Methods for Capturing and Analyzing Adaptations: Implications for Implementation Research
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Objectives

1. Discuss the context of adaptations and relevant frameworks
2. Describe the methods used to identify, track and organize adaptations
3. Discuss opportunities for future research and remaining questions
Methods for capturing and analyzing adaptations: implications for implementation research

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Abstract

Background: Interventions are often adapted; some adaptations may provoke more favorable outcomes, whereas some may not. A better understanding of the adaptations and their intended goals may elucidate which adaptations produce better outcomes. Improved methods are needed to better capture and characterize the impact of intervention adaptations.

Methods: We used multiple data collection and analytic methods to characterize adaptations made by practices participating in a hybrid effectiveness-implementation study of a complex, multicomponent diabetes intervention. Data collection methods to identify adaptations included interviews, observations, and facilitator sessions resulting in transcripts, templated notes, and field notes. Adaptations gleaned from these sources were reduced and combined;
What are Adaptations & Why are They Important?

• Stirman and colleagues defined adaptations as “changes made to programs or interventions to align them with the context in which they are implemented.”

• With regards to interventions and implementation strategies, state a priori those features of an intervention, implementation strategy, or protocol expected to retain fidelity (delivery as intended) – that is, the core elements or “functions” considered essential to effectiveness, versus those features more tolerant to adaptation – the peripheral elements that enhance fit to context without diminishing effectiveness.
Relevant Frameworks for Studying Adaptations

Framework for Reporting Adaptations and Modifications to Evidence-based interventions (FRAME) and FRAME-IS
• Catalogues adaptation components into “when, how, who, what, and why” descriptors (or “components”) of adaptations.
• Characterizes adaptation components according to context, content, or level of delivery, as well as whether adaptations were planned or unplanned and fidelity consistent or fidelity inconsistent.
• Using FRAME provides benefit in making adaptations discoverable through their identification and classification.

Model for Adaptation and Design (MADI)
• Effects of different types of adaptations on intervention and implementation outcomes
Studying Adaptations - Questions for the Field

• What is gained with a multi-method data collection approach, and are there modes of data collection best suited for capturing particular adaptation components and types?

• Does packaging descriptive components of adaptations together into multidimensional types better characterize them for a future analytical purpose versus examining components individually?

*Adaptation types might be more useful for conducting further analyses of adaptations when they become part of an outcomes assessment*
| Method                      | Description of Method                                                                 | Participants                                                                 | Timing                                                                                           | Instrument                                                                                     | Data Form Captured                                                                                     | Type of data captured                                                                                     |
|-----------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| Semi-Structured Interview   | Research assistant (RA) or Co-Investigator (Co-I) conducted Interview                  | Select members of the SMA implementation or care teams at practices            | Nine to 12 months after implementation started (midpoint)                                          | Mid-point Interview guide, including questions on adaptations                                     | Transcripts created from audio recording                                                              | Participants’ perceptions of their evaluation of the SMAs and any adaptations made in implementation and conduct of SMAs |
| Observation                  | RA or Co-I observed selected SMA sessions                                               | Randomly selected cohorts                                                      | Quarterly per practice, from implementation start to midpoint                                        | Observation template, including checkboxes for appropriate time ranges and materials for each session | Completed items from checkboxes; Descriptive field notes                                           | Time overall and time for each SMA component, content covered, care team present, facilitator quality, participant engagement |
| Facilitator check-ins       | During practice facilitation sessions, facilitator kept detailed notes                | Practice members who were involved with discussion with facilitators           | As needed per practice, from implementation start to midpoint                                        | Facilitator notes template including prompts for adaptations and reasons                          | Field notes                                                                                        | Questions and updates on implementation of the program and classes                                   |
| Qualitative team analysis   | Categorization of each adaptation into FRAME categories                                | N/A                                                                           | After completion of the above data collection                                                   | Excel-based adaptation tracking log                                                              | Adaptations gleaned from above data collection sources                                              | Components of each adaptation using the FRAME components, adapted for the study (Table 2)         |
Key Finding #1: Different methods elicited more overall adaptations

Some sources of data picked up some adaptations, while others did not. This varied across adaptations types.

• **Observation data** – best on what was happening in the session: changes to the curriculum, who was filling which roles in delivering SMAs, how long sessions lasted. This information was often absent from the interview transcripts or facilitator notes. Thus, without observation data, information about those adaptations would not have been revealed.

• **Facilitator field notes** - best on major process changes because difficulties with process elements were often discussed with facilitators.

• **Interview data** – best on the opportunity to explain adaptations but may have been prone to recall bias because interviews were often conducted much later than the adaptation occurred and may have varied by the particular participant interviewed.

  More data sources = more adaptations identified
Key Finding #2: Different data collection methods provided greater understanding of the components of and reasons for adaptation

• Across the 21 practices, there were a total of 202 adaptations when all duplicates within data sources were removed (Table 4).
• All practices reported at least three unique adaptations discovered from any method (range 3 – 22; mean of 9.6).
• More adaptations occurred in process/implementations (n=123) than in the sessions/program (n=79), with most of the adaptations across both types being unplanned/reactive (171) with the goal of improving the feasibility (49), reach (41) or outcome (27).
• The overwhelming majority were within the intervention protocol (162) noting that the fidelity to the core elements of the intervention was high and that most of what was being captured were changes to improve the fit of the intervention to the contextual circumstances rather than to change the intervention.
Key Finding #3: Different analytic methods revealed ways that adaptation components cluster together in unique patterns, producing adaptation “types”

• Table 4 (2 x 2) shows how the different components associated with the adaptation type (process/implementation vs. sessions/program)

• Tables 5A and 5B (k-mean clustering) can be used to describe what types of adaptations are occurring and why from the data

• Tables 6A and 6B (configurational taxonomic analysis) shows each independent combination of the adaptation components. Out of 414 possible iterations of adaptation component configurations, only 69 actually occurred
Invested in Diabetes Study

• Cluster randomized pragmatic trial (Hybrid type 2; n=22)
• Comparative effectiveness of patient-driven vs standardized diabetes shared medical appointments (SMAs). Practices received protocol, curriculum, and assigned practice facilitator; implemented SMAs using their own resources
• Patient and practice representatives engaged in research prioritization, design, conduct, and dissemination
• RE-AIM framework guided mixed methods evaluation
• Funded by PCORI Improving Healthcare Systems Award (MPIs: Kwan & Waxmonsky)
## Core Components of Protocol

### Features of Comparator SMA Models

| Same for both groups | Standardized SMAs | Patient-Driven SMAs |
|----------------------|-------------------|---------------------|
| **No. of sessions**  | 6 (consisting of diabetes and mental health sessions) |                     |
| **Educational components** | Diabetes and mental health with goal setting and psychosocial support topics (TTIM curriculum) |                     |
| **SMA coordinator**  | Scheduling and documentation |                     |
| **Medical provider** | Medication management by billable provider (Physician Assistant, Nurse Practitioner, or MD/DO); Answer patient-specific medical questions with group present |                     |

### Distinguishing features

| **Patient topic choice** | Order of and time spent on TTIM topics are set for all SMA cohorts | Patients in each SMA cohort select order of and time spent on TTIM topics |
|--------------------------|---------------------------------------------------------------|---------------------------------------------------------------------|
| **Health educator role** | Lead instructor for all educational components | Co-instructor with peer mentor for non-mental health topics |
| **Behavioral health provider role** | Not involved in SMAs | Co-instructor with peer mentor for mental health topics; Answer patient-specific mental/behavioral health questions with group present |
| **Peer mentor role** | Not involved in SMAs | Co-instructor for all group visits; 1x1 peer access |
### Analytic Steps and Rationale

| Step                                                                 | Reason                                                                                                                                                                                                 |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Primary documents (transcripts, notes) were analyzed; all adaptations found were enumerated. | To find all adaptations to the implementation process described                                                                                                                                 |
| 2. Adaptations were entered into a spreadsheet, and each FRAME component was described. | To be able to break down and review reasons why adaptations occurred and their intended consequences                                                                                                     |
| 3. Adaptations within each practice and data source were de-duplicated. | Quantitizing adaptations allowed us to gather information on how often certain adaptation components occurred and grouped together. Since adaptations were collected through qualitative methods, there was inherent inconsistency in how much any adaptation was identified within data sources. De-duplication removed the issue of conflating number of mentions with number of adaptations as certain interviews could mention the same adaptation multiple times. Keeping de-duplication within each data source allowed us to understand how adaptations occur in each source. |
| 4. Adaptations were compared between data sources.                  | Allowed us to make recommendations on which types of data collection to use and for what scenarios and intended outcomes                                                                                      |
| 5. Adaptations and their components were enumerated across data sources. | Allowed us to see raw numbers of adaptations/adaptation components discovered in the data                                                                                                |
| 6. Adaptation components were compared using three approaches: co-occurrence, k-means clustering, and taxonomic analysis. | Allowed us to see groupings of adaptations and adaptation components in order to be able to tell an implementation story                                                                                   |
| FRAME element                  | FRAME component choices                                      | Use of FRAME components for this study                                                                 |
|--------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| **Process**                    |                                                                                                           |                                                                                                        |
| When did the modification occur? | • Pre-implementation/ planning                               | • As our data was primarily from the implementation phase, we did not see data categorized as pre-implementation, Scale up, or Maintenance |
|                                | • Implementation                                              |                                                                                                        |
|                                | • Scale-up                                                    |                                                                                                        |
|                                | • Maintenance/ Sustainment                                    |                                                                                                        |
|                                | • As our data was primarily from the implementation phase, we did not see data categorized as pre-implementation, Scale up, or Maintenance |                                                                                                        |
|                                | • Split pre-implementation and implementation into “When did it occur” and “For how long did it occur” to distinguish permanence of adaptation |                                                                                                        |
| Were adaptations planned?      | • Planned/Proactive (proactive adaptation)                    | • No modifications                                                                                     |
|                                | • Planned/Reactive (reactive adaptation)                      |                                                                                                        |
| Who participated in the decision to modify? | • Political leaders                                           | • Changed to reflect relevant roles (Researchers, Patients, Study-involved staff at practice, Non-study-involved staff at practice, Both researchers and practice staff, Other) |
|                                | • Program leaders                                             |                                                                                                        |
|                                | • Funders                                                     |                                                                                                        |
|                                | • Administrator                                               |                                                                                                        |
|                                | • Program manager                                             |                                                                                                        |
|                                | • Intervention developer/purveyor                            |                                                                                                        |
|                                | • Researcher                                                  |                                                                                                        |
|                                | • Treatment/ intervention team                                |                                                                                                        |
|                                | • Individual practitioner                                    |                                                                                                        |
|                                | • Community members                                           |                                                                                                        |
|                                | • Recipients                                                  |                                                                                                        |
| Adaptation Domain – What was Adapted (FRAME) | Degree of Concordance/ Discordance Across Data Sources |
|---------------------------------------------|-------------------------------------------------------|
| Follow-up or Tracking (Ex: Began contacting patients before sessions) | Mean Score: 2.3  
Completely different (1): 8 Some similarities (2): 2 Mostly similar (3): 6 Same data (4): 4 |
| Program Content (Ex: Not all curriculum content covered) | Mean Score: 2.2  
Completely different (1): 4 Some similarities (2): 10 Mostly similar (3): 4 Same data (4): 2 |
| Recruitment (Ex: Expanded focus of recruitment with patients) | Mean Score: 2.4  
Completely different (1): 7 Some similarities (2): 2 Mostly similar (3): 7 Same data (4): 4 |
| Resources (Ex: Began utilizing whiteboard) | Mean Score: 2.6  
Completely different (1): 9 Some similarities (2): 1 Mostly similar (3): 0 Same data (4): 10 |
| Scheduling (Ex: Changed to weekly sessions from monthly) | Mean Score: 2.1  
Completely different (1): 9 Some similarities (2): 2 Mostly similar (3): 7 Same data (4): 2 |
| Time Devoted (Ex: Classes shorter than 120 minutes) | Mean Score: 1.7  
Completely different (1): 13 Some similarities (2): 2 Mostly similar (3): 3 Same data (4): |
| Who is Involved (Ex: Class facilitator resigned and replaced) | Mean Score: 2.8  
Completely different (1): 2 Some similarities (2): 4 Mostly similar (3): 11 Same data (4): 3 |
| Other (Ex: Practice staff began using instant messaging) | Mean Score: 2.9  
Completely different (1): 6 Some similarities (2): 2 Mostly similar (3): 0 Same data (4): 4 |
| Overall | Mean Score: 2.4  
Completely different (1): 58 Some similarities (2): 25 Mostly similar (3): 38 Same data (4): 39 |

Data from 21 practices, condensed to 20. Mean score of rating 1-4. Each domain was compared 20 times.
Table 4: Data Captured in the Adaptations Tracking Log

| FRAME Adaptation Descriptor | Process/implementation | Classes/program | Total |
|----------------------------|------------------------|----------------|-------|
| Process/implementation     | 123                    | 0 (N/A)        | 123   |
| Classes/program            | 0 (N/A)                | 79             | 79    |
| Follow-up or tracking      | 21                     | 1              | 22    |
| Program Content            | 0                      | 49             | 49    |
| Recruitment                | 43                     | 1              | 44    |
| Resources                  | 3                      | 5              | 8     |
| Scheduling                 | 17                     | 3              | 20    |
| Time devoted               | 7                      | 8              | 15    |
| Who is involved            | 26                     | 12             | 38    |
| Other                      | 6                      | 0              | 6     |
| Increase reach/engagement  | 36                     | 5              | 41    |
| Increase retention         | 5                      | 1              | 6     |
| Improve feasibility        | 41                     | 8              | 49    |
| Improve fit with recipients| 2                      | 13             | 15    |
| Improve outcomes           | 6                      | 21             | 27    |
| Reduce cost                | 6                      | 1              | 7     |
| Increase satisfaction      | 7                      | 10             | 17    |
| Other or N/A               | 6                      | 12             | 18    |
| Outside forces/"just       |                        |                |       |
| Variable                      | Category                          | Cluster 1 \(N=51\) | Cluster 2 \(N=18\) | Cluster 3 \(N=53\) | Cluster 4 \(N=28\) | Cluster 5 \(N=22\) | Cluster 6 \(N=30\) |
|-------------------------------|-----------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| What was adapted              | Followup or tracking              | 2%                  | 14%                 | 9%                  | 13%                 | 57%                 | 13%                 |
|                               | Other                             | 4%                  | 11%                 | 11%                 | 9%                  | 13%                 | 13%                 |
|                               | Program content                   | 50%                 | 50%                 | 50%                 | 50%                 | 50%                 | 50%                 |
|                               | Recruitment                       | 75%                 | 75%                 | 75%                 | 75%                 | 75%                 | 75%                 |
|                               | Resources                         | 2%                  | 2%                  | 2%                  | 2%                  | 2%                  | 2%                  |
|                               | Scheduling                        | 21%                 | 21%                 | 21%                 | 21%                 | 21%                 | 21%                 |
|                               | Time devoted                       | 14%                 | 14%                 | 14%                 | 14%                 | 14%                 | 14%                 |
|                               | Who is involved                    | 33%                 | 33%                 | 33%                 | 33%                 | 33%                 | 33%                 |
| Reason why it was adapted     | Cultural factors                  | 2%                  | 2%                  | 2%                  | 2%                  | 2%                  | 2%                  |
|                               | Improve feasibility               | 16%                 | 11%                 | 11%                 | 11%                 | 11%                 | 11%                 |
|                               | Improve fit with recipients       | 22%                 | 22%                 | 22%                 | 22%                 | 22%                 | 22%                 |
|                               | Increase satisfaction              | 22%                 | 22%                 | 22%                 | 22%                 | 22%                 | 22%                 |
|                               | Outside forces/"just happened"    | 4%                  | 4%                  | 4%                  | 4%                  | 4%                  | 4%                  |
|                               | Improve outcomes                  | 6%                  | 6%                  | 6%                  | 6%                  | 6%                  | 6%                  |
|                               | Increase reach/engagement         | 6%                  | 6%                  | 6%                  | 6%                  | 6%                  | 6%                  |
|                               | Increase retention                | 8%                  | 8%                  | 8%                  | 8%                  | 8%                  | 8%                  |
|                               | Other or N/A                      | 9%                  | 9%                  | 9%                  | 9%                  | 9%                  | 9%                  |
| Adaptation Type               | Classes/program                   | 100%                | 100%                | 2%                  | 21%                 | 14%                 | 100%                |
|                               | Process/implementation             | 98%                 | 89%                 | 86%                 | 86%                 | 86%                 | 86%                 |
| When did the adaptation occur | During or after 1st                | 31%                 | 44%                 | 51%                 | 36%                 | 36%                 | 13%                 |
|                               | Later into implementation         | 10%                 | 10%                 | 10%                 | 10%                 | 10%                 | 10%                 |
|                               | Planning                          | 50%                 | 50%                 | 50%                 | 50%                 | 50%                 | 50%                 |
|                               | Unclear                           | 6%                  | 6%                  | 6%                  | 6%                  | 6%                  | 6%                  |
| Planning Level                | Planned (proactive)               | 4%                  | 89%                 | 86%                 | 86%                 | 86%                 | 86%                 |
|                               | Unplanned (reactive)              | 96%                 | 11%                 | 94%                 | 93%                 | 100%                | 73%                 |
| Level Fidelity                | Became within protocol             | 4%                  | 6%                  | 2%                  | 9%                  | 9%                  | 97%                 |
|                               | Within protocol                    | 55%                 | 67%                 | 91%                 | 96%                 | 82%                 | 77%                 |
|                               | Outside of protocol               | 39%                 | 17%                 | 8%                  | 4%                  | 3%                  | 3%                  |
|                               | Outside of protocol (condition specific) | 2% | 11% | 11% | 11% | 11% | 11% |
| What was adapted? | Fidelity | Improve feasibility (during planning: after planning) | Improve reach/engagement (during planning: after planning) | Increase satisfaction (during planning: after planning) | Improve outcomes (during planning: after planning) | Improve fit (during planning: after planning) | Other/NA (during planning: after planning) |
|-------------------|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Content (n=47)    | Consistent (n=31) | 0:0                             | 0:3                             | 0:4                             | 2:10                            | 2:6                             | 0:4                             |
|                   | Inconsistent (n=16) | 0:0                             | 0:1                             | 0:2                             | 1:2                             | 0:2                             | 0:8                             |
| Who is involved (n=12) | Consistent (n=5) | 1:2                             | 0:0                             | 0:0                             | 0:0                             | 1:0                             | 0:1                             |
|                   | Inconsistent (n=7) | 0:1                             | 0:0                             | 0:1                             | 1:2                             | 0:0                             | 0:2                             |
| Time devoted (n=8) | Consistent (n=2) | 0:1                             | 0:0                             | 0:1                             | 0:0                             | 0:0                             | 0:0                             |
|                   | Inconsistent (n=6) | 0:1                             | 0:0                             | 0:1                             | 0:0                             | 0:0                             | 0:4                             |
| Scheduling (n=3)  | Consistent (n=3) | 0:1                             | 0:1                             | 0:1                             | 0:0                             | 0:0                             | 0:0                             |
|                   | Inconsistent (n=0) | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             |
| Resources (n=2)   | Consistent (n=2) | 0:0                             | 0:0                             | 0:0                             | 0:1                             | 0:0                             | 0:1                             |
|                   | Inconsistent (n=0) | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             |
| Follow-up (n=1)   | Consistent (n=1) | 0:1                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             |
|                   | Inconsistent (n=0) | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             |
| Recruitment (n=1) | Consistent (n=1) | 0:0                             | 0:1                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             |
|                   | Inconsistent (n=0) | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             |
| Other/NA (n=5)    | Consistent (n=5) | 0:1                             | 0:0                             | 0:0                             | 1:1                             | 0:2                             | 0:0                             |
|                   | Inconsistent (n=0) | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             | 0:0                             |
Contributions to the Field – this work illustrates:

• How existing methods can be utilized singly and in combination, which is of use to researchers studying translation of evidence-based interventions to practice.

• Using a case example, specific methods used in combination highlight ways to understand implementation through examination of adaptations and their descriptive components.

• Methods for studying adaptations, which may be useful for better characterizing which combination of adaptation components are associated with successful implementation outcomes.
Next Steps

• Which use of methods packaging works best?
• What adaptations are worth capturing and which are minutiae?
• Use of the adaptations “packages” for studying with outcomes – does this help us learn more about what adaptations work within context to produce the best outcomes?
  • Will frameworks or models (MADI?) might be a useful model for discovering this answer?
  • What methods might be used?
**Domain 1: Adaptation Characteristics (Stirman et al., 2019)**

Provides consistency in reporting of adaptations to promote comparison of findings across studies (prospective and retrospective application).

- **What** is modified (content; delivery; training and evaluation; implementation and scale-up activities)?
- **Nature** of adaptation (e.g., adding/skipping/substituting elements; shortening/condensing pacing; repeating elements)?
- **Who** participated in adaptation decision-making (political leaders; program leader; funder; administrator; program manager; intervention developer/purveyor; researcher; treatment/intervention team; individual practitioners; community members; recipients)?
- **For whom/what** is the adaptation made (individual; target intervention group; cohort/individuals that share a particular characteristic; individual practitioner; clinic/unit; organization; network/system community)?
- **When** did adaptation occur (pre-implementation/planning/pilot; implementation; scale-up; maintenance/extension)?

**Domain 2: Possible Mediating or Moderating Factors (Stirman et al., 2019; Moore et al., 2013)**

Criteria for making adaptations (prospective application); explanation of why, how, and under what circumstances outcomes are achieved (retrospective application).

**Potential mediator:**
- Alignment with core functions/relationship to fidelity: Adaptation consistent with core functions of the intervention or implementation strategy?

**Potential moderators:**
- **Goal/Reason for Adaptation:** Adaptation made for a reason/goal that addresses fit?
- **Systematic:** Adaptation made with due consideration given to impact on outcomes and using a systematic process (consulting data, stakeholders, theory, best practice)?
- **Proactive:** Adaptation made due to anticipated obstacle

**Domain 3: Implementation and Intervention Outcomes (Intended and Unintended) (Proctor et al., 2011)**

Encourages consideration of intended and unintended impact on intervention and implementation outcomes. Prospectively, promotes discussion of all impacts (e.g., if positive and negative impacts expected, can they be balanced? If not, should adaptations be re-designed? Could implementation strategies offset negative impacts?) Retrospectively, promotes more informed decisions in which variables to measure in evaluation.

**Implementation Outcomes**
- Adoption
- Acceptability
- Appropriateness
- Feasibility
- Cost
- Penetration
- Fidelity
- Sustainability

**Intervention Outcomes**
- Client outcomes
- Service outcomes

**Impact**

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**Fig. 1 Model for Adaptation Design and Impact (MADI)**
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THANK YOU