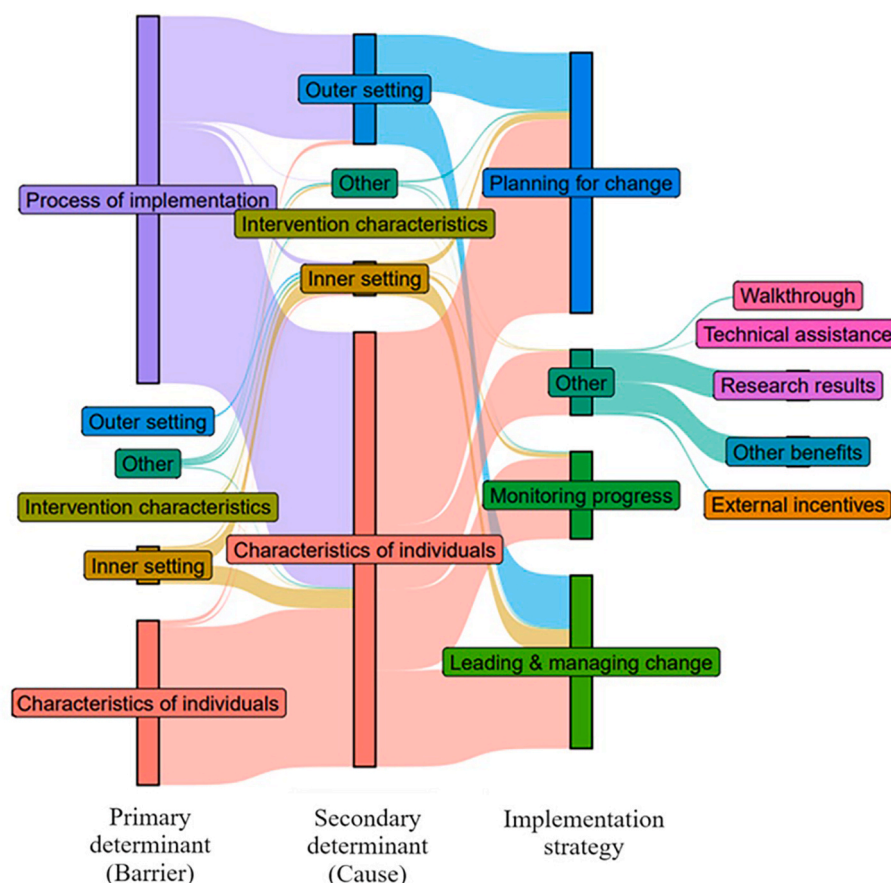
**Fig. 3. Sankey diagram for unsuccessful strategies** (description: Sankey diagram illustrating the relationship between unsuccessful strategies and their determinants).

% of all the secondary determinants (causes) identified. The fact that this domain accounts for such a significant proportion indicates that this is an important domain for future researchers to take into account when initiating an implementation process. In light of this finding, change agents could receive specific training in recognising the personal characteristics and attributes of the individuals implementing the change, thus streamlining determinant identification. There also exists potential for the use of profile matching techniques for selecting internal champions or internal implementation leaders. Intended providers exhibiting personalities conducive to the innovation could conceivably be directed towards key roles, which could theoretically reduce the number of barriers to change.

When analysing operationalised implementation strategies, numerous studies report very broad implementation approaches, such as general facilitation, support and working with opinion leaders and champions.[45,47,66] This renders initial change agent training considerably challenging, due to the absence of specific core implementation strategies. However, the literature emphasises the importance of change agents providing training as a central implementation strategy, whether that be educational meetings[66] or general staff and stakeholder training.[59,67] In this study, consistent with these existing findings, change agents guiding the service providers through the MAS consultation has been highlighted as one of the most frequently successful training strategies. This implies that it is important to provide extensive support to providers during the implementation process, as they often require significant assistance in understanding the use of new technologies and processes. In order to support change agents, training initiatives can be included in the timeline for the implementation of innovations.

### 4.2. Development of a visual strategy selection tool

Sankey diagrams offer a valuable means of addressing challenges in interpreting data when implementing evidence-based practices by visually allowing change agents to grasp flow, frequency and outcomes.[68–70] They present a novel and intuitive approach to illustrating the relationship between determinants and implementation strategies, potentially enhancing the selection, combination, and effectiveness of these strategies in real time by converting and interpreting large amounts of quantitative data. These diagrams have previously been used in fields such as economics, education, and healthcare to track patient transitions and treatment pathways.[68,71–74]

The generated Sankey diagrams illustrate the link between the primary determinant (barrier) and secondary determinant (cause) domains, although, in some cases, two identical determinant domains have been linked together. For instance, the implementation strategy "planning for change" was tailored 110 times to the secondary determinant (cause) "intervention characteristics". This domain was then, itself, associated with the primary determinant (barrier) "intervention characteristics". This could conceivably be a consequence of the wide scope of the CFIR domains. Therefore, to enhance this tool's usefulness when implementing innovations, it is recommended that the tool be reconfigured in the future as an interactive tool, increasing its granularity. This would also enable change agents to zoom in, explore details as needed, and better visualise and understand relationships between individual determinants and strategies.

The Sankey diagrams constitute a valuable tool which can undergo real-time development in ongoing research studies in many different settings. Therefore, rather than directly adopting the published Sankey diagrams, it is proposed that future implementation studies develop

their own diagrams to (1) create a local setting and context-specific visual implementation strategy tool, and (2) allow the tool to continually grow and adjust to the timeframe within which the adopters of the innovation find themselves. In the present study, the taxonomies for determinants and implementation strategies were found to be relatively straightforward for training change agents. Additionally, generating these diagrams using R software was also a relatively simple process. It is believed that interpreting these diagrams in real-time will not be overly complex or time-consuming, allowing for effective analysis even under time pressure.

*4.3. Limitations of the study*

One of the main limitations of this study stemmed from the restricted data collection, encompassing solely 92 pharmacies despite the study's broader scope across 45 Spanish provinces. This restriction resulted from the delayed integration of the EDC into the SEFAC eXPERT® platform. Future implementation studies should integrate the EDC design into the early stages of the implementation process to enable the proposed real-time generation of Sankey diagrams throughout the implementation of innovations.

Further innate limitations were observed in the manner in which the gathered data were interpreted and coded. Due to the quantity of qualitative data available for validation by the research team, the quality of data collected was moderately dependent on the individual skills of the change agent. This made it susceptible to possible unintended biases, potentially impacting the objectivity and reliability of the study findings. Comprehensive and ongoing training, coupled with consistent feedback on data coding, was carried out by a member of the research team in order to mitigate the change agents' qualitative coding and causality inaccuracies.

Neither the CFIR nor the Dogherty taxonomies were specifically tailored for the implementation of community pharmacy services. As a result, we found it necessary to add an additional domain ("other") to both taxonomies. These additional domains included determinants and strategies which were not included in the original taxonomies and could have potentially arisen in our implementation setting. When studying our results and, specifically, the high frequency of strategies categorised as "other", it can be determined that the implementation strategies operationalised by this study's change agents went exceedingly beyond the scope outlined in Dogherty's taxonomy. These taxonomy limitations were further exacerbated by the fact that, in contrast to the CFIR, Dogherty et al. did not provide descriptions for their implementation categories or individual strategies. This deficiency prompted the research team to develop a series of practical examples within the change agent guide. These examples require further validation. Therefore, it is suggested that there is a need to publish strategy compilations with more detailed definitions, descriptions, examples and coding guidelines.

## 5. Conclusion

The findings of this study lay the foundations for creating and refining future visual tools to assist change agents during the facilitation process. Sankey diagrams act as a generic and real-time tool for change agents implementing evidence-based practices. This will enable them to make more informed decisions when selecting implementation strategies by receiving feedback on the effect of their strategies. This will also reduce the complexity inherent to the facilitation activity, considering both contextual and temporal dynamics that influence implementation processes. These findings also enhance our understanding of the relationships between determinants acting as barriers and implementation strategies, using established implementation research taxonomies. This will facilitate prospective implementation researchers to plan implementation interventions and train change agents more efficiently, thereby optimising the change management process.

## CRediT authorship contribution statement

**Emma L. Graham:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Noelia Amador-Fernández:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Conceptualization. **Shalom I. Benrimoj:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Conceptualization. **Fernando Martínez-Martínez:** Writing – review & editing, Supervision, Resources, Project administration, Funding acquisition. **Rubén Palomo-Llinares:** Writing – review & editing, Software, Methodology, Formal analysis. **Julia Sánchez-Tormo:** Writing – review & editing, Software, Methodology, Formal analysis. **Vicente J. Baixauli-Fernández:** Writing – review & editing, Supervision, Resources, Project administration, Funding acquisition. **Vicente Colomer-Molina:** Writing – review & editing, Supervision, Resources, Project administration, Funding acquisition. **Elena Pérez-Hoyos:** Writing – review & editing, Supervision, Project administration. **Miguel Ángel Gastelurrutia:** Writing – review & editing. **Scott Cunningham:** Writing – review & editing. **Victoria García-Cárdenas:** Writing – review & editing, Validation, Supervision, Project administration, Methodology, Conceptualization.

## Ethics approval and consent to participate

Ethical approval for the study was obtained from the Granada Research Ethics Committee (CEI-Granada) under the code 0090-N-20. The full study protocol was registered through ClinicalTrials.gov under the registration number NCT05247333.[42] Both the patients and the pharmacists included in the study signed a consent to participate form.

## 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 Pharmaceutical Care Research Group (University of Granada), Spanish Society of Clinical, Family and Community Pharmacy (SEFAC) and the Pharmaceutical College of Valencia.

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Emma L. Graham - Declarations of interest: none.
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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sapharm.2025.02.002.

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