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Lessons Learned from Applying a Modified Learning Collaborative Model to Promote Change in Regional and Statewide HIV Care Systems

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Abstract
The Health Resources and Services Administration Special Projects of National Significance launched the Systems Linkage and Access to Care for Populations at High Risk of HIV Infection Initiative in 2011. Six state departments of health were funded to utilize a modified Learning Collaborative model to develop and/or adapt HIV testing, linkage to care and retention in care system-level interventions. More than 60 Learning Sessions were held over the course of the Learning Collaborative. A total of 22 unique interventions were tested with 18 interventions selected and scaled up. All interventions were created to impact services at a systems level, with standardized protocols developed to ensure fidelity. Our findings provide key lessons and present considerations for replication for use of a modified Learning Collaborative to achieve state-level systems change.

Keywords Learning Collaborative · Systems · Linkage to HIV care · Retention · Department of Health

Introduction

Learning Collaboratives (LC) have been used in a variety of ways to improve the provision of care in specific settings by implementing a community stakeholder-driven framework to identify, test and disseminate best practices. LCs have most often been used to address challenges in ambulatory care settings or to address specific clinical topics, e.g. management of diabetes [1–8]. Antonini et al. describes the use of a LC to address challenges faced in the integration of substance use diagnosis and treatment into primary health care and identify successful models and processes that minimize common barriers of documentation and privacy, financing and partnering with primary care providers [1]. Chin et al. and Landis et al. describe the use of LCs to improve diabetes care with the goal to increase rates of A1C testing, decrease mean values of HbA1c and increase implementation of eye exams and foot exams [2, 3]. Young et al. discuss the use of a LC to improve the delivery of preventive services by pediatric practices [8]. Collaborative resources valued most by participants have also been described in the literature and include the presence of collaborative faculty, availability of a change package and use of Plan-Do-Study-Act cycles [6, 7, 9, 10]. Few studies have examined the use of LCs to effect change through broader systems of care such as statewide [5, 11].

Learning Collaboratives: The Model

Most LCs follow the Breakthrough Series (BTS) Model, which was first developed by the Institute for Healthcare Improvement (IHI) in 1995 [9, 12]. In the BTS model, a

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"change package" of evidence-based practices is developed and agency-based teams work together on a specific issue for a defined period of time, typically six to fifteen months [12]. The primary aim is to close the gap between potential and actual performance by testing and implementing changes across an organization. The elements of the BTS model include: topic selection, faculty recruitment, enrollment of participating organizations and teams, learning sessions, action periods, Plan-Do-Study-Act (PDSA) cycles, summative meetings, evaluations and publications (Fig. 1) [12].

Learning Sessions provide a structured opportunity for teams to share their experiences, learn quality improvement techniques and plan for future action. In between the Learning Sessions, teams use Action Periods to test ideas in their organization. Performance is tracked over time and evidence-based locally adapted practices are ultimately adopted to effectively address the identified issue. Support is provided to the participating teams through on-site visits, conference calls, webinars, monthly team reports and assessments.

The purpose of this article is to describe the application of a modified Learning Collaborative model using a systems-level approach, associated lessons learned and explore considerations for replication.

Methods

The Systems Linkage Initiative

The Health Resources and Services Administration (HRSA) Special Projects of National Significance (SPNS) supports the development of innovative models of HIV care and evaluates the effectiveness of the models' design, implementation, utilization, cost and implementation outcomes while promoting the dissemination and replication of successful models. In 2011, the HRSA SPNS launched the Systems Linkage and Access to Care for Populations at High Risk of HIV Infection Initiative [13]. Six state Departments of Health (DOH) were funded to develop and implement sustainable, systemic HIV testing, linkage to care and retention interventions for hard-to-reach populations in Louisiana, Massachusetts, New York, North Carolina, Virginia and Wisconsin. Successfully linking and retaining persons living with HIV (PLWH) in primary HIV care supports patient viral suppression, reducing the risk of transmission of HIV to others and increasing patient survival. The demonstration states were supported by a cross-state evaluation and technical assistance center (ETAC) based at the University of California San Francisco (UCSF).

The four-year Systems Linkage Initiative was a unique project that utilized a modified LC model in combination with the more traditional SPNS demonstration and

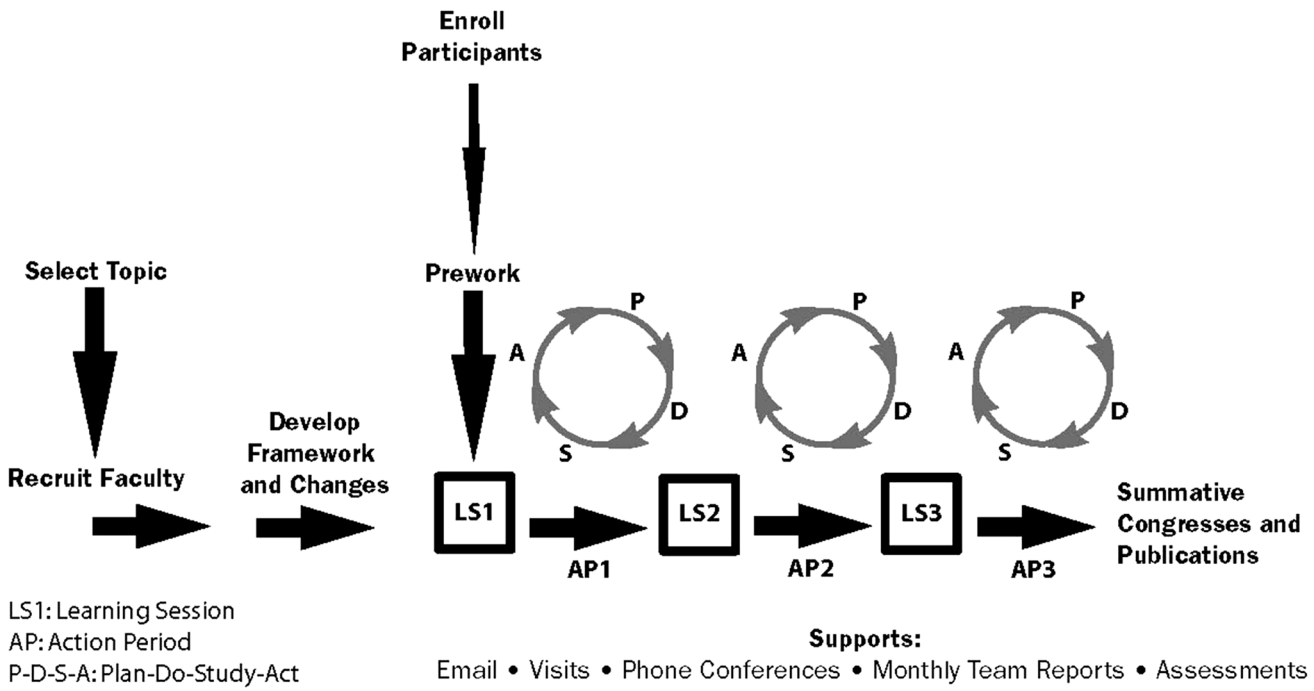

Fig. 1 Breakthrough series model

evaluation model. The LC model was modified in four distinct ways:

1. *Change Package* As part of the SPNS application for funding process, states were asked to pre-select interventions or models they wanted to test. The type of interventions varied widely, but all included a systems-level focus. Unlike a traditional LC, a change package of evidence-based practices was not available at the state systems level. The demonstration states were responsible for designing and piloting interventions in Years 1–2 with the intent of achieving broad scale, systems-level implementation on select successful interventions in Years 3–4. Each state was expected to create a comprehensive implementation manual and corresponding protocols for the chosen interventions to ensure fidelity as wide-scale implementation occurred.
2. *"Train-the-Trainer" model* Instead of convening all the participating agencies from the six states to one consolidated Learning Session, the states were responsible for implementing their own LCs. A "Train-the-Trainer" model was employed by the ETAC to educate the states in the LC model and a Learning Collaborative Resource Manual was created. Additional resources, such as Learning Guides were created to help states develop agendas and prepare for each Learning Session. States were responsible for applying the model to identify, pilot test, refine and implement the interventions across the defined service area in preparation for wide-scale implementation in Years 3–4.
3. *1:1 Coach* Each state was partnered with an ETAC coach with expertise in quality management, implementation science and systems level change. The coach provided technical assistance and support in six major areas: (1) implementation of the LC model; (2) system-level intervention design and implementation; (3) tests of change (PDSA cycles); (4) networking, peer learning and collaboration; (5) development of protocols, implementation manuals and other documents; and (6) information dissemination. Example of activities included participating in state planning calls to guide and redirect the discussions as needed, attending and/or presenting at the Learning Sessions and reviewing completed PDSA cycles. Input was provided on the pilot interventions with discussions centered around the ability to successfully scale up the intervention, complexity of the intervention, available resources, cost, and potential impact. Topic-driven affinity groups were held on a regular basis to facilitate sharing of information and resources across states around cross-cutting issues, such as consumer involvement and patient navigation. As the project progressed into wide-scale implementation, intervention-specific protocols and implementation manuals were reviewed for content, flow and presentation. Templates for the protocols and implementation manuals were developed for use by the sites. Throughout the process, coaches made observations and shared these with the ETAC team. Other ETAC staff provided additional support related to program evaluation.
4. *Performance measurement* The interventions varied widely within and across the states. As such, a standardized set of metrics was not employed in Years 1–2. Sites were responsible for implementing a local evaluation plan to assess impact. Throughout the initiative, documentation on activities and meetings implemented as well as observations made were documented and shared with the ETAC team. These documents, along with DOH progress reports, PDSA cycles and other reporting requirements served as the basis for the findings.

Figure 2 presents a visual depiction of the application of the LC model to the SPNS Linkage to Care initiative.

Results

Statewide Learning Collaboratives

Representatives from the demonstration states invited key stakeholders to participate in multi-day Learning Sessions to develop new interventions or adapt existing evidence-informed models to address identified gaps in HIV care and services. Stakeholder involvement varied by state but typically included representatives from state health departments, HIV medical programs, community-based organizations and persons living with HIV. Depending on the specific intervention, agencies such as local health departments, counseling and testing sites, correctional settings and prevention were also included.

In some settings, the LCs helped foster new or enhanced interactions among organizations, or between agencies and the DOH. For instance, in Massachusetts, a novel intervention was piloted using electronic laboratory reports received by the DOH to identify patients who appeared to be out of care at three healthcare facilities [14]. This intervention built a new system for direct, routine communication between HIV/AIDS Surveillance Program staff and HIV/AIDS service providers and lay the foundation for expanding successful components of the SPNS initiative beyond the end of the grant. In Virginia, a "relationship-first" approach was adopted by the DOH, where high value was placed on relationships formed among all involved in the referral and coordination processes of all four interventions implemented [15].

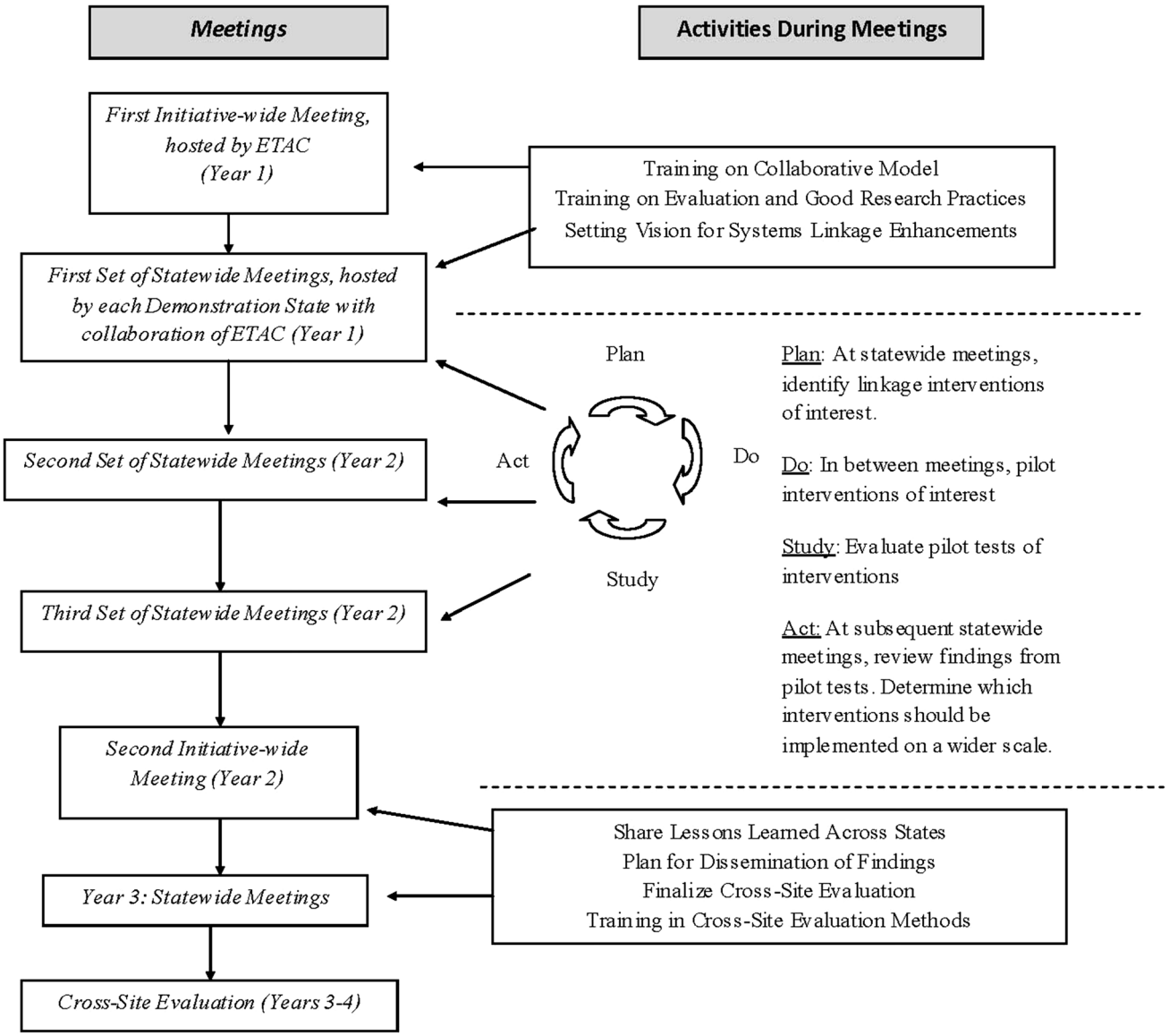

Fig. 2 Application of LC model to SPNS initiative

Over the course of the LC phase, more than 60 Learning Sessions were held, with each meeting bringing together 45–80 people. Having greater experience with LCs, New York was able to implement a more complex Learning Collaborative structure utilizing 10 regional groups and implementing 38 discrete Learning Sessions. With past participation in other LCs and a solid understanding of the core elements of the LC model, Virginia was able to identify key stakeholders and implement an orientation training 1 month after the initiative was officially launched. Other states required additional time to prepare for the Learning Sessions as they were trained on the LC model.

By the end of Year 2, a minimum of three Learning Sessions had been implemented by each state. While the content for the Learning Sessions was individualized, core topical areas were explored (Table 1). Between each Learning Session, all or parts of the interventions were pilot tested using Plan-Do-Study-Act cycles. While most states invited all key stakeholders involved with the pilot interventions to the Learning Sessions, Louisiana's final Learning Session focused solely on strategies implemented in the correctional setting.

Each demonstration state used a planning group or advisory committee to oversee implementation of the LC and the testing of the respective interventions. All of the planning bodies included key DOH staff and the ETAC coach. Other representation varied by state and included agency personnel, evaluation staff, technical assistance providers

Table 1 Learning session topical areas of focus

Learning session 1	Overview of Learning Collaborative model Overview of PDSA cycles Overview of strategies being tested Delineation of stakeholder roles and responsibilities Development of initial PDSA cycles for each strategy Overview of evaluation plan Identification of training and technical assistance needs
Learning session 2	Pilot site experiences implementing PDSA cycles Refinement of interventions Development of tools and products Development of site-specific implementation plans Identification of training and technical assistance needs
Learning session 3	Review of accomplishments and progress Pilot site experiences implementing PDSA cycles Development of site-specific implementation plans Preparation for expanding interventions to new sites Development of strategy intervention protocols and other resources

and PLWH. Some states created separate implementation teams or subcommittees for the discrete interventions. A range of training and support was provided to the individual agencies that tested the interventions across the five states. Massachusetts and Virginia offered a more extensive range of technical assistance, including defined training and coaching on select topics such as motivational interviewing.

Interventions

A total of 22 unique interventions were tested during Years 1 and 2 of the initiative, all of which focused on HIV testing, linkage, retention and/or re-engagement in care. Based on the results of the pilot testing and PDSA cycles, 18 interventions were selected and scaled up in Years 3 and 4 and implemented across the defined geographic regions (Table 2). Some interventions were expanded to statewide while others were replicated locally or regionally [16].

All interventions were created to impact services at a systems level, with standardized protocols being developed to ensure fidelity. The vast majority of interventions focused on outpatient HIV medical care sites and involved referrals into or out of the medical care setting. A handful of strategies centered on correctional settings while others focused on the use of care and surveillance data to create lists of clients who were out-of-care or at-risk of falling out of care. Various articles have been published documenting the results of the Systems to Care Linkage initiative, a select group of which are discussed below [14–21].

Hague et al. described the use of Massachusett's DOH HIV surveillance laboratory data to identify clients who were potentially out-of-care. The creation of out-of-care lists was seen as an essential first step in identifying PLWH who have fallen out of care. The sites were able to utilize the information to prioritize re-engagement efforts resulting in 72% of clients who were confirmed out-of-care returning to care within 6 months [14].

Rhodes et al. noted that Virginia's Care Coordination Program saw an increase in clients picking up their HIV medications after consistent and timely referrals from the Department of Corrections were established. Prior to implementation of the intervention, 40% of clients had picked up their HIV medications within 60 days of release, compared to 81% post-intervention [15]. More notable was the impact on longer term health outcomes. Of the 94 clients served by the program in CY2104, 95% were linked to HIV care within 90 days of their release from a correctional facility, 94% were retained in HIV care and 68% were virally suppressed in the 12 months following their release [15].

Schumann et al. discussed a patient navigation program that stemmed from the limitations of Wisconsin's case management system to serve clients with significant barriers to care [17]. While the program was designed to be 9 months in duration, half of the 540 clients were enrolled beyond that time. Given the frequency of client contact and emotional support provided by the navigator, strong relationships were developed and clients were reluctant to transition out of the program. Other challenges noted include role confusion between the patient navigators and case managers due to similarities in function. Similar issues were noted across all navigator-type interventions in this initiative.

Sena et al. documented outcomes from the North Carolina State Bridge Counselor (SBC) Program that link newly diagnosed HIV clients and reengage PLWH who are out of care [18]. Of clients receiving SBC services, 69% of newly diagnosed persons and 51% of PLWH reengaged in care achieved viral load suppression within 12 months of referral. The SBC program has become an integral part of HIV services in NC. With new approaches for using surveillance data to identify persons who are out care, alternative referral paths for SBC are being explored [18].

Table 2 State interventions implemented

State	System of focus	Intervention
HIV testing[a]		
Louisiana	Office of Public Health; County/Parish Jails; Case Management Agencies	*HIV Testing in Jails.* During medical intake screening, opt-out HIV testing is offered to the incarcerated. Those newly diagnosed are linked to HIV care while incarcerated and upon release, linked to Ryan White case management and medical services
North Carolina	Outpatient HIV Medical Care Sites	*Clinic-Based HIV Testing.* Free rapid HIV tests are offered to individuals who accompany HIV-positive clients to appointments
Wisconsin	HIV Counseling, Testing and Referral Sites	*Social Network Testing.* HIV testing agencies work with community peers who are HIV-positive or at very high risk for HIV to implement a social networks testing program. Through the peer's social network, friends, partners and other people are encouraged to participate in HIV testing
Linkage to/re-engagement in care		
Louisiana	Office of Public Health; LSU Public Hospital System	*LaPHIE.* A secure, bi-directional electronic exchange of public health information between the Office of Public Health and the public hospitals (LaPHIE), identifies HIV-positive persons who are out of care. In LaPHIE, if a person who is out of care is admitted to one of the participating medical centers, an alert appears in the patient's electronic medical record. Through a series of check boxes, the clinician is guided through a discussion on the importance of HIV care and becoming re-engaged in care
Louisiana	Office of Public Health; Department of Corrections; Case Management Agencies; LSU Telemedicine	*Telehealth.* Linkage to HIV care and support services upon release from prison is facilitated through a pre-release videoconference session with a case manager located where the client will receive services upon release
Massachusetts	Community Health Centers; Outpatient HIV Medical Care Sites; Department of Public Health; Ryan White Part A Medical Case Management Agencies	*Peer-Nurse Dyad.* Peer-nurse teams provide intensive, short-term services to clients with moderate-to-high acute service needs as measured by a newly developed acuity tool. Working in tandem with the client, a level of stability is targeted and once attained, transition to routine medical case management services or self-management is undertaken
Massachusetts	Community Health Centers; Outpatient HIV Medical Care Sites; Department of Public Health	*Line Lists.* Persons who do not have a CD4 count or HIV viral load submitted to the HIV/AIDS Surveillance Program in more than 6 months are designated as out of care. Clinic-specific lists of out of care clients are generated by the HIV/STD Surveillance Program and distributed to outpatient ambulatory medical care settings. HIV care teams use the lists to identify and re-engage clients in care
New York	HIV Testing Sites; Outpatient HIV Medical Care Sites	*ARTAS.* Staff implement up to five strengths-based, client-entered interactions with recently diagnosed clients to encourage and support linkage to care
New York	Outpatient HIV Medical Care Sites	*Peer Support.* A peer at the first appointment greets new clients. Advice is provided via phone as needed
North Carolina	Department of Public Health	*State Bridge Counseling Linkage Services.* Disease Intervention Specialists send referrals to the State Bridge Counselors ((Linkage and Re-Engagement Counselors, SBC) of newly diagnosed clients. SBCs confirm clients attend the first appointment scheduled by the DIS or assist the client in securing and attending the first appointment
North Carolina	Department of Public Health	*State Bridge Counseling Re-engagement Services.* SBCs take referrals from medical and case management retention staff to locate clients who have been out of care for 6–9 months or more and are not easily located by the retention staff in medical and case management agencies

Table 2 (continued)

State	System of focus	Intervention
Virginia	Prisons and Jails; Department of Health	*Care Coordination.* Treatment, care and support services are coordinated for clients released from correctional facilities by a Care Coordinator. Medical appointments and medication access is tracked for up to 12 months
Virginia	HIV Testing and Referral Sites; State Department of Health; Outpatient HIV Medical Care Sites	*Active DIS Referral.* Through the use of a standardized protocol, DIS staff rapidly link newly diagnosed persons to HIV medical care and confirm linkage to care by the referred provider
Virginia	Outpatient HIV Medical Care Sites	*Patient Navigation.* Using motivational interviewing, Patient Navigators work with clients to link and retain clients in care for up to 12 months
Wisconsin	HIV Testing Sites; Outpatient HIV Medical Care Sites; Inpatient hospitals; Department of Corrections	*Linkage to Care Specialist.* Linkage to Care Specialists work with HIV clients to provide short-term, intensive case management and care coordination services to identify and overcome barriers to accessing and maintaining engagement in HIV medical care
Retention in care		
New York	Outpatient HIV Medical Care Sites	*Appointment Procedures.* Targeted appointment reminders and other processes are implemented to help clients keep their medical appointments and help facilities follow-up with clients after medical appointments are missed
North Carolina	Outpatient HIV Medical Care Sites	*Retention Protocol.* Medical clinic or case management agency retention staff generate monthly reports of clients who have not attended medical appointments in the previous 6-9 months and do not have a scheduled appointment. Once identified as out of care, the retention protocol is used to search for and re-engage these clients. A range of strategies is used such as phone calls, letters, internet searches, outreach to providers and pharmacies. Clients who are not located are referred to State Bridge Counselors
Virginia	Outpatient HIV Medical Care Sites; Mental Health Programs	*Mental Health Screening.* Through the use of a standardized screening and referral protocol, clients are screened for mental health issues and referred to services to address mental health barriers to linkage and retention in HIV care

[a]Each intervention is listed under its primary area of focus of the HIV care continuum. It is recognized that several of the interventions target more than one area

Fuller et al. interviewed a subset of clients ($n=24$) who had been or were about to be released from prison within the previous 18 months and received navigation services from Louisiana, Massachusetts, North Carolina and Wisconsin [19]. An array of challenges was described post-release and often related to transitioning into the community. Across all four states, participants appreciated having a designated person they could contact for assistance related to medical care or other services. Interventionists helped participants access medical and support services and navigate the health care system. Most participants felt they had learned skills that would be useful to them and expressed confidence in their abilities to manage care in the future [19].

Discussion

The 2-year LC phase provided the six participating states the opportunity to develop capacity, pilot test ideas, forge cross-agency relationships and refine data collections systems to maximize the success and utility of the subsequent wider-scale implementation and evaluation of interventions. For instance, Massachusetts created and piloted a medical case management client acuity scale that is now standardized across all medical case management contracts funded by the DOH. In New York the regional groups (NY Links) became part of the Governor's Ending

the Epidemic Initiative [22]. While it is difficult to show direct outcomes from system level changes, the lessons can be utilized by other states and jurisdictions as they contemplate applying a LC to new models of care or expansion of existing models to other locations and/or agencies.

Experience with Learning Collaborative Model

Of the six DOH, one was experienced in organizing and implementing LCs (New York) while another (Virginia) had participated in two previous LCs sponsored by HRSA's HIV/AIDS Bureau. The remaining four states had not previously been exposed to LCs. Based on observations; states that had participated in past LCs appeared to benefit from this experience as they created new LCs in their states. New York's size and sophistication allowed for a regional approach and ultimately implemented a total of 48 Learning Sessions. With Virginia's understanding of the LC structure, they were able to quickly implement an orientation for the key stakeholders. Agencies that did not have previous LC experience had a steeper learning curve, as they had to first understand and become knowledgeable about the model before implementing it in their state. For some states, this impacted the buy-in of key stakeholders, complicating implementation. Having a coach available to each state to guide the process was useful to reinforce the approaches being explored, to offer additional suggestions and/or serve as a sounding board. Use of a coach with sufficient time to participate in the LC calls and meetings was an important element in addressing the lack of experience of individual teams.

Planning and Identifying Key Stakeholders is Critical

An initial planning phase was built into the SPNS initiative in order to allow states to effectively plan for their LCs and identify and engage key stakeholders in the process. States worked with partner agencies to identify strategic representatives to participate in their LC. Selecting the right representatives for the LC ensures that members represent a broad range of perspectives, experience levels, and decision-making capabilities. It also engenders support for the initiative and can be used to minimize or temper resistance. While Learning Sessions provided a venue for provider input, in Wisconsin, the statewide meetings were not sufficient to work through service details [17]. Involving key stakeholders in the planning bodies was one strategy several states employed for securing buy-in. As new members joined the initiative, orientation to the project goals and invitation to participate in the planning meetings proved to be critical to their understanding, ongoing support and involvement.

Difficult Shift from State-Driven to Participant-Driven Ideas

The LC model is intended to collectively identify and test various ideas so that the group can learn as a community. Koester et al. note that the LC model was an effective structure that allowed sufficient time for key staff to come together and work towards a common vision [19]. However, the SPNS initiative was structured in a way that required the funded State Health Departments to select and commit to specific interventions during the award process. In some instances, the SPNS interventions were integrated into existing state-funded HIV service contracts, which involved routine oversight and management. Advancing major system-level improvements while allowing agencies to identify and work through the SPNS interventions and, at the same time providing contract oversight, may have presented added challenges for some state health departments. In addition, some agencies expressed hesitancy in putting forth ideas or challenging assumptions. In this context, it was difficult to shift to a LC model where the participants were expected to develop the interventions and identify the core elements of these interventions. Some health departments managed this challenge by supporting agencies in the process of refining core elements and developing and testing mechanisms for the creation of intervention protocols and specific service approaches. To support the success of future LCs in fostering more participant-driven approaches, grant application and contracting processes must ensure clarity regarding roles and expectations of respective parties in establishing interventions and defining core elements and protocols associated with these interventions.

Ongoing Change Impacts Sustainable Interventions

Many of the interventions implemented required significant change at the system level. The LC model afforded the time needed for states to test and implement the interventions. While protocols were developed towards the end of the second year, changes continued to be made as relationships were forged and new ideas were introduced and spread. For instance, Virginia's Care Coordination intervention focused initially on the interface between the Department of Corrections and the VA DOH. As they gained experience and implemented the protocol, they were able to apply the model to several local jails. As the project entered its final year, more than 20 local and regional jails had begun utilizing the protocol. North Carolina implemented a retention protocol in one region during pilot testing, expanded to four regions in the implementation phase and expanded to several additional regions at the end of the project. Massachusetts plans to expand the use of out-of-care lists to additional facilities

within the state [14]. Similar examples were seen in others states as well.

Structure of Learning Sessions is Variable

The LC model is based on development of a working group of key stakeholders. In this initiative, the LC was applied to multiple interventions and multiple sites within each state. Some sites retained the central working group with a single consolidated meeting but others did not. Depending on the range of interventions being tested, the structure of the Learning Sessions differed. In some situations, a single consolidated meeting with all participants may not be the most effective format to utilize. New York chose to divide their Learning Sessions by geographic regions as a way to more effectively convene the teams. A virtual learning network was also used to communicate across a wider geographic area. Wisconsin effectively implemented Learning Sessions that involved more than 80 participants and explored multiple interventions. North Carolina, Virginia and Massachusetts involved stakeholders across all strategies. In Massachusetts, in addition to holding large two-day Learning Sessions for participating agencies and stakeholders, smaller meetings were convened for key staff delivering the interventions. Virginia also implemented additional strategy and region-specific virtual meetings between the Learning Sessions. Louisiana began with all stakeholders involved but chose to focus their final Learning Session on a single intervention involving corrections rather than including the initiative that focused on health information technology.

While the modified LC model was successfully implemented at the systems level by the states participating in the SPNS Systems Linkages initiative, there may be some benefit to conducting smaller and separate LCs if multiple systems interventions are being implemented at one time, followed by larger meetings bringing all partners together to discuss the entire system. This approach may help stakeholders focus on making smaller, more manageable changes rather than being overwhelmed with changing the entire system at once.

Provision of Technical Assistance

Technical assistance and support is needed to assist agencies as they implement and participate in LCs. As part of the SPNS initiative, technical assistance and support was provided to the states by the ETAC through coaching, annual grantee meetings, webinars, affinity groups and other learning opportunities as they developed their approach. In addition, four states (Louisiana, Massachusetts, North Carolina and Virginia) utilized a third party to help plan and implement their specific Learning Sessions. Three of these states (Massachusetts, North Carolina and Virginia) also hired agencies to provide intervention-specific technical assistance. By means of individual-level and group sessions, Massachusetts provided assistance on a range of topics including, but not limited to, the development of interdisciplinary care teams, the integration of peers into care teams, the use of an acuity tool to assess client needs and develop appropriate service plans, garnering agency buy-in, providing clinical supervision, and using data effectively. North Carolina used CDC's DEBI program to get external training on ARTAS for the Bridge Counselors. Virginia provided additional assistance on motivational interviewing, patient navigation, general HIV training and fidelity monitoring. These trainings and support were deemed to be necessary to successfully implement the interventions as intended and the additional costs had to be assumed through the project. Despite access to an experienced TA team, trainings with experts are sometimes needed to bring in specific skills. As part of the planning process for a LC, an assessment of these needs and expenses should be considered.

Change Packages

Using PDSA cycles states were able to test and modify multiple interventions with 18 ultimately selected for expansion. In order to standardize the interventions and ensure fidelity to a model, protocols and implementation manuals were created. Some sites also created readiness assessments and other resources to aid implementation [15, 17, 21]. The protocols cover the range of interventions and focus on: HIV testing, patient navigation, Bridge Counselors (NC's Linkage and Re-Engagement Counselors), care coordination between corrections and medical care settings, appointment reminders, active referral from DIS to medical institutions, videoconferencing, mental health screening, creating line lists and ARTAS. These protocols and materials were refined over multiple PDSA cycles and form a robust set of materials for use by others in the field as a product of the LC. The materials are available through the HRSA HAB Target Center at: https://careacttarget.org/library/replication-resources-spns-systems-linkages-and-access-care.

Building and Formalizing Relationships

The states successfully implemented the LC model and developed interventions but also forged new and/or stronger relationships with various departments within their agency or with external agencies. Prior to the SPNS initiative, several of the State Departments of Health had limited communication between their surveillance and prevention and care/services divisions. The model allowed various partners to engage in dialogue and together develop the respective strategies. These relationships have led to new initiatives in several states. By working closely, pilot testing interventions and formalizing

Table 3 Considerations for replication

Learning Collaborative expertise	Ensure faculty has a solid understanding of the LC model in order to guide the participating organizations, especially those without past LC experience
Build and sustain partnerships	Identify key stakeholders, be inclusive and engage partners early on in the process. Sustain relationships beyond the initial phase to ensure ongoing support and commitment to the initiative
Participant-driven	From the onset, clarify expectations that ideas and interventions are to be participant-driven to ensure usability to the intended system
Variable learning session structure	Create a LC structure that allows for variability and flexibility to best meet the intended goals
Build in sufficient time	Build in sufficient time to test out the respective interventions before wide-scale implementation
Provision of technical assistance	Provide a range of technical assistance tools, content and supports to the participating organizations to encourage their successful participation
Change package	Develop a change package with complete protocols and implementation plans to ensure fidelity to the intervention

protocols participants were introduced to others in a different way, all working towards a common goal. Wisconsin and Virginia are now developing a data-to-care initiative that involves sharing data with providers to identify clients who are out of care and trigger outreach efforts. Massachusetts developed a data-to-care intervention that necessitated a new kind of partnership between DOH HIV/AIDS surveillance and prevention/care staff, and between DOH staff and contracted HIV/AIDS service providers. Massachusetts also shifted to an acuity-based medical case management system which has been implemented statewide and which utilizes an acuity scale that was developed and piloted as part of this project. Koester et al. noted the LC model facilitated consensus building and with increased contact among stakeholders, effective communication channels were developed and relationships were established or strengthened [19].

As previously described, the various interventions yielded many systems changes, however, there are limitations with showing direct outcomes from system level changes, especially at the LC stage. This initiative was funded for 4 years with the first 2 years dedicated to the LC process. By design, the LC focuses on identifying changes and impact on a small scale—clinic practice, changes in agency policy, implementation of new procedures/processes between providers. Once small level changes are identified and interventions are honed and proven, they may then be scaled up to a larger system level. Solidifying systems changes and identifying the impact takes time, particularly when working with multiple clinics/agencies working together under the leadership and funding from state governmental systems that are not traditionally nimble or flexible.

Conclusion

Overall the use of the modified LC model applied to state-level organizations in six states successfully refined, tested and implemented a range of system-level interventions targeted to HIV testing, linkage to and retention in care for persons living with HIV. The creation of intervention manuals and protocols provided solid resources for other agencies and jurisdictions to test and build upon, thereby creating "change packages" that did not exist prior to the SPNS Linkage initiative. The interventions impacted not just a single agency, but entire systems of care across defined regions or, in some instances, the entire state. New relationships have been forged or strengthened through the use of the LC model, which allowed the partners to engage in dialogue and together develop the respective strategies.

As the modified LC model is considered for use in other systems-level initiatives, it is important to reflect on the lessons learned. See Table 3 for considerations for replication.

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Compliance with Ethical Standards

Conflict of interest The authors declare they have no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

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