Using the IFASIS (Inventory of Factors Affecting Successful Implementation and Sustainment) to advance context-specific and generalizable knowledge of implementation determinants: case study of a digital contingency management platform

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Abstract

Background Contingency management (CM) is the most effective treatment for stimulant use disorder but is under-utilized by opioid treatment programs (OTPs) despite the high prevalence of stimulant use in this setting. As part of a state-wide initiative, we piloted a novel assessment, the Inventory of Factors Affecting Successful Implementation and Sustainment (IFASIS), to examine determinants of implementation of a digital CM platform across a set of OTPs. We describe how the IFASIS was used to elucidate both generalizable and context-specific implementation determinants, and to guide the provision of implementation facilitation.

Methods Six OTPs received a multi-level implementation strategy (including facilitation) to promote program-matic uptake of a digital CM platform. Pre-implementation, OTPs completed the IFASIS, a 27-item questionnaire that assesses both the valence (positive/negative) and importance of determinants across 4 domains: outside the organization, within the organization, about the intervention, and about intervention recipients. OTP staff completed the IFASIS as a team, identifying consensus ratings during recorded discussions. Transcripts of IFASIS recordings were analyzed using rapid qualitative analysis. Quantitative IFASIS results were aggregated into medians and ranges within and across organizations. A detailed review of implementation facilitation meeting notes was conducted to examine how the IFASIS was used to guide facilitation.

Results Quantitative ratings and qualitative feedback revealed common barriers to implementation of the digital CM platform, including a lack of sustainable funding sources, absence of external and organizational policies, insufficient higher-level leadership support, and mixed attitudes among staff members toward CM. Common implementation facilitators included enthusiasm and commitment among organization leadership and the perception that the digital CM platform would reduce the workload and burden on OTP counselors. The IFASIS was used to guide facilitation in several ways, including stimulating discussion about barriers and facilitators, brainstorming strategies to address

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barriers rated as "very important", and identifying facilitators that could be harnessed as part of implementation efforts.

Conclusions The IFASIS identified important determinants of CM implementation in OTPs and was instrumental in shaping facilitation. The IFASIS may be a valuable assessment for the implementation science community to identify and address generalizable and context-specific implementation determinants.

Keywords Contingency management, Opioid treatment programs, Opioid use disorder, Implementation determinants, Rapid qualitative analysis

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Contributions to the literature

- We report the use of a novel assessment, the Inventory of Factors Affecting Successful Implementation and Sustainment (IFASIS), to pragmatically identify implementation determinants of a digital contingency management (CM) platform in opioid treatment programs.
- The IFASIS provided both quantitative and qualitative data about implementation determinants across and within programs. These data guided the provision of external facilitation and contribute to the body of research on CM implementation.
- This case example describes how the IFASIS can be used to identify both context-specific and generalizable implementation determinants with high potential to benefit implementation science practitioners and researchers.

Background

The sharp rise in stimulant use among patients with opioid use disorders [1] has led national organizations to call for widespread implementation of contingency management (CM) in opioid treatment programs (OTPs) [2, 3]. Contingency management (CM), a behavioral intervention in which patients earn incentives for meeting treatment goals, is the most effective treatment for stimulant use disorder and an effective adjunct to medications for opioid use disorder [2, 3]. Receipt of CM is associated with over twice the rate of abstinence compared to treatment as usual [2] and has large adjunctive effects with medications for opioid use disorder [3]. Recent data indicate that about 50% of OTPs report providing CM [4], yet surveys of OTPs suggest that CM is frequently delivered without fidelity to evidence-based guidelines (e.g., incentives provided with insufficient frequency, intensity, and duration) [5, 6].

Determinants (i.e., barriers and facilitators) of CM implementation in OTPs are well documented and span multiple levels. Some established examples of CM determinants when delivered in-person include funding for CM incentives, organizational resources (i.e., staffing, time) to deliver CM with fidelity [7, 8], and provider

attitudes toward patients earning incentives [9]. Widespread recognition of these determinants has led to efforts to increase CM accessibility via development of digital CM platforms that allow patients to remotely complete toxicology screens and receive monetary incentives electronically [10]. Digital CM platforms have demonstrated acceptability to an array of patients, including those in rural areas, using multiple substances, and/or socioeconomically disadvantaged [11, 12]. Multiple studies in the United States have found that digital CM platforms are associated with higher rates of abstinence and engagement in substance use treatment than treatment as usual [11]. Digital CM platforms have also been theorized to present a cost-effective alternative to in-person CM [10, 13–15].

Despite the potential of digital CM platforms to address well-established determinants, digital interventions introduce unique determinants, including reliance on internet/smartphone access, patient/provider concerns about data privacy and security, and ongoing financial investment and information technology support as technology evolves [16]. Yet, to date, little to no research exists on determinants of CM implementation using a digital platform. The current study addresses this gap by elucidating determinants across a cohort of OTPs given access to a digital CM platform through a state-funded implementation initiative.

A key tension when attempting to elucidate implementation determinants is reconciling the uniqueness of determinants in specific contexts with the scientific goal of producing generalizable knowledge. Generating locally relevant implementation strategies requires a context-specific understanding of determinants, while producing knowledge that can help other OTPs necessitates approaches that reveal commonalities across programs. To address this tension, we used a novel, team-based assessment called the Inventory of Factors Affecting Successful Implementation and Sustainment (IFASIS) (Chokron Garneau H, Cheng H, Kim JP, Abdel Magid M, Chin-Purcell L, McGovern MA: A Pragmatic Measure Of Context At The Organizational Level: The Inventory Of Factors Affecting Successful Implementation And Sustainment (IFASIS), Forthcoming) in two complementary

ways that varied in their intent: (a) to guide OTP-specific implementation facilitation (context-specific) and (b) to elucidate common determinants across OTPs (generalizable). This manuscript serves as a case example of how the IFASIS can be employed both as a determinant assessment tool and an implementation facilitation guide, advancing both context-specific and generalizable knowledge.

Methods

Parent trial

This analysis was embedded within Maximizing the Implementation of Motivational Incentives in Clinics 2 (MIMIC2), one of three coordinated research projects comprising The Center for Dissemination and Implementation at Stanford (C-DIAS; 21). C-DIAS is a National Institute on Drug Abuse-funded P50 Center of Excellence focused on advancing the equitable implementation of evidence-based addiction treatments [17].

MIMIC2 partnered with two Departments of Health (Rhode Island and Chicago, Illinois) to offer a multi-level implementation strategy called the Science to Service Laboratory to OTPs seeking to implement CM. This analysis focuses on work with the Rhode Island Department of Behavioral Healthcare, Developmental Disabilities & Hospitals (hereafter called the Health Department) to support the state's rollout of an evidence-based digital CM platform using opioid settlement funds. The MIMIC2 team led both the multi-level implementation strategy and the evaluation of the state-wide rollout. The focal assessment was the IFASIS, a C-DIAS common measure to evaluate contextual determinants. All MIMIC2 study procedures received approval from the Northwestern University Feinberg School of Medicine Institutional Review Board (Protocol STU00219088).

Participating OTPs and providers

The Health Department invited OTP administrators throughout Rhode Island to participate in the state-funded CM initiative. Of the 13 OTP administrators, six expressed interest, all of whom were approved for participation. Table 1 presents information about the participating OTPs, including each organization's for-profit status, patient census, and medications provided.

Once consented, OTP administrators nominated staff to receive implementation support. Nominated staff were required to have active clinical caseloads and be willing to receive implementation support over a 6-month period. Across OTPs, 5–18 staff were nominated per program.

The Digital CM platform

The digital CM platform was secure, HIPAA-compliant, and delivered up to $599 in incentives to each patient over a 6-month period. Incentives were earned for testing negative on self-administered, video-recorded toxicology screens, completing modules, and attending treatment sessions. The platform served as an "off-the-shelf" complement to clinical care that required minimal ongoing engagement from the referring OTP. The primary responsibilities of OTP staff were to enroll patients in the platform and to reinforce patient engagement in the program, by logging into a provider portal to review patient toxicology results and progress in the program.

Implementation strategy

The Science to Service Laboratory implementation strategy had three components: didactic training, performance feedback, and external facilitation. Didactic training included a live training session with the digital CM platform administrators and a pre-recorded video on CM principles. Performance feedback was provided via weekly OTP-specific newsletters reporting on patient enrollment. Finally, of direct relevance to this analysis, each participating OTP was offered six-monthly external facilitation sessions between September 2023 and April 2024. Facilitation calls were commenced within two weeks of didactic training, 30- to 60 min long, offered to all OTP staff, and led by doctoral-level implementation

Table 1 Characteristics of Each Participating Opioid Treatment Program (*N* = 6)

Characteristics	Organization IDs					
	101	102	103	104	105	106
Organization status (For vs. Non-Profit)	For-profit	For-profit	For-profit	For-profit	Non-profit	Non-profit
Patient census (Number)	550	605	625	502	850	350
Patients with stimulant use (%)	5–10%	20%	65–75%	50%	85%	40%
Patients dispensed methadone (%)	20%	85%	100%	90%	85%	91%
Patients dispensed buprenorphine (%)	75%	15%	0%	10%	15%	9%
Providers nominated for training (Number)	7	15	18	10	16	5
Nominated providers completing training (%)	100%	93%	94%	100%	100%	100%

scientists. Facilitation sessions were designed to systematically identify OTP-specific determinants of implementation and collaboratively brainstorm strategies to address barriers while capitalizing upon facilitators.

The IFASIS

Development and validation of the IFASIS followed a comprehensive, multi-step process guided by the COSMIN (Consensus-based Standards for the selection of health status Measurement Instruments) and PAPERS (Psychometric and Pragmatic Evidence Rating Scale) guidelines [18, 19]. Drawing from multiple implementation science frameworks [17, 20, 21] the IFASIS conceptualizes context as multi-level and dynamic, spanning four domains and 13 subdomains. Domains include Factors Outside Your Organization, Factors Within Your Organization, Factors about the Intervention, and Factors about the Person Receiving the Intervention. The 13 subdomains contain 27 items, each rated on two scales. First, the valence of each determinant is rated from 1–5, with 1–2 indicating the determinant is a barrier, 3 denoting that the factor is neutral, and 4–5 indicating the factor is a facilitator. Next, each determinant's importance is rated on a scale from 1 (not important) to 3 (very important). The full IFASIS is available on the C-DIAS website and select items have been published elsewhere (Chokron Garneau H, Cheng H, Kim JP, Abdel Magid M, Chin-Purcell L, McGovern MA: A Pragmatic Measure Of Context At The Organizational Level: The Inventory Of Factors Affecting Successful Implementation And Sustainment (IFASIS), Forthcoming), [22]. Psychometric analyses have demonstrated that the IFASIS is reliable and has both predictive and concurrent validity (Chokron Garneau H, Cheng H, Kim JP, Abdel Magid M, Chin-Purcell L, McGovern MA: A Pragmatic Measure Of Context At The Organizational Level: The Inventory Of Factors Affecting Successful Implementation And Sustainment (IFASIS), Forthcoming).
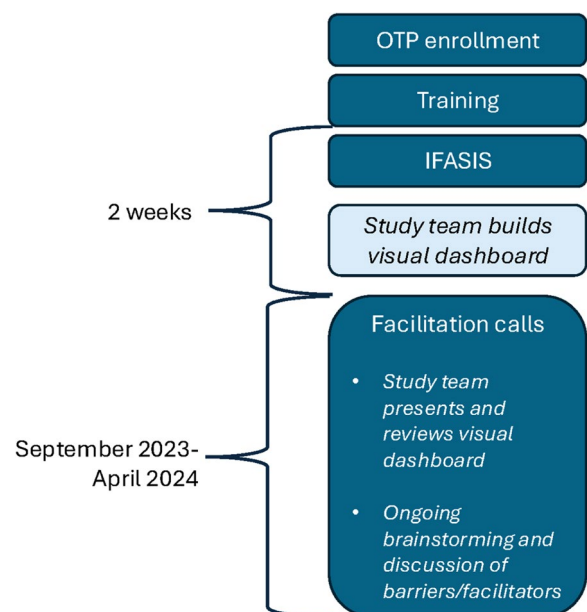
The IFASIS is administered as a team-based assessment, with team members encouraged to discuss each question to generate consensus ratings. The assessment can be self-administered by the team on paper or electronically via Qualtrics, or administered by a trained facilitator, who records the consensus ratings. Training to facilitate IFASIS sessions is minimal. It involves reading over an instruction manual and a 30-min meeting with the instrument developers to review the instrument's purpose, scoring criteria, and facilitation techniques. The IFASIS was developed as a self-administered tool, and although the presence of a facilitator is helpful, it is not necessary.

At each OTP, organization leaders invited 3–5 team members involved in implementation of the digital CM platform to complete the IFASIS. Team members were informed that the IFASIS was being completed as part of the evaluation of the state-funded CM rollout. Five of the six OTP teams completed the IFASIS with a facilitator, while the sixth completed the IFASIS independently due to scheduling difficulties. Team members were always together at their OTP, while facilitators joined via Zoom. Facilitators were three female BA-level research assistants trained in IFASIS administration, all of whom had 1–3 years of clinical research experience. Facilitators' primary roles were to take notes on the discussion and to answer clarifying questions. OTP staff had met two of the facilitators at the didactic training sessions. Four of the sessions had a second research staff member join, and one of these sessions was observed by the IFASIS developer for training purposes. The five facilitator-led sessions (ranging from 30–62 min) were audio-recorded and transcribed verbatim. A recording was not available for the OTP that self-administered the IFASIS. This OTP's results were therefore included in the quantitative but not the qualitative analysis.

All six OTPs completed the IFASIS before initiating the six-monthly facilitation calls (Fig. 1). In Month 1, the facilitator presented each OTP with a customized IFASIS dashboard depicting each determinant's valence and importance rating.

OTP staff were asked to provide feedback on whether the results accurately reflected their early experiences implementing the digital CM platform. Using the visual

Fig. 1 Schematic of when and how the IFASIS was used to guide facilitation

dashboard, the facilitator first gained consensus around barriers and facilitators and then helped the OTP staff prioritize which barriers should be addressed first, focusing on those with the most negative valence and rated most important. In Months 2 through 5, the facilitator engaged OTP staff in collaborative brainstorming to address high-priority barriers while harnessing those facilitators with the most positive valence and rated most important.

Quantitative analysis

For each OTP, we plotted the consensus IFASIS score to create OTP-specific dashboards. Across OTPs, we calculated the IFASIS score median and range for each item. We also conducted a sensitivity analysis excluding the OTP that completed the IFASIS independently without a facilitator (Site 105) to assess whether there were any substantial differences in the medians and ranges.

Qualitative analysis

To elucidate implementation determinants across OTPs, we employed rapid qualitative analysis. We chose this approach given the highly structured nature of the IFASIS and the pragmatic goal of the current study (identifying generalizable implementation barriers across OTPs). Our qualitative methods and results are reported in line with the Consolidated Criteria for Reporting Qualitative Research (COREQ) [see Additional file 1] [23]. We used a summary template and matrix analysis approach [24] that included two female raters (AJ, a physician with rapid qualitative methods expertise, and BP, an MS-level research specialist with qualitative expertise), neither of whom was involved in the IFASIS nor implementation facilitation sessions. AJ provided a brief orientation to rapid qualitative analysis to BP at the project start and feedback on BP's completed summary templates (e.g., amount of information to include, use of quotes, etc.).

The two raters first drafted a summary template based on the IFASIS items with fields to describe reasons participants gave for IFASIS ratings and importance scores, notes on discussion dynamics, and an interview summary. The raters finalized the summary template after dual analysis of one transcript. In total, three transcripts were dual analyzed. During the dual analysis phase, the raters met weekly and compared each other's templates, discussed disagreements, and generated a master consensus template. The raters then single-analyzed the two remaining transcripts and compiled all finalized templates into a single matrix to facilitate comparisons across OTPs. Finally, the raters divided the IFASIS domains in the matrix and prepared summaries of each domain, highlighting major barriers and facilitators. Each rater reviewed the other's written summaries and provided

feedback until consensus was obtained about the most salient implementation determinants.

When summarizing qualitative results, we prioritize those IFASIS domains and subdomains with quotes explaining the numeric IFASIS scores. For subdomains where participants provided numeric scores but had little discussion about reasons for scoring, we report numeric IFASIS scores for completeness.

Because of the IFASIS's highly structured format, there was little free-ranging discussion. In a few instances, coders agreed that staff responses under one subdomain fit better under another subdomain (e.g., staff discussed lack of funding under the "Do-ability" subdomain instead of the " Resources" subdomain). In these instances, for clarity of reporting, we report the finding under the subdomain where coders agreed it fit best.

Review of facilitation notes

To examine the context-specific ways the IFASIS guided implementation facilitation, the two qualitative raters conducted a detailed review of meeting agendas and minutes from the six-monthly facilitation calls. Five of the six OTPs completed at least five facilitation calls. One OTP (Site 101) opted out of participating in the CM rollout immediately after completing the baseline IFASIS, citing staff concerns about patient privacy. In total, 28 agendas were available for analysis.

The two raters reviewed detailed meeting notes from all facilitation calls and extracted data into a grid organized by OTP and call date on whether and how the IFASIS was used. The grid included a summary field for each OTP where raters described how the IFASIS was used in each facilitation call. The grid was shared with the facilitators (SJB, KS, KDB) who then reviewed their personal notes and records, met as a group, and agreed upon how the IFASIS was used to guide facilitation and inform the selection of implementation strategies. When presenting results, we report the group consensus and share illustrative examples of how the IFASIS guided facilitation at different OTPs.

Results

IFASIS participants

Across the five OTPs that recorded their IFASIS assessments, an average of 5 (3–7) staff participated per program, with 28 staff members participating. Each OTP had at least one organizational leader participate, most commonly the OTP director or lead clinical supervisor. Each OTP also had multiple frontline staff participate, most commonly OTP counselors. Participant characteristics are presented in Table 2. Participating staff were predominantly female (86%), white (75%), and not Hispanic/Latino (82%), with either a Bachelor (39%) or

Table 2 Characteristics of Opioid Treatment Program (OTP) Staff Participating in Inventory of Factors Affecting Implementation and Sustainment (IFASIS) Assessments (*N*=28)

OTP Staff Characteristics	N (% Staff)
Job type	
Direct clinical service provider	14 (50%)
Organization director or administrator	4 (14%)
Support staff	3 (11%)
Clinical supervisor	7 (25%)
Biological sex	
Female	24 (86%)
Male	4 (14%)
Race	
White	21 (75%)
Black of African American	3 (11%)
More than one race	3 (11%)
Unknown/Not reported	1 (3%)
Ethnicity	
Not Hispanic/Latino	23 (82%)
Hispanic/Latino	4 (14%)
Unknown/Not reported	1 (3%)
Education	
Some college, but no degree	3 (11%)
Associate's degree	5 (18%)
Bachelor's degree	11 (39%)
Master's degree or higher	8 (29%)
Unknown/Not reported	1 (3%)
	Mean (SD)
Average years of experience in the field	10.1 (8.1)
Average years with the organization	5.3 (4.5)

Master's degree or higher (29%). The average tenure of staff at their OTP was 5.3 years (*SD* 4.5), while the average tenure in the substance use field was 10.1 years (*SD* 8.1).

Quantitative data across OTPs

Figure 2 presents the consensus IFASIS scores for each of the six OTPs. Facilitators (i.e., positive valence) are depicted in blue, while barriers (i.e., negative valence) are depicted in red. The darkness of the circle indicates the assigned importance rating. Items in the dashboard are listed in valence order; within each section, the most positive-valence facilitators are listed at the top, and the most negative-valence barriers are listed at the bottom.

Table 3 presents median IFASIS Ratings and Importance Scores across OTPs. The domain with the lowest ratings was *Factors Outside your Organization (External)*, with OTPs assigning particularly low ratings to external support, system-level policies, and support from and consultation with community organizations. The next lowest-rated domain was *Factors within your Organization (Internal)*, with particularly low ratings assigned to financial means to implement and organizational policies to implement.

The domain with the highest ratings was *Factors About the Intervention (Intervention)*, with participants consistently rating the fit, usability/complexity, and relative advantage of the digital CM platform as facilitators. The next highest-rated domain was *Factors About the Person Receiving the Intervention (Patients)*, with participants positively rating all but one item in the dimension (which span *Benefit to the Recipient* and *Recipient Needs and Values*).

Our sensitivity analysis, excluding the OTP that completed the IFASIS independently (Site 105), did not substantially change our results (i.e., median scores did not alter valence from barrier to facilitator or vice versa). One item changed valence from neutral to facilitator, and three changed from facilitator to neutral (see Additional File 2).

Qualitative data across OTPs

We present qualitative data on implementation determinants of the digital CM platform organized by the five IFASIS domains. For simplicity, if a team completing the IFASIS endorsed a concept or gave a specific rating, we attribute the team's input to the entire OTP (e.g., "five out of six OTPs reported fit was a barrier").
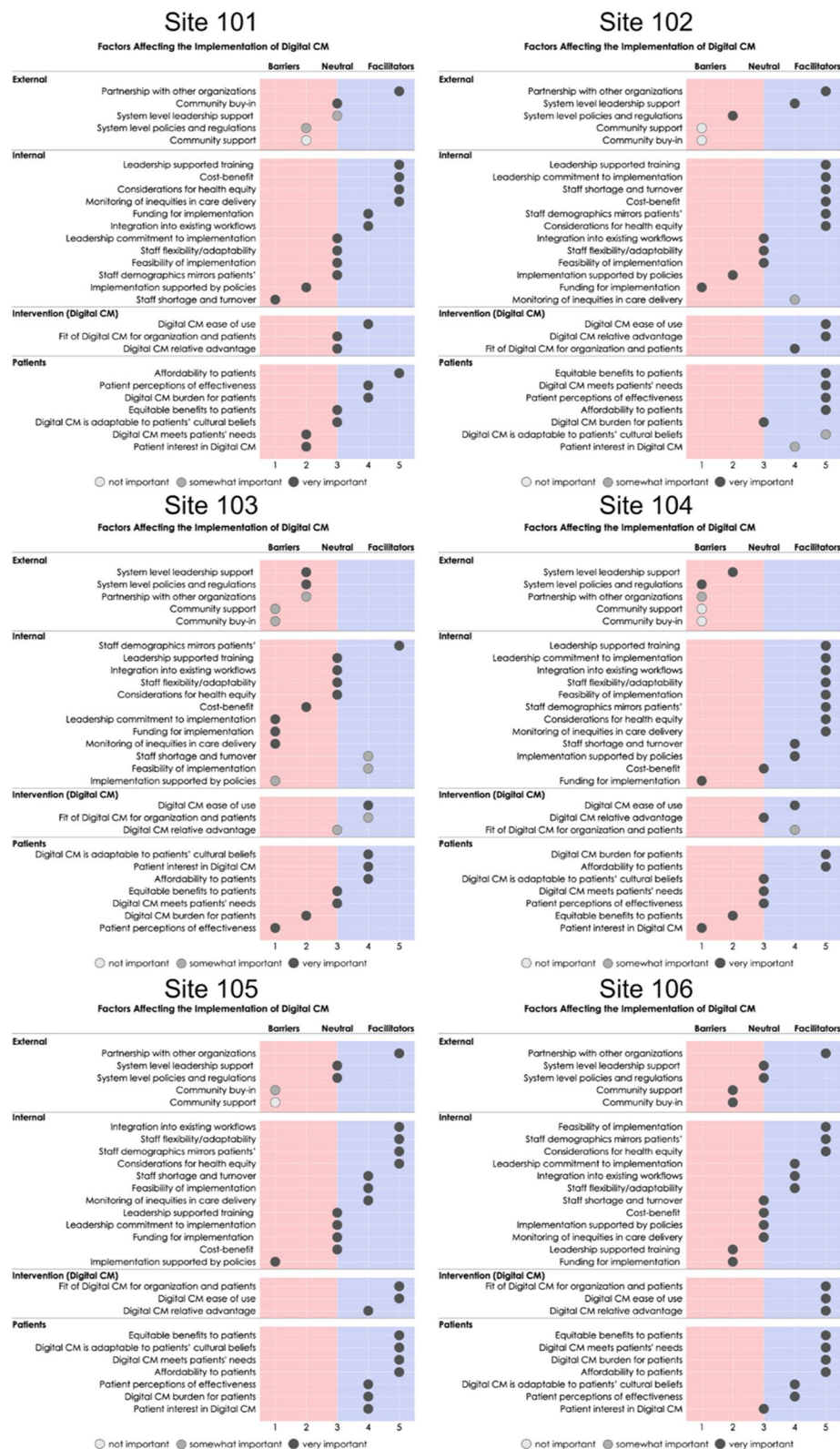
Factors outside your organization

This IFASIS domain encompassed two sub-domains: external policies and community support.

External policies

This sub-domain included two items about system-level leadership and system-level policies. Five of the six OTPs rated both system-level leadership and system-level policies as barriers or neutral. Interestingly, four of the OTPs acknowledged state-level support, and one identified the existence of a state-level champion to support the implementation of the digital CM platform. However, there was universal uncertainty about the extent of federal support and state and federal policies and regulations around CM ("If they exist, I don't know what they are." Site 102). Moreover, there seemed to be broad uncertainty about whether the state-level leadership support would be sustained. All OTPs identified system-level leadership and system-level policies as very important.

Community support

Three items comprised this sub-domain: community support; community buy-in; and partnerships with other organizations. The six OTPs universally rated

Fig. 2 Visual graphic of results from the IFASIS conducted at baseline with each of the six OTPs. Each of the 27 items is listed, and the marker is placed at the consensus score. The further to the left the marker is placed, the more of a barrier it is perceived to be; the further to the right the marker is placed, the more of a facilitator it is perceived to be. The level of importance for each item is indicated by the shade of the marker, ranging from not important (white) to very important (dark gray)

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Table 3 Median Inventory of Factors Affecting Implementation and Sustainment (IFASIS) Valence and Importance Scores across Opioid Treatment Programs (*N* = 6) when Evaluating a Digital Contingency Management Platform

IFASIS Domains	Median Valence[1] (Range)	Median Importance[2] (Range)
Factors Outside Your Organization (EXTERNAL)		
External Policies		
Support from system-level leadership	3.0 (2–4)	3.0 (2–3)
System-level policies and regulations	2.0 (1–3)	3.0 (2–3)
Community Support		
Community support	1.0 (1–2)	1.0 (1–3)
Community buy-in	1.0 (1–3)	2.0 (1–3)
Partnership with other organizations	5.0 (1–5)	3.0 (2–3)
Factors Within Your Organization (INTERNAL)		
Leadership		
Leadership supported training	4.0 (2–5)	3.0 (3–3)
Leadership commitment to implementation	3.5 (1–5)	3.0 (3–3)
Resources		
Staff shortage and turnover	4.0 (1–5)	3.0 (2–3)
Funding for implementation	1.5 (1–4)	3.0 (3–3)
Cost–benefit	3.0 (2–5)	3.0 (3–3)
Organizational Readiness		
Implementation supported by policies	2.0 (1–4)	3.0 (2–3)
Integration into existing workflows	4.0 (3–5)	3.0 (3–3)
Staff flexibility/adaptability	3.5 (3–5)	3.0 (3–3)
Do-ability		
Feasibility of implementation and/or expansion	4.0 (3–5)	3.0 (2–3)
Person Focused Care		
Leadership and staff demographics mirror community	5.0 (3–5)	3.0 (3–3)
Prioritization and documentation of health equity	5.0 (3–5)	3.0 (3–3)
Monitoring of inequities in care delivery	4.0 (1–5)	3.0 (2–3)
Factors About the Intervention (INTERVENTION)		
Fit		
Fit for the organization and patients	4.0 (3–5)	3.0 (2–3)
Usability/Complexity		
Ease of use	4.0 (4–5)	3.0 (3–3)
Relative Advantage		
Advantages relative to the current approach	4.0 (3–5)	3.0 (2–3)
Factors About the Person Receiving the Intervention (PATIENTS)		
Benefit to Recipient		
Equitable benefits to patients	4.0 (2–5)	3.0 (3–3)
Recipient Needs and Values		
Adaptable to patients' cultural beliefs	4.0 (3–5)	3.0 (2–3)
Meets patients' needs	4.0 (2–5)	3.0 (3–3)
Patient perceptions of effectiveness	4.0 (1–5)	3.0 (3–3)
Burden for patients	4.0 (2–5)	3.0 (3–3)
Patient interest in the intervention	3.5 (1–4)	3.0 (2–3)
Affordability to patients	5.0 (4–5)	3.0 (3–3)

[1] Valence ratings range from 1 to 5 (1–2 = Barriers; 3 = Neutral; 4–5 = Facilitators)

[2] Importance ratings range from 1 (Not important) to 3 (Very important)

community support and community buy-in as barriers or neutral (median ratings of 1.0). Yet, these determinants were generally rated as low importance because OTPs reported that community organizations do not have "any say over our practices" or "don't really support our treatment ideas anyway" (Sites 101 and 104). One OTP identified that the community had minimal information and education about CM. Only one OTP had begun introducing the digital CM platform to partner organizations but expressed concerns about receiving opposition, particularly from family treatment or drug courts. By contrast, four of the six OTPs viewed partnerships with other organizations as a facilitator of their implementation of the digital CM platform.

Factors within your organization

This was the largest domain of the IFASIS, spanning five sub-domains: leadership, resources, organizational readiness, do-ability, and person-focused care.

Leadership

This sub-domain included two items assessing support from OTP leadership to complete training and commitment from leadership to implement the digital CM platform. Two OTPs reported that perceived leadership support was strong and that leadership was supportive of training in CM. When reflecting upon leadership commitment, two OTPs described their leadership as having a "passion" or "pushing" for the digital CM platform but identified a lack of strategies or long-term plans to implement the platform in their setting (Sites 101 and 106). One OTP leader noted that they had not heard anything nor a "clear direction from corporate" about implementation of the digital CM platform (Site 103).

Resources

This sub-domain had three items about staff retention, financial support, and cost-effectiveness. Staff retention was rated as a facilitator by four of the six OTPs (median rating of 4.0). These OTPs rated staff retention as high importance and acknowledged that it could affect implementation but noted that they were not currently experiencing shortages. One OTP pointed out that the digital CM platform made CM more feasible by reducing the clinical workload despite staffing challenges. Across OTPs, the funding for implementation item had the lowest ratings (median rating of 1.5). Four OTPs reported that without external funding, they could not implement the digital CM platform, and one OTP expressed concern about sustaining it after the initiative ended. Just one OTP indicated that CM implementation was such a high priority that they would find a way to implement the platform, even without external support. Concerning

cost–benefit, there was substantial variability in how OTPs perceived the digital CM platform: it was perceived as a facilitator by two OTPs, a neutral determinant by three OTPs, and a barrier by one OTP.

Organizational readiness

This sub-domain contained three items about organizational policies, integration of CM into the workflow, and staff flexibility/adaptability. This sub-domain elicited substantial conversation across the participating OTPs. Organizational policies were viewed as a barrier by four OTPs (median rating of 2.0), and all six OTPs referenced the absence of organizational policies related to the digital CM platform. One OTP described policies as less important because they did not have policies for other innovations but could still implement them. Another OTP asserted that clear organizational policies from leadership would help with staff engagement in the implementation initiative.

Integration into the workflow received higher ratings (median rating of 4.0), but OTPs noted several challenges to integrating the digital CM platform into workflows. Staff burden was a theme that arose, with one OTP expressing concern about the need to manage "extensive" and "ever-changing" requirements (Site 102) and another noting that integration would be extremely difficult without a dedicated staff member responsible for the digital CM platform. Two other OTPs highlighted the importance of staff and leadership buy-in, with one OTP reporting that the most important predictor of whether they could incorporate the digital CM platform was "whether or not [staff] want to do this" (Site 104) and another OTP emphasizing the importance of having organization leadership monitor counselor use of the digital CM platform to promote integration of the platform into staff's workflow (Site 103). Another OTP noted that limiting the platform to patients using stimulants made integration challenging because the OTP did not treat patients with and without stimulant use differently. Finally, one OTP noted that external support from the state was a major facilitator of integrating the digital CM platform into the workflow.

The final item in this sub-domain was staff flexibility and adaptability. Three OTPs described staff as being very flexible or having adapted to the digital CM platform, while the other three OTPs rated this item as neutral (median rating of 3.5). Among those rating this factor as neutral, potential challenges mentioned included not all staff being adaptable or "open to extra work" (Site 102), small staff size making it more difficult to add on additional work, and lack of defined workflows being a barrier to staff adapting quickly to a new practice.

Do-ability and Person-centered care

The remaining two sub-domains, Do-Ability and Person-Centered Care, consisted of one and three items, respectively. The Do-Ability item assessed perceived feasibility of implementing the digital CM platform, whereas the Person-Centered care items assessed the extent to which staff demographics matched those of patients; the organization prioritized equity; and the organization measured patient demographics to assess inequities. All four items were rated highly (median ratings of 4.0 to 5.0) and generally viewed as facilitators within the existing OTPs.

Factors about the intervention

This IFASIS domain consisted of three sub-domains, each with only one item: fit, relative advantage, and ease of use. All three sub-domains had median ratings of 4.0, indicating they were generally perceived as facilitators.

Fit

Although five of the OTPs rated the digital CM platform as a facilitator, two OTPs indicated that a minority of staff questioned its appropriateness or had not had enough experience to understand it. One OTP rated fit as neutral and expressed doubt about the platform, commenting, "We are mostly not convinced" (Site 104).

Relative advantage

Three OTPs rated relative advantage as a facilitator, and three rated it as neutral. One of the OTPs that rated this item as a facilitator favorably compared the digital CM platform to take-home methadone bottles (the usual incentive for abstinence) regarding their ability to enrich usual care. Two OTPs that rated this item neutrally reported that the digital CM platform was complementary to, not better than, other services they offered.

Ease of use

All six OTPs rated the digital CM platform's ease of use as a very high-valence facilitator, and they generally rated this item as very important. This item had among the narrowest range of scores, ranging from 4.0 to 5.0.

Factors about the person receiving the intervention

This domain spanned two sub-domains: Benefit to Recipient and Recipient Needs and Values.

Benefit to recipient

This sub-domain contained only one item that assessed the extent to which the digital CM platform offered support to patients equitably. This item was generally viewed as a facilitator (median rating of 4.0). Despite the generally favorable ratings, OTPs identified several groups that they thought might not benefit from the platform, including (a) affluent patients who might not be incentivized by cash rewards (two OTPs); (b) non-stimulant users who are not eligible for the digital CM platform (two OTPs); (c) those without phones, without data on their phones, or who might be uncomfortable with technology (three OTPs); and (d) Spanish speakers who must use automated translation software that was viewed as sub-optimal (one OTP).

Recipient needs and values

This sub-domain included six items that assessed the extent to which patients view the digital CM platform as adaptable to their cultural beliefs; able to meet their needs; burdensome; effective; something they would ask about; and affordable. Most comments were elicited by the items assessing whether the platform met patients' needs and was something patients would ask about.

The platform's ability to meet patients' needs was generally rated favorably (median rating of 4.0): three OTPs rated this item as a facilitator, two rated it neutrally, and one rated it as a barrier. One of the OTPs that rated it as a facilitator indicated that "money is helpful for everyone" (Site 102). Among the OTPs that rated this item neutrally, one suggested that the platform would not meet the needs of patients who were not eligible (e.g., those without stimulant disorder or a smartphone). Another expressed concern that the platform focused too much on "instant gratification" without emphasizing patient "accountability" (Site 104). The OTP that rated this item as a barrier noted that the digital CM platform did not (and could not possibly) meet all patients' needs.

Perceived patient interest was generally rated neutrally (median rating of 3.5). Several OTPs indicated that their ratings were driven by a lack of patient awareness, noting that patients were not asking about nor aware of the digital CM platform but would likely be interested when they learned about it. One OTP that had previously participated in Project MIMIC reported that patients supported CM. Another OTP noted that patients did ask about incentives in general and would likely appreciate the opportunity to use a digital CM platform.

The remaining items were generally rated as facilitators. OTPs rated the fact that the platform was free to patients as a very high-valence, very important facilitator with a narrow range (median rating of 5.0, range from 4.0 to 5.0). OTPs also rated the platform's adaptability and

perceived effectiveness highly (median ratings of 4.0). OTPs did not perceive that patients would find the digital CM platform to be burdensome (median rating of 4.0), except potentially patients who had difficulty keeping appointments (two OTPs) or with transportation (one OTP).

Use of IFASIS to Guide facilitation

Use of the IFASIS to guide facilitation sessions enabled a customized approach to selecting implementation strategies. For instance, Site 103 identified leadership commitment to the implementation, funding for the implementation, and organization-level policies as important barriers to implementing the digital CM platform. The facilitator guided the team in brainstorming several potential strategies to increase leadership commitment and support the development of organization-level policies, including several proposals for the state Department of Health funding the initiative: (a) providing higher levels of reimbursement for services offered by OTPs delivering CM; (b) providing incentives and recognition to OTP staff delivering CM; (c) requiring that leaders complete training in CM for an OTP to receive funding support; and (d) providing a state certificate or other form of recognition for that OTPs deliver CM. Another OTP identified staff retention as a significant barrier (Site 101). This OTP proposed having a joint meeting and celebration between the state health department, OTP leadership, and the MIMIC2 study team to recognize those staff members who had successfully implemented the digital CM platform to increase staff morale and promote retention.

Discussion

We used the IFASIS, a novel assessment that elicits both quantitative and qualitative data, to identify both generalizable and context-specific determinants associated with implementation of a digital CM platform. Findings from this study demonstrate how the IFASIS can be employed to assess determinants and guide implementation facilitation, and our case study in OTPs highlighted important barriers and facilitators unique to the digital CM platform.

We elicited several generalizable determinants across OTPs that aligned with well-established barriers to implementing face-to-face CM. Two of the most negative valence implementation barriers across OTPs included the absence of organizational policies and insufficient leadership support, consistent with research indicating that implementation climate (i.e., a climate in which the innovation is expected, supported, and rewarded) and leadership engagement are key determinants of CM

implementation [25–27]. During facilitation calls, OTP staff suggested that uptake of digital CM would increase if the digital CM platform were incorporated into existing workflows, incentivized by organizational leadership, and visibly led by leadership champions. These suggestions were well-aligned with established implementation strategies to promote the uptake of CM and other new practices [25, 26, 28]

Other generalizable barriers identified across OTPs that aligned with prior CM literature included lack of perceived community support and concerns about funding sustainability. Regarding community support, OTPs have historically been heavily stigmatized [26, 29], limiting the ability of staff to leverage local resources in service to their patients. OTPs could be supported in communicating with community members about CM and other services through community-focused implementation strategies such as education and stigma-reduction campaigns. Concerning funding, OTPs were nearly unanimous that sustaining the platform would be impossible without external support. Recent work has proposed that CM implementation could be funded via Medicaid, Substance Abuse and Mental Health Services Administration block grants, TRICARE (a funder of military and federal personnel), Indian Health Services, and opioid settlement funds [7, 10]. Whether delivered face-to-face or via a digital platform, reliable funding for CM will be a crucial aspect of sustaining implementation efforts.

In addition to elucidating the aforementioned barriers that aligned with prior CM literature, the IFASIS identified a set of additional determinants across OTPs that appeared to be unique to the digital CM platform, including fit, relative advantage, ease of use, adaptability, and accessibility. In contrast to prior literature suggesting that providers have concerns about the effectiveness and fit of face-to-face CM models, the platform's feasibility, ease of use, and effectiveness were all viewed as facilitators. These data confirm that a digital CM platform can potentially address some of the barriers associated with face-to-face models. However, the digital CM platform was also associated with concerns about accessibility for non-English speakers, older adults, and individuals without phones or those with limited digital literacy. These results highlight the need for additional research on the cultural and linguistic appropriateness of digital CM [10, 30] as well as the need to train OTP staff in strategies to access phones and data plans under the Affordable Care Act to allow patients without phones to access the digital CM platform [7, 15].

Finally, another novel contribution of the IFASIS was its ability to quickly and efficiently identify a set of

context-specific determinants that were used to guide implementation facilitation sessions. Variability in context-specific determinants across the six OTPs was notable. For instance, five of the IFASIS items had a range of scores from 1.0 to 5.0, highlighting the need to consider context-specific variability in multi-site implementation initiatives. Some of the items with the greatest variability in IFASIS scores included close partnerships with community organizations, commitment from internal leadership, and staff retention. These results suggest that different OTPs are likely to require different implementation strategies. An interesting future direction for the field could be to use tools such as the IFASIS to identify the most common set of determinants in a specific setting; develop modular, multi-component implementation strategies; and then tailor such strategies to the determinants identified in a specific context.

Findings highlight the pragmatism of the IFASIS as a tool for elucidating implementation determinants, particularly when compared to commonly used methods such as in-depth qualitative interviews. Because the IFASIS is a team-based measure, the study team did not have to recruit individual staff or aggregate data for analysis. As a team-based measure, the IFASIS also requires participants to come to a consensus, which may yield higher quality data than individually administered assessments [31]. To our knowledge, the inclusion of both valence and importance ratings distinguishes the IFASIS from other tools to identify contextual determinants, allowing implementation researchers and practitioners to target implementation strategies to the determinants organizations consider most important. The IFASIS also generated immediate, actionable quantitative data on CM determinants that could be shared back with the OTPs using user-friendly visual dashboards to stimulate discussion and guide facilitation. While not required for other studies, audio-recording the team-based IFASIS sessions also produced highly structured qualitative data, well-suited for rapid qualitative analysis, allowing us to efficiently develop a richer interpretation of the data. Overall, the IFASIS was a useful, feasible tool that generated rich, actionable data on implementation determinants.

Results of this study must be interpreted in the context of limitations. First, OTPs occasionally misunderstood IFASIS questions and asked for clarification from the facilitator. Additional written instructions might help to limit facilitator influence. Second, as a new assessment, the IFASIS has not yet been evaluated for concurrent validity. This paper describes how the IFASIS can be used to elicit determinants but does not assess how the IFASIS compares to existing guides such as the Consolidated Framework for Implementation Research [17]. Third, OTPs were recruited from a single state, which may limit generalizability to OTPs in other regions. Fourth, IFASIS ratings on patient benefit, needs, and values were based on the perceptions of OTP staff. While staff perceptions are relevant to implementation outcomes such as adoption, these perceptions may not accurately represent patient views and experiences. Finally, the current study only examines determinants at the start of the implementation initiative. Future work will explore how these determinants changed with time.

Conclusions

Despite these limitations, the current study provides a valuable illustration of how the novel IFASIS assessment can be employed to elicit contextual determinants and guide implementation facilitation. The IFASIS elicited a range of generalizable and context-specific barriers to implementing a digital CM platform, confirming that digital platforms face many of the same determinants as face-to-face models. Results also revealed determinants unique to the digital CM platform, which varied in their valence and importance across OTPs. The IFASIS assessment can support research teams and community partners in collaboratively assessing key determinants and selecting implementation strategies that will enhance the likelihood of sustained innovation implementation both across and within specific settings.

Abbreviations

CM	Contingency management
HIPAA	Health Insurance Portability and Accountability Act of 1996
IFASIS	Inventory of Factors Affecting Successful Implementation and Sustainment
OTP	Opioid treatment program

Supplementary Information

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Additional file 1: COREQ (COnsolidated criteria for REporting Qualitative research) Checklist.

Additional file 2: Median IFASIS scores excluding the OTP that completed the IFASIS without a facilitator.

Authors' contributions
AJ and BP conceptualized the paper, conducted the rapid qualitative analysis and outlined the manuscript. AJ, BP, SS, KDB and SB wrote the Introduction and Methods. AJ, SS, and KS wrote the Results. AJ and KS wrote the Discussion. SB provided mentorship on the development of the manuscript. All authors edited and approved the final manuscript.

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Data availability
The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.
Data will be made available on reasonable request.

Declarations

Ethics approval and consent to participate
Ethical approval was provided by Northwestern University's Institutional Review Board (Protocol STU00219088).

Consent for publication
Not applicable.

Competing interests
The authors have no competing interests to declare.

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