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Implementing Pay-it-Forward STI Testing: A Mixed-Methods Evaluation in Community-Based Organizations and STI Clinics in China

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Research Article

Keywords: Pay-it-forward, Implementation strategy, RE-AIM framework, Sexually transmitted infections

Posted Date: November 1st, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10471326/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

Pay-it-forward is an implementation strategy that offers individuals a health service as a gift and then invites voluntary contributions to support subsequent users. Although prior trials have demonstrated its effectiveness in increasing sexually transmitted infection (STI) testing, little is known about pay-it-forward implementation in diverse settings.

Methods

We conducted a convergent mixed-methods evaluation guided by the RE-AIM framework. Data was collected from the PIONEER trial, which evaluated a pay-it-forward strategy to promote STI testing in two settings in China: community-based organizations (CBOs) and STI clinics. Quantitative data from 800 trial participants (400 CBOs, 400 clinics) assessed reach, uptake, donation behavior, and participant understanding. Implementers (n = 34) were surveyed to assess organizational readiness. Semi-structured interviews were conducted with implementers (n = 10) to explore adoption processes, workflow adaptations, and perceptions of sustainability, as well as with trial participants (n = 24) to understand their experiences with pay-it-forward.

Results

Test uptake in pay-it-forward arm was high in both settings (CBO: 90.8%; clinic: 97%), though each setting reached distinct populations. CBOs primarily engaged men who have sex with men and first-time testers, while clinics reached more men with multiple concurrent sex partners. Barriers and facilitators to adoption differed by setting. CBOs had strong mission alignment but chronic staffing shortages, while clinics required leadership approval, multi-department coordination, and implementer motivation to sustain delivery. Clinics frequently abbreviated procedures, including providing full explanations of pay-it-forward, due to workflow pressures. Fewer than half of participants (41%) fully understood the pay-it-forward strategy in both settings. Donation rates were modest and did not differ significantly between settings (CBO: 16.8%; clinic: 21.8%; p = 0.088), though CBO donors contributed larger amounts on average (0.8 vs. 0.4 USD); together, donations covered the cost of approximately 22 additional tests. Qualitative data suggested CBO donations were motivated by gratitude and a sense of community reciprocity, while clinic donations, though somewhat more frequent, were tempered by implementer caution around patient trust and fears of appearing to solicit money.

Conclusions

Pay-it-forward can increase STI testing in both community and clinic settings; however, test receipt through pay-it-forward does not ensure participants will understand the participatory implementation strategy. CBOs can leverage preexisting connections and trust with marginalized communities to implement pay-it-forward, but resource limitations remain a substantial barrier. The large patient volumes in STI clinics pose a challenge to consistent and faithful implementation of pay-it-forward. Effective scale-up will require setting-specific strategies that address staffing constraints in CBOs and leadership and workflow barriers in STI clinics. Our findings may be relevant to implementation scientists working across clinic and community settings.

Contributions to the literature

- Most studies of pay-it-forward have focused on whether it works, not how delivery differs across service settings; this study compares its implementation head-to-head in community-based organizations and public clinics.
- We show that the same strategy can succeed through different mechanisms depending on setting, trust and peer relationships in community organizations versus institutional legitimacy and clinical routine in clinics.
- Using the RE-AIM framework with mixed methods, we identify setting-specific barriers to sustaining pay-it-forward, offering practical guidance for scaling sexual health interventions across diverse delivery platforms in low-resource settings.

Introduction

Pay-it-forward is an implementation strategy designed to enhance uptake of health services by framing the service as a gift subsidized by prior participants' voluntary contributions, with recipients then invited to contribute to a shared pool that sustains services for future users (1, 2). Pay-it-forward is grounded in reciprocity and collective responsibility and aims to reduce both financial and psychological barriers to health services (1, 3, 4). Previous randomized controlled trials (RCTs) in China have demonstrated that pay-it-forward can significantly increase chlamydia, gonorrhoea, hepatitis B, and hepatitis C testing, as well as HPV and influenza vaccination (5–10). However, while its effectiveness in improving service uptake is promising, less is known about how pay-it-forward can be implemented across different service environments, especially those with contrasting organizational structures, delivery models, resource barriers, and community dynamics.

In the PIONEER trial, a pay-it-forward strategy to increase chlamydia and gonorrhoea testing among men was utilized in two distinct service settings: public sexually transmitted infection (STI) clinics and sexual health community-based organizations (CBOs) (11). Public STI clinics in China are government-funded healthcare facilities that provide standardized services for the diagnosis and treatment of STIs to the general public. In these settings, patients are typically charged fees for STI testing services. These clinics operate within structured administrative hierarchies, follow national guidelines for STI care, and

prioritize clinical efficiency and population-level disease control (12). In contrast, sexual health CBOs are non-profit organizations that are often peer-led and embedded in the communities they serve. They primarily focus on HIV prevention, including free HIV and syphilis testing as core outreach activities, and provide tailored support for men who have sex with men (MSM) (13, 14). These two settings were selected because they represent contrasting organizational models for STI service delivery in China, one governmentally-administered and clinician-driven, the other community-embedded and peer-driven, providing an opportunity to examine how setting-specific factors shape the implementation of pay-it-forward across diverse delivery environments.

While PIONEER found that the pay-it-forward strategy equally improved STI testing uptake compared to standard of care in both settings, there was notable variation in how the strategy was implemented between CBO and STI clinic trial sites (11, 15). This paper evaluates the implementation of pay-it-forward to provide recommendations for optimal implementation, expansion, and scale-up to other settings. Using a convergent mixed-methods analysis of data from the PIONEER trial, we examine how setting-specific factors shaped the delivery and outcomes of pay-it-forward between CBOs and STI clinics in four southern Chinese cities.

Methods

Analytical Framework

We used the RE-AIM framework (16, 17) to guide the organization and interpretation of qualitative and quantitative data. A convergent mixed-methods design was chosen because quantitative data from trial participants and implementers could capture the magnitude and distribution of implementation outcomes, while qualitative data from interviews provided contextual depth to explain how and why implementation varied across settings. Integrating both allowed quantitative findings to be validated, expanded, or contradicted by qualitative evidence, yielding a richer understanding of implementation processes than either approach could provide independently.

RE-AIM was selected as the organizing framework because it was specifically designed to evaluate multi-level implementation outcomes, spanning individual, organizational, and system levels (18, 19). RE-AIM has been widely applied across diverse health and implementation contexts and is flexible enough to accommodate both community-based and clinical settings, making it well-suited for cross-setting comparative analyses. Definitions for each RE-AIM domain were adapted to the pay-it-forward strategy for STI testing in Chinese clinical and community settings in China (Table 1) (11).

Table 1
Operational Definitions and Measures for RE-AIM Framework Components

RE-AIM Domain	Operational Definition	Measures and Data Source
Reach	The characteristics of participants who received gonorrhea and chlamydia testing through pay-it-forward in CBOs and public STI clinics	- The proportion of participants with concurrent sex partners recruited at each site (participant survey data) - The proportion of participants identified as first-time testers (never tested in the past) (participant survey data)
Effectiveness	The individual-level impact of pay-it-forward on uptake of gonorrhea and chlamydia testing among those offered the pay-it-forward strategy	- The proportion of participants who completed STI testing at each site (participant survey/program records)
Adoption	The degree to which implementers initiated and were willing to deliver the pay-it-forward strategy, including organizational-level decisions and readiness to integrate the strategy into routine practice	- Qualitative assessment of organizational decision-making processes related to initiating the intervention (implementer interview data) - Implementer organizational readiness scores (range: 0–60) based on a 12-item question battery prior to implementation (implementer survey data), disaggregated into change commitment and change efficacy domains.
Implementation	The quality, consistency, and fidelity of program delivery, including how well core components were delivered and how participants understood key elements of pay-it-forward	- Participant understanding of pay-it-forward assessed based on a 2-item question battery (participant survey data). - Qualitative assessments of perceptions regarding delivery quality as well as barriers and facilitators to implementing pay-it-forward according to its original design (implementer interview data)
Maintenance	Short-term sustainability (i.e., during the trial) and long-term sustainability (i.e., after completion of the trial) of monetary donations in pay-it-forward, including implementer views on feasibility, ongoing support, and integration of pay-it-forward donations into existing systems.	- The proportion of participants who donated (participant survey and program record data). - The average donation amount per participant (program record data). - Number of additional gonorrhea and chlamydia tests financially

CBO: community-based organization; MSW: men who have sex with women; STI: sexually transmitted infection

RE-AIM Domain	Operational Definition	Measures and Data Source
		supported through total donations (program record data). - Implementer perceptions of long-term sustainability (implementer interview data).
CBO: community-based organization; MSW: men who have sex with women; STI: sexually transmitted infection		

Data Collection

Settings and Participants

Pay-it-forward in the PIONEER trial was implemented at eight sites in four cities, with each city contributing one public STI clinic and one sexual health CBO. Table 2 summarizes characteristics of trial sites. Public STI clinics were in large, tertiary medical centres, staffed primarily by full-time clinicians, and served a broad patient population with varying levels of health literacy. Monthly patient volumes in STI clinics ranged from 1,500 to 24,000 visits. CBOs were grassroots or CDC-affiliated entities primarily serving MSM, staffed by part-time workers or volunteers, most of whom were MSM themselves. CBOs conducted 98 to 200 visits with clients monthly. These structural and patient-level differences informed the analysis of how pay-it-forward was implemented in each setting. Trial participants were recruited from October 2023 to May 2024.

Eligibility criteria for participants recruited included all men, regardless of sexual orientation, who were: (1) 18 years of age or older; (2) sexually active within the past year; (3) not tested for gonorrhoea or chlamydia within the past year; (4) resident in the city for at least the past three months; (5) able to speak Mandarin or Cantonese; and (6) mentally capable of providing informed consent for gonorrhoea and chlamydia testing. This secondary analysis includes only participants randomized to the pay-it-forward arm of the PIONEER trial. Participants randomized to the standard-of-care arm were excluded because they were not exposed to the pay-it-forward strategy and therefore could not contribute data on implementation-related outcomes, which were the focus of this evaluation.

Table 2
Setting-Specific Characteristics of Public STI Clinics and Sexual Health CBOs in the PIONEER Trial

Setting	City	No. of Implementers [1]	Patient Volume	Recruiting Personnel
STI Clinics	Jiangmen	11	9,000/month	Doctor
	Zhuhai	5	2,400/month	Doctor/Nurse
	Foshan	3	24,000/month	Doctor
	Huizhou	5	1,500/month	Doctor
CBOs	Jiangmen	2	106/month	CBO Staff
	Zhuhai	2	98/month	CBO Staff
	Foshan	2	200/month	Trained Volunteer
	Huizhou	2	125/month	Trained Volunteer

[1] Implementers: refer to the frontline staff and volunteers responsible for delivering the pay-it-forward strategy at each site, including recruiting participants, explaining the pay-it-forward concept, facilitating STI testing, and managing donation procedures.

A co-creation process was conducted prior to implementation to tailor the delivery of pay-it-forward in each setting, ensuring that implementation aligned with the unique characteristics, workflows, and needs of CBO and STI clinics (20). Table 3 showed the identified barriers and cocreated adaptations prior to the trial launch.

Table 3
Identified Barriers to Pay-It-Forward Implementation and Co-created Adaptations Prior to Trial Launch

Setting	Main Barriers Identified Through Co-creation	Workflow Adaptations	Material Adaptations	Staffing Adaptations	Engagement Adaptations
STI Clinics	High STI stigma; fear of disclosing sexual orientation	Discreet pathways using QR codes, signs, digital prompts	Subtle LGBTQ-friendly cues; stigma-reducing symbols	MSM volunteers recruited to foster trust	Focus on confidentiality, subtle engagement, and digital tools
CBOs	Lack of infrastructure for chlamydia and gonorrhea testing; limited staff knowledge of bacterial STIs	New chlamydia and gonorrhea testing workflow integrated into existing HIV testing services	Pamphlets to raise STI knowledge; messages openly supporting the MSM community	Leverage existing peer navigators and MSM community members already trusted in local community	Postcards, gifts, onsite activities co-designed by MSM

STI: sexually transmitted infection; CBO: community-based organization; QR: quick response; LGBTQ: lesbian, gay, bisexual, transgender, and queer; MSM: men who have sex with men; HIV: human immunodeficiency virus

Qualitative Data Collection

We conducted in-depth, face-to-face interviews with pay-it-forward implementers, including clinical staff, volunteers, and program coordinators. Implementers were identified for interviews by site leaders and invited based on their active involvement in program delivery and decision-making processes. CBO implementers came from three of the four CBO sites; the remaining site could not be included because the implementing staff members had left the organization and were not reachable. We also conducted interviews with trial participants to understand their experience of pay-it-forward. Purposive sampling was used to ensure representation across diverse levels of engagement with the pay-it-forward strategy, including participants who did and did not make a pay-it-forward donation. Recruitment continued until thematic saturation was reached. Interviews lasted approximately 60 minutes and were conducted by trained researchers with prior experience in qualitative methods. For implementers, interview topics covered institutional support, patient engagement, daily workflows, and perceived barriers and facilitators to implementing the pay-it-forward strategy. For participants, interview topics focused on their understanding of and experiences with the pay-it-forward strategy. Interview guides are included in Supplementary material 1.

Quantitative Data Collection

Quantitative data were collected from participants who were randomized to the pay-it-forward arm of the PIONEER trial. Data included participant demographics, gonorrhea and chlamydia test uptake, donation

behaviors, and two multiple-choice questions that assessed understanding of the pay-it-forward strategy. Implementers were invited to complete a 12-item organizational readiness question battery at the beginning of the trial, measuring confidence and perceived capacity of their organization to use pay-it-forward to encourage gonorrhea and chlamydia testing. This survey was adapted from a validated instrument measuring organizational readiness to implement change and assessed multiple domains (21). Each item measuring readiness on a Likert scale. Total scores ranged from 0 to 60, with higher scores indicating greater perceived organizational readiness to introduce the pay-it-forward implementation strategy. Survey instruments are included in Supplementary material 2.

Data Analysis

For qualitative data, we conducted separate two-stage thematic analyses of interview transcripts for implementers and trial participants, given that the interview guides differed across groups. Interviews were audio-recorded, transcribed in Chinese, de-identified, and imported into NVivo 12. First, we focused on inductively developing thematic codes. A researcher conducted line-by-line open coding of transcripts to capture nuanced meanings and generate an initial set of descriptive codes reflecting participants' experiences with intervention delivery, setting-specific challenges, and perceptions of sustainability. A second researcher independently reviewed the transcripts and applied the draft codebook. Discrepancies were resolved through discussion, and the codebook was iteratively refined through consensus. After all transcripts were coded, the research team synthesized codes into higher-order categories and systematically identified themes by examining patterns, contrasts, and contextual factors within and across settings. Themes were then deductively organized according to the RE-AIM framework to contextualize findings related to adoption, implementation, and maintenance.

For quantitative data, we used descriptive statistics and between-group comparative tests to examine differences between CBOs and STI clinics across RE-AIM domains. To assess reach, we used chi-square tests to compare proportions of key participant characteristics across settings, including the proportion of participants who were MSM, first-time testers (i.e. had never previously received gonorrhea or chlamydia testing), and men who had multiple concurrent sex partners. For effectiveness, chi-square tests were used to compare gonorrhea and chlamydia test uptake between settings. For adoption, we compared mean organizational readiness scores using independent-sample t-tests. For implementation, we used chi-squared tests to assess differences in participant understanding of the pay-it-forward strategy as an indicator of whether the concept of pay-it-forward was implemented with fidelity. For maintenance, we used chi-squared tests to compare donation rates and independent-samples t-tests to compare mean donation amounts between settings. Descriptive statistics quantified total donation amounts and estimated the extent to which participant contributions could cover the costs of additional gonorrhea and chlamydia tests. Statistical analysis were conducted using R Studio (22).

Ethics

All participants provided informed consent. The study was approved by institutional review boards at the Dermatology Hospital of Southern Medical University (Clinical Trial Registry NCT05723263) and the University of North Carolina at Chapel Hill.

Results

A total of 800 participants from the intervention arm of the PIONEER trial were included in the quantitative analysis, with 400 enrolled at sexual health CBOs and 400 at public STI clinics. All 34 implementers across the eight sites completed organizational readiness surveys prior to implementation. A subset of implementers (n = 10; seven from STI clinics and three from CBOs) and trial participants (n = 24) were interviewed.

Reach

CBOs enrolled a higher proportion of MSM (n = 384; 96%) compared to public STI clinics (n = 40; 10%) ($p < 0.001$). In contrast, public STI clinics enrolled a higher proportion of participants with multiple concurrent sex partners (n = 262; 66%) compared to CBOs (n = 184; 46%) ($p < 0.001$). The proportion of first-time testers was similarly high across both settings, with 99% (n = 399) in CBOs and 99% (n = 397) in clinics ($p = 0.62$).

These differences in who accepted gonorrhea and chlamydia testing offered through pay-it-forward were also reflected in interviews. Rather than drawing new populations into either setting, pay-it-forward appeared to engage primarily the populations that already attended CBOs and public STI clinics, respectively, suggesting that reach was largely shaped by each setting's preexisting patient base rather than by the pay-it-forward strategy itself. Implementers described how setting-specific dynamics shaped engagement with MSM, first-time testers, and individuals at increased risk of STIs within these existing populations.

CBOs: A trusted environment tailored to MSM

Staff across CBO sites emphasized that longstanding community trust and peer networks made it easier to introduce pay-it-forward specifically, noting that "people come because they already know us and feel safe here."(FS-CBO-01) Because MSM participants viewed the CBO as "a familiar, non-judgmental space where they can talk freely about their sexual life,"(ZH-CBO-01) implementers described being able to explain the pay-it-forward concept, including its donation component, more openly and with less hesitancy than they anticipated in a less familiar setting. This existing trust also meant that participants were less skeptical of the "gift" framing at the center of pay-it-forward, an element implementers elsewhere associated with suspicion (see Adoption, below). Digital outreach on social media platforms, online groups, and volunteer circles further expanded the pool of participants exposed to the strategy. However, staff recognized that online promotion sometimes attracted participants with low intrinsic motivation: "Some people only came because they saw 'free test plus a small reward' in the pay-it-

forward strategy… it wasn't really about sexual health."(JM-CBO-01) This phenomenon increased overall volume, but many of these participants visited primarily for HIV prevention services rather than bacterial STI care.

STI Clinics: Reaching higher-risk patients through clinical referral and provider engagement

Public STI clinics primarily reached men with multiple concurrent sex partners and symptomatic patients seeking care for STI-related concerns, but reported limited reach to MSM specifically. Providers frequently stated that "MSM don't usually come here. They prefer larger hospitals or places where they don't need to show their ID."(HZ-Clinic-02) Fear of stigma, privacy concerns, and requirements to produce identification were major deterrents. Clinic reach was also shaped by variation in individual clinicians' motivation and capacity to recruit patients, a dynamic explored further below (see Adoption).

At several clinics, implementors mobilized referrals from departments outside STI clinics to expand reach. As one clinician explained: "We realized STI clinics alone couldn't meet the [target recruitment] numbers. So, we told urology and surgery, if you see someone with urethral discharge or risky behavior, send them here. After that, recruitment improved."(ZH-Clinic-01) The pace of clinical work meant that time-pressured patients, particularly older men, often declined to participate in pay-it-forward because they lacked the patience to learn a new concept or were reluctant to scan the QR code requesting donations. Clinicians also adapted recruitment by prioritizing symptomatic patients or those with other STIs, recognizing that these individuals were more receptive to testing.

Efficacy

Testing uptake was high in CBOs and STI clinics. The proportion of participants who accepted gonorrhoea and chlamydia testing through pay-it-forward was higher at STI clinics (n = 388; 97%) than at CBOs (n = 363, 91%) ($p < 0.001$).

CBOs: High uptake driven by preexisting trust and integration with HIV testing

Clients typically visited CBOs for HIV services and accepted gonorrhoea and chlamydia testing as "a natural extension." One implementer described that when pay-it-forward STI testing was introduced, "most people said yes immediately, [because] they trusted the service and felt it was a good opportunity."(ZH-CBO-01) Participants also expressed emotional responses to receiving STI testing as a "gift," saying that knowing someone had donated for their test made them "more willing to complete the testing and also donate if they could."(CBO Participant-03) However, a subset still avoided testing due to fear of discovering infection: "Some worry, if it's positive, then what? They would rather not know."(ZH-CBO-01)

STI Clinics: High uptake driven by removal of cost barriers

Clinics also achieved high uptake, particularly when clinicians first clearly explained both gonorrhoea and chlamydia testing as well as pay-it-forward. Providers reported that even participants who had not heard of chlamydia and gonorrhoea before still agreed to testing after learning these infections were common and easily treatable. One clinician explained: “Once I tell them, ‘This infection is curable, and the test is free today,’ they usually go ahead. They trust the doctor’s advice.” (HZ-Clinic-02) Financial barriers were especially salient in lower-income areas, where routine chlamydia and gonorrhoea testing (18–28 USD) was viewed as too expensive. Clinicians described participants reacting with relief: “When they found out it was free [through pay-it-forward], you could see the pressure lift from their shoulders.” (HZ-Clinic-02) However, some patients skipped pay-it-forward participation because the process, videos, questionnaires, scanning, interfered with their priority of “solving the problem quickly and leaving.”(JM-Clinic-02)

Hospitals demonstrated strong linkage-to-care capacity. Almost all positive gonorrhoea and chlamydia cases were treated. Providers contrasted this with CBOs: “Here, if the result is positive, we can treat immediately. That’s the benefit of doing this in a clinic.”(ZH-Clinic-02) Follow-up for positive cases was less consistent in CBOs because they could not provide confirmatory testing or treatment, relying instead on participant willingness to be linked to care at STI clinics.

Adoption

Figure 1 presents organizational readiness for pay-it-forward at STI clinics and CBOs, disaggregated into change commitment and change efficacy domains. Overall, both settings demonstrated high levels of readiness, with most respondents expressing agreement or strong agreement with readiness items. CBOs showed consistently strong intrinsic motivation, reflected in high levels of agreement on commitment-related items (e.g., willingness to implement the change). In contrast, public STI clinics demonstrated comparable or slightly higher scores on efficacy-related items, particularly in areas related to organizational support, coordination, and ability to manage implementation challenges.

CBOs: Strong mission alignment but vulnerable to staff shortages

CBOs adopted pay-it-forward enthusiastically because it aligned with their core work of promoting sexual health for MSM. Staff described pay-it-forward as “fitting perfectly” (ZH-CBO-01) with their mission of serving marginalized communities and promoting testing. However, adoption was fragile due to limited staffing. Many CBOs had only one implementer handling recruitment, counselling, sample collection, data entry, and donation messaging. As one implementer explained, “It’s not that we don’t want to do more, we just don’t have the capacity.” (ZH-CBO-01) Some CBOs also experienced administrative pressure to meet recruitment targets, which could shift outreach from organic engagement to quota-driven strategies.

STI Clinics: Dependence on leadership support and inter-departmental coordination

Adoption in clinics required approval from hospital leadership and complex coordination among the dermatology, urology, testing services, laboratories, finance, and information technology departments. Sites with strong leadership described the process as “smooth,”(JM-Clinic-01) while others faced significant bottlenecks. Clinician participation varied by enthusiasm and workload. One implementer noted: “When the motivated clinicians were transferred out, everything stalled. Adoption really depends on who is available and willing.” (JM-Clinic-01) Clinics also had multiple concurrent public health responsibilities (e.g., sentinel surveillance, HIV follow-up), making it difficult to prioritize pay-it-forward implementation.

STI clinic staff expressed challenges in explaining or promoting the donation component of pay-it-forward. One clinic implementer described: “There are some cultural tensions between public messaging and local conservative values… donation is a somewhat sensitive topic” (JM-Clinic-01). Concerns about patient trust were also reported: “With widespread concern about scams nowadays, patients were often hesitant to engage” (JM-Clinic-01). Some staff raised issues of workload and limited motivation: “Other doctors didn’t really care. I was the only one doing [pay-it-forward]… This stuff is troublesome and mentally exhausting” (FS-Clinic-01). Perceptions of local economic conditions and cultural context were also described as factors influencing willingness to introduce the details of pay-it-forward.

Implementation

Quantitative analysis showed that fewer than half of participants fully understood the pay-it-forward approach, indicating gaps in implementation fidelity. Among participants recruited at CBOs, 40% (159/400) correctly answered both knowledge questions about pay-it-forward, compared to 42% (166/400) of participants in STI clinics ($p = 0.79$). These findings suggest that, despite differences in delivery approaches, participant understanding remained limited across both settings.

CBOs: Highly adaptive, relationship-based delivery

CBOs demonstrated the most flexibility in how pay-it-forward was introduced and explained. Staff routinely adjusted messaging to participant comfort levels, using analogies (“like paying for the next person’s coffee”) that made the concept relatable.(JM-CBO-01) Implementation was sequenced intentionally, with pay-it-forward being introduced after HIV testing, when participants were waiting for test results. However, this flexibility also meant that explanations were often informal and varied across implementers, which may have led to inconsistent messaging. In addition, CBOs struggled with burdensome questionnaires. Many clients expressed frustration, “this form is longer than my whole life story,”(DG-CBO-01) and required staff assistance to complete them. These longer interactions may have reduced attention to key concepts of the pay-it-forward strategy and contributed to limited understanding.

STI Clinics: Structure, constraints, and procedural adaptations

Clinics operated within rigid hospital workflows, making it difficult to maintain fidelity during busy periods. Clinicians frequently shortened explanations or skipped videos to save time. One provider reflected: “I can’t follow the patient through every step. If they get confused about the questionnaire or scanning codes, sometimes they just drop off and walk away.”(DG-Clinic-01) Videos and brochures were rarely used, as patients preferred brief direct explanations. The rigidity of existing hospital workflows made it difficult to integrate pay-it-forward's procedures without disrupting routine clinical operations. As a result, clinics tended to adopt pay-it-forward primarily as a free-testing mechanism rather than fully embracing the underlying philosophy of reciprocity and community support: the time and communication needed to convey this philosophy were often the first casualties of workflow pressure. Clinics had to coordinate laboratory departments, financial reimbursement systems, questionnaires, and reporting procedures, leaving limited time for explaining the reciprocal community-support concept to patients. As one provider explained: “We only touched on the surface… just giving a brief explanation”. (ZH-Clinic-02)

Maintenance

Donation were modest across both settings. At CBOs, 17% (67/400) of participants donated, compared with 22% (87/400) in STI clinics ($p = 0.088$). Among those who donated, contributions ranged from 0.01 to 28 USD. Donation amounts varied across settings, with CBO donors contributing a mean of 0.8 USD (SD = 5.8), compared with 0.4 USD (SD = 3.1) among STI clinic donors ($p < 0.001$). In total, participants in CBOs contributed approximately 396 USD, compared with 241 USD in STI clinics. Total donations covered the testing costs for approximately 22 additional participants.

CBOs: Community-motivated donation but limited capacity for long-term operation

In CBOs, donations were often motivated by gratitude and the sense of community responsibility. One participant noted he wanted “to support the next person because I’ve received help here many times.”(JM-CBO-01) However, donation amounts were insufficient to sustain gonorrhoea and chlamydia testing costs. Continuously operating pay-it-forward was seen as unfeasible for CBOs because implementation relied on a single staff member or volunteer. Many favoured seasonal or short-term campaigns, explaining “a short-term or seasonal campaign is much more manageable. We simply don’t have the resources [both staff and funding] to run pay-it-forward continuously throughout the year.”(ZH-CBO-01.)

STI Clinics: Cautious donation promotion and preference for periodic implementation over sustained delivery

Clinicians often downplayed the donation component, fearing it might undermine trust: “We have to be very careful… pushing too hard will make patients suspicious [of our role as a public hospital].”(ZH-Clinic-01) Despite this caution, a higher proportion of clinic participants donated than at CBOs, though at smaller average amounts. Implementers speculated that participants may have been more willing to donate, even without active promotion, because the public hospital setting lent a sense of institutional legitimacy and trust regarding how funds would be used, compared to the more informal donation process at CBOs. Providers agreed that donations from participants alone would be unlikely to support long-term maintenance of a pay-it-forward strategy. Sustained implementation would require government or institutional funding and protected staff time. Busy service periods (e.g., summer peaks, accreditation cycles) further limited the feasibility of year-round pay-it-forward delivery. Clinics also favoured periodic implementation, reporting that “doing this every year for a month or two” would be more realistic and maintain staff motivation. (ZH-Clinic-01, ZH-Clinic-02, HZ-Clinic-01, HZ-Clinic-02, JM-Clinic-02, FS-Clinic-01)

Discussion

This mixed-methods analysis of data from the PIONEER trial examined how a pay-it-forward strategy to increase gonorrhea and chlamydia testing was implemented across two distinct settings in China. We found three key implementation patterns. First, both settings showed high organizational readiness, but adoption was driven by directives from leadership at STI clinics and by staff feeling a strong sense of mission alignment at CBOs. Second, implementation fidelity was particularly challenging in STI clinics, where the fast-paced, high-volume clinical environment made it difficult to explain the pay-it-forward concept fully, resulting in abbreviated procedures and limited participant understanding. Third, the potential for sustained cost sharing through pay-it-forward was constrained across both settings, as total contributions covered only a small fraction of testing costs. This study extends prior research on pay-it-forward by moving beyond effectiveness to examine how and why implementation varies across settings (5, 8, 10). More broadly, it contributes to a growing body of implementation science literature showing that even well-designed implementation strategies require ongoing adaptation, motivated implementers, and structural support to achieve consistent real-world delivery.

Implementer motivation was a core determinant of whether pay-it-forward is proactively adopted, delivered with fidelity, and sustained over time. This aligns with the broader literature on close-to-community health providers, which highlights motivation as both fragile and foundational, shaped by organizational commitment, community engagement, and job satisfaction (23). Our findings show that motivation was highly context dependent. In CBOs, motivation was largely mission-driven, but constrained by limited resources and heavy workloads, increasing the risk of burnout over time. In STI clinics, motivation was more externally imposed, relying on leadership directives or individual champions, and diminished when workloads increased or key staff were transferred. These patterns are consistent with evidence linking demotivation to burnout, reduced quality of care, and turnover (24, 25). Strategies to strengthen and sustain motivation should therefore be tailored to each setting. In CBOs, priorities include reducing workload, minimizing administrative burden, and providing recognition for

staff contributions. In STI clinics, efforts should focus on securing leadership endorsement, identifying and supporting local champions, and protecting staff time for pay-it-forward delivery. Across both settings, broader organizational supports, including digital tools and supportive supervision, may help sustain implementation (26, 27).

Low donations suggest the need for further optimization of pay-it-forward financing. Although the strategy elicited donations across settings, consistent with research showing that community-based reciprocity can stimulate prosocial giving (28), donations could only subsidize a small portion of the testing costs. This aligns with other literature on innovative financing mechanisms (29, 30). At CBOs, mean donation amounts were higher but still insufficient to meaningfully share testing costs. Sustainability was further constrained by chronic understaffing, a well-documented barrier in community-delivered health interventions (23). In STI clinics, donation willingness was modest and often complicated by patient mistrust, where implementers also expressed discomfort promoting donations, fearing it could erode patient trust. Across both settings, implementers emphasized that sustained delivery would require stable external funding. One potential solution would be to implement pay-it-forward periodically, rather than year-round. These findings mirror broader implementation research indicating that community-driven innovations scale most effectively when embedded within supportive policy environments, integrated financing structures, and well-defined operational pathways (31, 32). Pay-it-forward may be useful as a complementary engagement strategy that strengthens participation and trust in episodic time-limited campaigns.

Adaptation and community engagement emerged as central components of pay-it-forward's delivery (9). Studies of complex community interventions show that even when standardized protocols are co-created with stakeholders, implementation deviations are common because frontline staff adjust procedures to address workload, local constraints, and patient needs (33, 34). Despite beginning with a co-created standard operating procedure, we similarly found that CBOs and STI clinics deviated from the adapted versions of pay-it-forward to address limited capacity and motivation. Such ongoing adaptation can be central to effective implementation because interventions must be continually realigned with contextual realities to remain acceptable and workable (34, 35). Community engagement was also a defining strength of pay-it-forward, echoing systematic reviews showing that community participation enhances trust and uptake in health services, especially among marginalized populations (36). Peer-led outreach and long-standing relationships enabled CBOs to deliver the strategy with greater relational depth, while clinics leveraged routine service structures to normalize chlamydia and gonorrhoea testing. Taken together, the literature suggests that pay-it-forward should be viewed not as a rigid protocol but as a dynamic, community-engaged strategy whose effectiveness depends on its ability to adapt while remaining structurally supported by robust health-system infrastructure.

Future research should focus on strategies to enhance both adoption and sustainability of the pay-it-forward approach. One priority is optimizing implementation processes by testing iterative adaptations that can reduce staff burden, particularly within clinic workflows. Leveraging digital tools, such as mobile applications or automated systems, may also help streamline delivery and enhance donation

transparency (37). Future studies could investigate strategies that combine participant donations with institutional or external funding. Finally, future research should examine whether adjustments to key components of the pay-it-forward strategy, including the financial nudges (such as suggested donation amounts or default options) and social nudges (such as messages emphasizing community reciprocity or previous donor contributions), alter its feasibility and acceptability. When pay-it-forward transitions from a research trial to routine programmatic implementation, the administrative burden associated with trial procedures, such as lengthy questionnaires and data collection requirements, would be substantially reduced, potentially easing workload pressures on implementers. However, the removal of financial incentives that characterize the trial context raises important questions about sustained uptake. It would therefore be essential to assess whether pay-it-forward can maintain strong participant engagement in the absence of such incentives, as doing so would not only improve scalability but also enable more seamless integration into routine health system workflows.

Several limitations should also be noted. First, as an implementation evaluation of an implementation strategy in an RCT, our assessment relied on existing trial data and was not designed specifically to capture all dimensions of implementation. Second, donation behaviour and sustainability could only be assessed over the duration of the trial, limiting insights into maintenance beyond the study period. Third, findings are specific to clinical and community contexts in China and may not generalize to health systems in other contexts.

Conclusion

This mixed-methods evaluation demonstrates that pay-it-forward is a feasible strategy for expanding STI testing across community-based and clinical settings, but its implementation is shaped by local context, organizational capacity, and implementer motivation. While the strategy successfully increased testing uptake and fostered prosocial participation, implementation fidelity varied, and participant understanding of pay-it-forward was limited. Donations were insufficient to support sustained delivery, indicating that pay-it-forward cannot function as a stand-alone financing mechanism. Instead, the strategy operates most effectively when embedded within supportive organizational structures, including leadership endorsement, protected staff time, clear workflows, and stable funding. Community engagement and adaptive delivery were critical to ensuring relevance in both settings. Taken together, our findings position pay-it-forward as a complementary implementation strategy that strengthens reach, acceptability, and community connection. Further implementation research is needed to embed the benefits of pay-it-forward within health systems.

Declarations

Conflicts of interest

The authors declare that they have no competing interests.

Funding

This project is sponsored by the National Institutes of Health (grant number NIH NIAID R01AI158826). The funder (s) played no role in the following study-related activities: study design, implementation, data collection, management, analysis and interpretation of data, writing of reports and the decision to submit the report for publication.

Acknowledgements

We appreciate the staff of the University of North Carolina at Chapel Hill and the Dermatology Hospital of Southern Medical University for their collaboration and assistance.

Availability of data and materials

The qualitative and quantitative datasets generated and analysed during the current study are not publicly available due to the sensitive nature of the data, which includes information related to the sexual health and behaviours of men who have sex with men (MSM), a population vulnerable to stigma and discrimination. De-identified data may be made available from the corresponding author upon reasonable request and subject to approval by the relevant institutional ethics review board(s).

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Figures

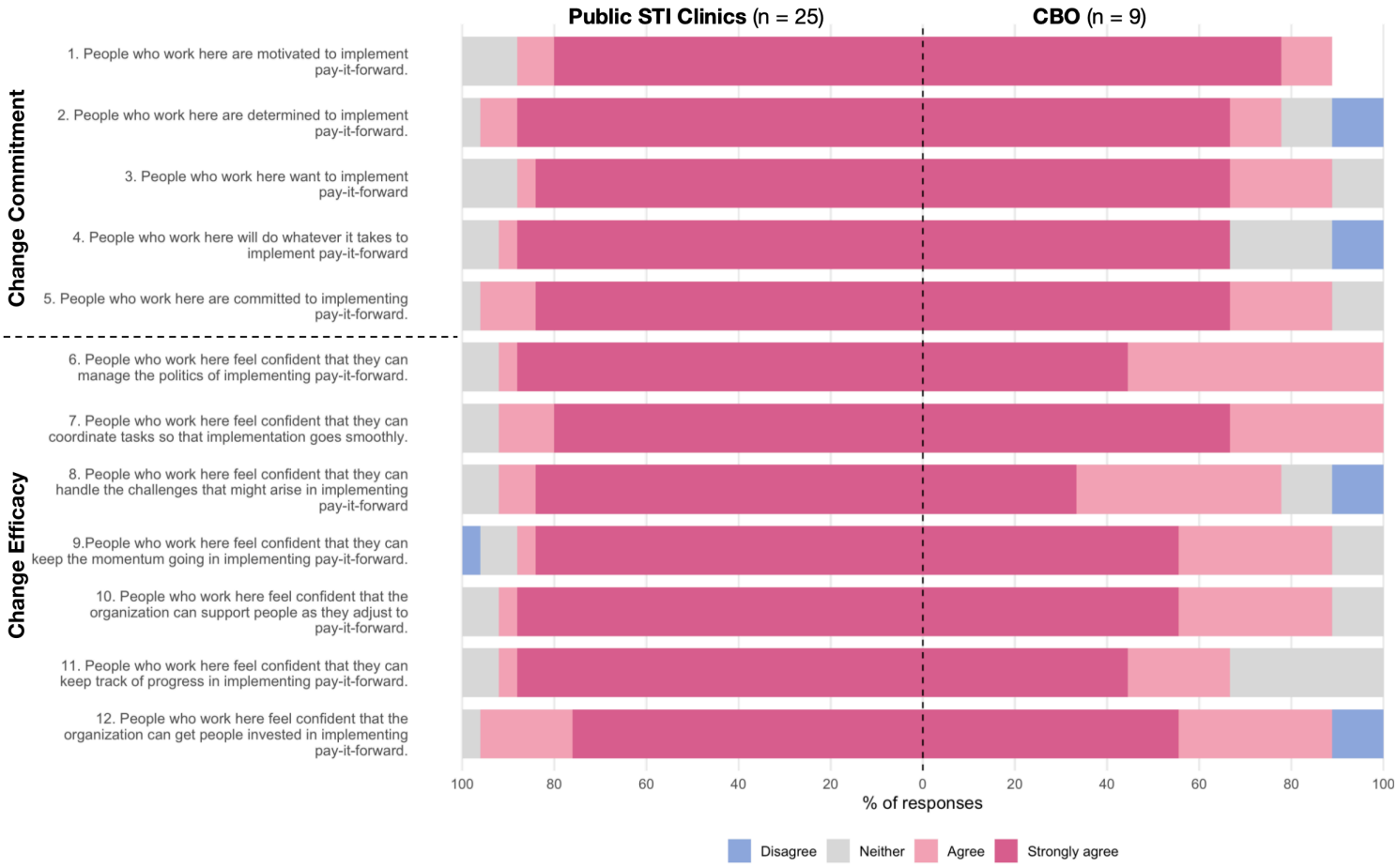


Figure 1

Organizational Readiness to Implement Pay-it-Forward in STI Clinics and CBOs

Supplementary Files

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