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Partner Services in STD Prevention Programs: A Review

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Abstract

Background—Partner services have been a mainstay of public health sexually transmitted disease (STD) prevention programs for decades. The principal goals are to interrupt transmission and reduce STD morbidity and sequelae. In this paper, we review current literature with the goal of informing STD prevention programs.

Methods—We searched the literature for systematic reviews. We found nine reviews published between 2005 and 2014 (covering 108 studies). The reviews varied by study inclusion criteria (e.g., study methods, geographic location, infections). We abstracted major conclusions and recommendations from the reviews.

Results—Conclusions and recommendations were divided into patient referral interventions and provider referral interventions. For patient referral, there was evidence supporting the use of expedited partner therapy and interactive counseling, but not purely didactic instruction. Provider referral through Disease Intervention Specialists was efficacious and particularly well-supported for HIV. For other studies, modeling data and testing outcomes showed that partner notification in general reached high-prevalence populations. Reviews also suggested more focus on using technology and population-level implementation strategies. However, partner services may not be the most efficient means to reach infected persons.

Conclusions—Partner services programs constitute a large proportion of program STD prevention activities. Value is maximized by balancing a portfolio of patient and provider referral interventions and by blending partner notification interventions with other STD prevention interventions in overall partner services program structure. STD prevention needs program-level research and development to generate this portfolio.

Partner services programs have been a mainstay of state and local public health operations in U.S. sexually transmitted disease (STD) control for decades.[1-2] As with some other infectious diseases, standard STD partner services practices include the identification, location, and notification of sex partners (and drug-using partners for HIV and some hepatitis infections) of infected persons, and the referral of those partners to evaluation, treatment, and care.[3] The goal is to identify and treat undiagnosed infections and interrupt the chain of transmission at a level sufficient to reduce morbidity. Another important aspect of partner services is the ability to intervene in disease progression (including incubating

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disease) and prevent serious sequelae such as congenital syphilis. Partner services also contribute to understanding the epidemiology of infection.

The centrality of partner services has led to numerous efforts to make partner notification (PN) practices more efficient and even to introduce new techniques that change the intervention itself. Interventions designed to increase the efficacy or efficiency of this practice include individual- and community-level interventions, requiring various combinations of interventions with patients, practice changes for program staff (Disease Intervention Specialists, or DIS), and policy changes. At the individual level, given the combination of morbidity and lack of resources in many public health jurisdictions, patient-based referral replaces universal DIS interviewing and PN for gonorrhea and chlamydia.[4] At the community level, triage models that prioritize types of patients or geographic areas (i.e., focusing on core areas with high morbidity and sustained transmission) help programs cope with resource limitations while controlling infection spread.[5] Managing disease intervention, including partner services, through partnerships with outside agencies (e.g., community-based organizations and health care provider organizations) is frequent.[6] Policy changes may include legislation, but may also be simply changes in prevention program policies.[7-8]

In this paper, we have synthesized existing reviews, focusing on their common conclusions and recommendations. We have also added potential STD prevention program roles to increase the relevance of this review to STD programs, especially those funded through CDC's Assessment, Assurance, Policy and Prevention Services (AAPPS) cooperative agreement.[9] The results are intended to be a portrait of linked multilevel interventions[10] from which a program can construct and evaluate a partner services program that best fits its needs and capabilities in a given jurisdiction. Hopefully, this review will also provide some insights into optimizing the strategic deployment of partner services as part of a suite of interventions, coordinated in a way to maximize impact and reduce costs.

Methods

To find reviews of partner notification efficacy, effectiveness, and impact, we searched online publication registries for combinations of the approach (partner services, notification, or management, and also contact tracing) and the topic (versions of STD, STI, and HIV). We limited yields to systematic narrative or quantitative reviews written in English. This search strategy yielded 72 review papers published between 2005 and February 2014, the majority of which were only incidentally related to partner services (e.g., mentioning it as an adjunct to HIV testing). We excluded reviews of primary data that were not systematic (e.g., commentaries and updates). We retained nine reviews in which partner services were explicitly analyzed.

We summarized populations and settings, infections, partner services approaches, any specific interventions covered, and the outcomes of those interventions for each review. We then catalogued any conclusions or recommendations in the reviews, as well as any cost analyses named. Finally, we used an ongoing PubMed automated review to uncover articles in the field of PN that were published in 2014 or early 2015. We included these studies in the *Other Studies* section of the Results.

Results

The reviews and recommendations are summarized in Table 1.[11-19] Excluding 91 reports in Brewer[19] (1975 to 2004, many unpublished and not named in the review), the reviews covered data from 1977 to 2011 in 108 publications (median publication year = 2002, interquartile range (IQR) = 1998, 2004). The number of studies or reports covered in each review ranged between 7 and 39. Only 27 studies (25%) were cited in more than one review, largely due to time and differing inclusion criteria for reviews (e.g., limiting the review to randomized controlled trials (RCTs)). The 16 most frequently cited studies (3 or more times) across reviews dealt mostly with expedited partner therapy (EPT) in the form of patient-delivered partner therapy (PDPT) and enhanced counseling techniques for improving patient referral.

The number of patients in the reviews ranged between 1,140 and > 50,000. The total population sampled across studies included patients, health care providers, and occasionally practices or institutions. Thus, we cannot provide a precise N, but the level of overlap and estimates in Table 1 indicate a minimum of 85,000 patients across reviews.

Settings, Populations, and Infections

A majority of studies was drawn from patients in the U.S., but some reviews drew from a wider geographic range. The 108 studies covered across the 9 reviews were drawn from North America (7 reviews), Europe (6), Africa (5), Australia (3), Asia (2) and South America (1). STD clinics were the most common settings across reviews; they constituted 49% of settings in one of the larger reviews[17] and were the sole setting in one other review.[19] Most reviews, however, also covered studies in hospital clinics, primary care settings, and various community clinics. With respect to infections, a majority of reviews that specified infections included chlamydia, gonorrhea, trichomoniasis, and syphilis; 4 of 9 reviews covered HIV (one exclusively)[16] and one covered only chlamydia.[15] Reviews centered on infections other than HIV or syphilis typically focused on patient referral interventions. The largest review of HIV PN was composed of provider referral interventions.

Precise figures for population characteristics were hard to estimate as reviews generally drew from a broad spectrum of studies. Brewer's[19] review had no data on gender by report but the patients in the reports were almost certainly a majority of heterosexual men. One review covered only male index patients.[15] Of the remaining 7 reviews, studies enrolling only women made up 5–57% of those reviewed, men were the sole participants in 13–21% of studies, and both men and women were enrolled in 28–67% of studies. A review of HIV partner services provided proportions for males (60–88%) in the 7 of 9 studies reviewed that provided demographics; that same review also provided proportions for gay, bisexual, and other MSM (24 – 76% in 5 studies).[16] GLBTQ populations, however, made up generally < 10% of studies in most reviews (insofar as we could determine sexual orientation, preference, or identity). Race and ethnicity typically varied across reviews; also, conceptions of race and ethnicity have varying meanings in the international studies that were in most reviews.

Review Findings

Each review is summarized individually in Table 1. Table 2 contains a synthesis of the conclusions in Table 1 as well as potential STD prevention program roles or activities. Table 2 and the text below are organized by patient and provider referral.

Patient referral interventions—Four[13-15,18] of the nine reviews covered patient referral approaches exclusively. Three others covered predominantly patient referral interventions.[11,12,17] The most common topics covered were EPT, generally in the form of PDPT and mostly for gonorrhea or chlamydial infection, and behavioral counseling with various enhancements (Table 1). Counseling interventions reviewed were almost all one-on-one interventions delivered in clinical settings (one review covered a video presentation that found no effect). Evidence across reviews revealed that successful counseling interventions had interactive components, such as question and answer, hypothetical situations, or role-playing. Most reviews clarified, however, that the effects of counseling interventions were mixed overall and one review noted that the efficacious components of counseling were not clear.[12] Later reviews devoted particular attention to the outcomes of one PN counseling RCT conducted in Brooklyn, NY, that showed a 53% reduction in index patient reinfection.[20]

Patient referral interventions aside from counseling had in common that the index patient agreed to take something for the partner: medications or prescriptions, referral cards, or sampling kits. All reviews covering EPT acknowledged that findings were generally favorable and cost-effective (U.S. data) and recommended the intervention for consideration. The strength of the recommendation was correlated with the number of studies reviewed. Composite estimates showed that index patient reinfections were reduced with EPT (29% across infections in the most recent estimates). Most reviews, however, emphasized that EPT could not be distinguished from enhanced counseling interventions with respect to reductions in index patient reinfection. Reviews covering data on actual notification rates for EPT versus other methods suggested mixed results here (either no difference or higher proportions with EPT); the most consistent difference was the increased proportion of partners treated. For EPT RCTs, the comparison groups were typically basic patient referral, although some reviews noted that patient referral tended to be higher quality than is the norm in most U.S. settings where patients are diagnosed with EPT-relevant infections.

Home sampling in the context of PN, where an index patient brings back a test kit for a partner, was reviewed relatively favorably in 2007,[18] with an estimate of 8 sampling kits distributed for each kit returned. A later review, however, noted null results and did not recommend uptake of this intervention.[12] Similarly, referral cards, long a component of patient-based PN interventions, received mediocre reviews, with little evidence of effectiveness.

Provider referral interventions—Two reviews[16,19] covered exclusively or predominantly provider referral, and three others reviewed studies pertinent to provider referral.[11,12,17] Generally, reviews found that provider referral was more efficacious than

other approaches, although considerably more expensive. The most extensive review had little available data on program components, but reported the programs needed 4-5 PN interviews to find a case of syphilis, gonorrhea, or chlamydial infection, and approximately 9 to find a new case of HIV. The Community Guide review found a similar number of PN interviews, 8.6, were needed to find a new case of HIV (calculated from Table 2 of that review).[16] Twenty percent of HIV partners tested through provider referral were new cases, which led to a specific recommendation to offer provider referral services to all new cases of HIV. Reviews also found evidence that intensifying provider referral efforts for STD could lead to decreasing incidence. New York state community-level analyses of PN for gonorrhea[5,21] covered in one review suggested that concentrating provider referral in high-prevalence areas could lead to decreased incidence and that increasing the proportion of gonorrhea patients interviewed was associated with decreased rates in subsequent years. Similarly, Brewer noted that the percentage of cases who participate in PN is as or more critical to disease control as the level of case-finding yield.[19] Even if PN were very effective in finding new cases, it is likely to have modest overall impact on incidence if rarely used.

Network methods in conjunction with provider referral were a small proportion of evaluations, but two reviews concluded that including network methods or even simply interviews of social contacts could contribute to understanding the epidemiology of infection in a program jurisdiction and also to more effective partner services over time. A retrospective analysis of Colorado data, for example, suggested declining endemicity not visible through case reporting.[22] Other provider referral data found in reviews incorporated a DIS role in interventions such as EPT and electronic media for referral (internet, email). In one study of field-delivered therapy (FDT) in which DIS carried medications for gonorrhea while locating partners, the estimated proportion of untreated partners fell from 38% to 20%.[23] One review covered early case studies of PN over the internet. Investigators found that large numbers of exposed partners with no other identifying information could be located through this approach, albeit mainly because the small number of index patients had lots of partners.

Other studies

One community-randomized trial of EPT for gonorrhea or chlamydial infection has recently been published.[24] In this study, groups of local health jurisdictions in Washington state were randomly assigned in chronological order to implement an EPT program over approximately 2 years: counties not assigned to implement PDPT at any given point served as controls for those that had. Although the 10% decline in population prevalence in the intervention counties relative to controls was not statistically significant, the study demonstrated that planning, operating and reporting protocols, and procedural guidance could substantially increase the proportion of partners receiving PDPT (from 18% to 34%, $p < .001$) and the proportion receiving any partner services (from 25% to 45%, $p < .001$). No adverse events were reported.

Only one review mentioned accelerated partner therapy (APT), a form of EPT in which the partner has some contact with the health care system prior to treatment, but not necessarily an in-person evaluation (consultation is by telephone or with a pharmacist).[25] Althaus et

al.[11] did not cover APT in their main chapter on clinical effectiveness because there was no RCT available at the time of the review, but they did report modeling results that indicated APT could reduce index patient reinfection rates through decreasing the time to partner treatment (i.e., the same principle as EPT in general). A non-randomized trial in which index patients chose standard patient referral or an APT approach showed that patients choosing an APT approach had more partners treated (59% telephone, 66% pharmacist consult, 36% basic patient referral).[25]

Text messaging and similar short message service (SMS) technologies were not generally covered in the nine reviews. We found one review of SMS technology, but that review had insufficient data on PN to be included.[26] Between 2011–2012, New York City researchers evaluated the incorporation of text messaging into PN algorithms and found that the proportion of partners contacted via text (77%) was statistically greater than that reported for in-person contact tracing (69%) and internet partner services (IPS) (41%), $p < .0001$. Conversely, the proportion of those contacted who agreed to be tested for HIV was higher with personal contact versus either text or IPS (69% vs. 45% vs. 34%, $p < .0001$).[27] Earlier evaluations of email-based notification by DIS indicates that using these methods increases the number of partners found for syphilis and HIV (often, the alternative is not to pursue any contact).[28,29] A UK survey found that most clinics (86%) used text messaging at some point for PN, and staff charged with PN duties used text messaging as their second preference (after telephone).[30] Text messages generally asked the partner to make contact and did not specify the nature of the infection.

From a patient perspective, text messages or internet contact have mixed results in terms of uptake. Initial evaluations of an anonymous internet PN program suggested it was popular with gay, bisexual, and other MSM,[31] but an evaluation in Colorado showed that uptake was very low at an STD clinic with primarily heterosexual clientele.[32] A recent Australian assessment found that uptake of text messages was primarily confined to people with more than two partners at the time of diagnosis.[33]

Discussion

While at first glance partner services may appear to be a simple and straight-forward public health intervention, it is in fact a complex set of interventions, each requiring skilled and timely actions. Variable success in partner services implementation remains a critical issue, with both sufficient coverage and effective implementation of partner services relevant to impact.[34] Thus, this discussion is concerned with what prevention program actions are supported through this review, including what other interventions can help maximize the value of the activity. The most substantial constraint on the discussion is that reviews cover primarily individually focused interventions, whereas STD prevention programs most need to know which combinations of PN interventions work in which program contexts. We will therefore also discuss what additional evidence needs to be collected.

STD Prevention Program Action

The largest review of provider referral found that this approach resulted in a higher proportion of partners treated compared to other approaches. DIS use of technological

innovations such as email and smartphones has increased yield in program evaluations, although implementation issues are not yet well studied.[35] Reviews that addressed provider referral were supportive of provider referral for syphilis, for which timely notification is particularly important,[36] and which yields relatively high-quality epidemiologic information (if visual case analysis is done well). There were relatively few recent data supporting syphilis PN, especially in terms of preventing transmission. Syphilis infection, however, is often comorbid with HIV, raising its importance (and it makes sense to conduct PN for both conditions if an individual is co-infected). Moreover, as a relatively rare infection, alternatives like screening for syphilis are less effective than they are for, say, chlamydia.

The strongest evidence for provider referral came from HIV studies. Partners of HIV index patients have increased rates of undiagnosed HIV (and often other STDs), and provider referral is a relatively effective means of assuring that those partners are found and evaluated, analogous to targeted screening.[37] Because the value of bringing an HIV-infected person to treatment is so high, provider referral is cost-effective even though it is a costly intervention. It can be made more cost-effective if other services are incorporated into care, as long as the costs and benefits are aligned from the perspective of policy (i.e., that the costs of provider referral for HIV are aligned with the total benefits of retention in care, social services, etc.).

If the benefits of bringing an individual to care do not appear sufficient to justify the partner notification, the primary concern is whether PN finds enough infected persons to stem transmission, especially in core groups or areas. Gathering network data and using it for prevention is thus another avenue for direct action. Network-based PN is relatively rare, with the most extensive coverage coming from the 8 studies in the PN review for the 2006 STD Treatment Guidelines.[17] Network methods for investigation are a demanding short term strategy; the yield from network contacts is typically less than that from interviewing sex partners. It is, however, an increasingly valuable long-term strategy, as investigations contribute to a dynamic portrait of the structure of community STD transmission (e.g., network and venue characteristics).[22,38-40] This information can be used to target additional resources and messages to relatively small numbers of individuals in identified hot spots, both physical and virtual, as well as better targeting of non-PN interventions and services (e.g., screening or health communication). We add to this domain the concept of locating DIS outside categorical clinics. One evaluation in New York showed a large improvement in DIS-assisted PN outcomes among HIV clinics that had an “embedded” DIS, compared to those that did not.[41] With the requisite strategic thinking, incorporating network approaches is an example of maximizing the value of partner services programs.

STD programs can also increase the value of supporting partner services infrastructure with oversight, coordination, or assurance roles in other PN interventions. For example, STD programs can coordinate the provision of EPT, including in conjunction with other PN interventions.[42] One population-level evaluation of the introduction of EPT in Seattle demonstrated the benefits of doing so on the proportion of partners treated (rising from 39% to 58%, and to 65% with DIS services added to the options).[43] STD programs with a role in supporting patient referral could provide rules and technical guidance on EPT and behavioral counseling. PDPT as recommended by the CDC requires brief, but meaningful

interaction between provider and patient--so do the more efficacious versions of behavioral counseling to support patient referral. Such roles require, at a minimum, staff time, which means that most programs already operating at full capacity would have to hire more staff or redirect staff from other activities.

Referral cards had little overall support as an intervention, but an STD program could certainly provide templates and content guidance: these tools would support counseling and PDPT. A demonstration of an online STD management service (eSTI) across four California counties provides a case in point.[44] Integrated online management of testing, treatment, partner notification options, and linkage to care for chlamydia, gonorrhea, and trichomoniasis brought services and found cases for infections unlikely to be managed through PN alone. There was diminishing support over time for home sampling, which was also costly.

A broader question is central for many STD program managers – how does provider referral, an expensive case-finding activity, fit into the overall mix of STD prevention services? If the goal of partner services is to identify and bring to treatment infected and undiagnosed persons with STDs, then it would make sense to maximize cheaper case-finding strategies first. Provider referral could be used to complement such strategies and focus on at-risk populations that are not reached by screening or other strategies. Focusing multiple interventions, including screening, partner services, and condom distribution, on heavily impacted communities is a strategy supported in the current National HIV/AIDS Strategy (NHAS)[45] and previously in the Female Gonorrhea Screening Program (1972 – 1994).[46] Under the historic Gonorrhea Screening Program, over 8 million women were screened annually and 31–37% of cases were interviewed.[19]

In sum, the STD partner services program can be the primary vehicle for HIV and syphilis PN, as well as a recourse when partners *must* be found. To be successful, DIS must be well-trained, highly qualified investigators who elicit and find partners and who provide system-level technical assistance for patient referral interventions and programs across health systems. They and the program in general are also a source of community structural knowledge – about networks, gate-keepers, partnerships. The necessary partnership with surveillance is hopefully clear.[47]

Research and Evaluation Directions

Evolving use of technology remains one avenue for further exploration.[48] Lim et al.'s review of mobile phone text messaging in sexual health noted that text messaging can facilitate communication between patients and health care providers, often saving time and increasing convenience and the likelihood that a given message would be received by either party.[26] This was particularly true of communication suited to short information transmission, such as reminders. Evaluation in this area could be combined with evaluation of referral cards and other information provided to partners since a text message about PN is basically an electronic referral card. An associated experimental question is whether naming the infection on the message improves efficacy (one would have to measure privacy outcomes as well). Finally, with respect to interventions where patients are the medium through which partners are notified, incorporating patient choices among conditions into the

intervention may be important. A second APT trial just published in which patients were randomized to hotline, pharmacy contact, or standard patient referral found no significant differences in the proportions of partners treated.[49]

Even DIS interviews could be subject to further research. Although reviews included partner services for several infections, the issues of variable time, effort, and complexity of interviews across infections were not addressed. Typical HIV and syphilis interviews take more time and require greater interview skill than chlamydia or gonorrhea interviews, although partners of chlamydia and gonorrhea cases are much more likely to be infected than those of syphilis or HIV cases.[16,19] While these factors complicate the calculus of partner services, their consideration could lead to better partner services outcomes. For example, a Colorado RCT showing the effect of heuristic techniques on increasing partner yields[50] could be replicated and implemented with the goal of targeting the intervention most efficiently (i.e., perhaps confined to index patients with more than 4 or 5 partners). A recent evaluation of telephone interviewing for gonorrhea and chlamydia in Louisiana clinics suggested that the cost of finding a case with telephone-based PN and selective screening was $291 per case, compared to screening alone ($299 per case).[50] The additional cost for each case found through PN was $171.

At a community level, research into implementing PN strategies such as core area concentrations[5] or abbreviated interview techniques could lead to greater efficiency in partner services operations, as could research into combinations of interventions. Such studies are also conceivable in evaluation frameworks and would blend into quality improvement efforts. The largest question of all is the evaluation of the blend of PN interventions in the context of (a) HIV/STD partner services structure and (b) the overall range of prevention and care services in a community. Some of the EPT RCTs, in which the intervention was embedded in current services and the effect of the whole package evaluated, are good models.[24,52] Those models also show that many current metrics used in partner notification, such as the number needed to interview to find an infected person, remain salient. More work needs to be done, however, to implement cost metrics (e.g., dollars spent per new infection identified) and to identify and adapt metrics that are suited to program and population-level evaluation.

Limitations

This review may be limited by missing unpublished data, although we note four reviews included unpublished data. With the exception of Brewer,[19] the reviews did not utilize the extensive program data on provider referral in the U.S.; this limits the review of provider referral techniques. In the same vein, the typical focus of reviews on intervention efficacy meant that data on implementation and translation were limited. CDC's STD treatment guidelines, partner services recommendations for programs, and guidelines from other countries with similar public health capacity in STD and HIV prevention help address these issues.[3,53,54] Finally, given the centrality of gay, bisexual, and other MSM to HIV and syphilis prevalence in the U.S., we found too few studies on this population. While there were some studies of MSM in one review,[16] data were gathered before 2003.

Conclusions

The research and evaluation needs and the limitations point to one clear course of action: gathering and using STD program data to inform research and programmatic action. This point is not unique to partner services, but stands out because partner services are typically a large part of STD prevention programs. One “big picture” outcome could be a vision of the total effort required to operate a partner services program combined with the total benefits for more accurate resource allocation decisions. As shown in this review, partner services can provide STD prevention benefits other than the benefits of notifying, evaluating, and treating partners of infected people, including linkage to HIV care, condom education, and even condom provision. Population and health care provider attitudes to PN are generally positive.[55] The role of research and evaluation to demonstrate how to maximize the value of the service is essential here.[56]

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Brief summary

Interventions such as expedited partner therapy and enhanced counseling are well-supported, but further program-level research and evaluation is needed to improve the impact of partner services.

Table 1
Summary data from reviews of partner services interventions 2005 - 2014

Review and PN approach	Meta-data	Populations and Settings	Interventions and Principal Effects	Major Conclusions or Recommendations
Althaus et al. (2014) *Health Technol Assess* Patient & provider referral[1]	k = 21 studies N = 10 – 15,000 Study type: RCT Range = 1988 – 2011 Meta-analysis Grey literature = Yes Studies from: • Africa • Australia • Europe • N America	**Populations** Race/ethnicity: varied Gender: 33% female, 19% male, 48% both GLBTQ: 5% MSM (1 study) **Settings and infections** Settings: public health clinics (most), primary care, university clinic (1 study) STI diagnoses: CT, GC, NGU, TV, STI syndrome	• **EPT:** 29% lower risk of reinfection in index across (mainly) GC and CT: RR = 0.71 (0.56-0.89). Inconsistent findings on number notified; moderate difference favoring EPT in numbers treated, but heterogeneous results (3 studies) • **Counseling:** Lower reinfection rate vs. patient referral (no enhancements) (1 study). Some others were not distinguishable from basic patient referral. Intervention could be delivered by different health professionals (no differences among doctors, nurses, health advisors). • **EPT v. Counseling:** Studies showed no consistent differences in reinfection or partners evaluated. Possible evidence EPT resulted in more partners treated (1 study).	• **Patient:** ○ EPT results in a lower risk of reinfection in the index case when compared with simple patient referral, but not when compared with enhanced patient referral methods. • **Practice points/ General:** ○ Taking sexual histories is important. ○ PN is an efficient method for case- finding for chlamydia because partners of infected cases have rates 5-10 times higher than the general population.
Ferreira et al. (2013) *Cochrane Review* Patient & provider referral	k = 26 studies N = 17,578 Study type: RCT Range = 1977 – 2011 Meta-analysis Grey literature = Yes Studies from: • Africa • Australia • Europe • N America	**Populations** Race/ethnicity: varied Gender: 27% female, 23% Male, 50% both GLBTQ: 8% MSM **Settings and infections** Settings: STD clinics (most), primary care clinics, university clinic (1 study) STI diagnoses: CT, GC, NGU, syphilis, HIV, TV	• **Provider referral:** Sparse evidence in recent trials, but some evidence suggests it is better than patient referral (not enhanced) (1 study). • **EPT:** Index patients in the EPT group had a 29% lower risk of being re-infected compared with index patients in patient referral group (RR 0.71, 95% CI 0.56 to 0.89). Stratified data do not point to a clear advantage for any one	• **Patient:** ○ EPT is more successful than simple patient referral in preventing re-infection of the index patient and resulted in more partners treated when compared with simple patient referral and contract referral. These findings, however, cannot be demonstrated for any individual infection. ○ Those using EPT should include all components of the intervention.

Review and PN approach	Meta-data	Populations and Settings	Interventions and Principal Effects	Major Conclusions or Recommendations
			infection. Inconsistent results for number of partners notified; more partners treated with EPT (varying estimates). • **EPT (vs. enhanced counseling):** No difference in reinfection (RR 0.96, 95% CI 0.6 to 1.53)or number of partners elicited (MD 0.07, 95% CI −0.18-0.32) or evaluated (MD 0.01, 95% CI −0.02 to 0.03). Small increase in number of partners treated in the EPT group (MD 0.22, 95% CI 0.21 to 0.23)—1 study. • **Counseling:** Mixed effects, with some RCTs showing efficacy and others none. • **Home sampling:** Flat results for reinfection and treatment. • **Patient referral via internet:** With EPT and internet notification together, more partners identified (MD 1.15, 95% CI 0.22 to 2.08) (1 study). No differences in the number of partners treated or notified.	○ Counseling for PN is worthwhile for syphilis and HIV. • **General:** ○ No single optimal strategy for PN was obvious. The most effective components of interventions were not clear, and more research is needed in this area.
Wetmore et al. (2010) *Epidemiol Rev* Patient referral	k = 7 studies N = not reported Study type: RCT Range = 1981 – 2009 Narrative Grey literature = No Studies from: • Europe • N America	**Populations** Race/ethnicity: varied Gender: 57% female, 14% male, 28% both GLBTQ: not reported **Settings and infections** Settings: STD clinics, FP clinics STI diagnoses: CT, GC, TV	• **EPT:** Reductions in reinfection ranging from 25-62%, depending on population and infection. • **Counseling:** 53% reduction in reinfection (1 study). • **Follow-up rates:** Notes follow-up rates in PN studies ranged from 30-89%.	• **Patient:** ○ Women with STIs may have more difficulty in convincing their male sex partners to take treatment than vice versa. ○ STI prevention efforts should integrate new technologies and focus on implementation research. • **General:** ○ PN interventions, along with behavioral interventions, have

Review and PN approach	Meta-data	Populations and Settings	Interventions and Principal Effects	Major Conclusions or Recommendations
				shown "promising results with respect to reducing risk of STIs." ○ Adherence to interventions is a consistent issue.
Alam et al. (2010) *BMC Pub Health* Patient referral	k = 39 studies N = 50 – 60,000 Study type: RCT, program evaluation, observational studies Range = 1996 – 2007 Narrative review Grey literature = No Studies from: • Africa • Asia • S America • Caribbean	**Populations** Race/ethnicity: varied Gender: 15% female, 8% male, 38% both, 33% unknown GLBTQ: not reported **Settings and infections** Settings: STD clinics, primary care clinics, FP clinics, hospitals STI diagnoses: CT, GC, syphilis, TV	• **EPT:** Higher numbers of partners treated (1 study) • **Counseling:** median of 54% of partners notified (range = 0-94%). Counseling generally results in more partners notified. • **Referral cards:** 45% of those receiving referral cards had treated partners (1 study)	• **Patient:** ○ Counseling raises awareness of PN and helps reduce STI-related stigma and fear. ○ Counseling should be promoted in public and private STD clinic settings. ○ Cell phones should be used to enhance PN (and the internet explored for use)
Hogben/ Kissinger (2008) *Sex Transm Dis* Patient referral	k = 9 studies N = 1,140 Study type: RCT, program evaluation Range = 1997 – 2007 Aggregate data Grey literature = No Studies from: • Europe • N America	**Populations** Race/ethnicity: varied Gender: 100% male GLBTQ: minimal or none **Settings and infections** Settings: STD clinics (includes hospital GUM clinics), one CHC STI diagnoses: CT	• **Aggregated PN findings:** 69% of partners notified through some patient-based approach (10 estimates); 46% treated. • **EPT:** Data suggest increased levels of partner treatment (76% vs. 57%), compared to patient referral. • **Counseling:** Increases in proportions of partners notified, but effects often confounded with other interventions (EPT). • **Referral cards:** No reported increment in PN in a comparison with counseling (52% vs. 57%). Cards naming the infection may produce more partners for evaluation than generic card (84% vs. 33%) (1 study).	• **Patient:** ○ Patient referral enhanced with either educational information or EPT is likely the most practical approach for management of sex partners of men infected with chlamydia in the US. • **General:** ○ Efforts must be made to ensure that taking medication does not reduce overall care-seeking.
Hogben et al. (2007) *Am J Prev Med*	k = 9 studies n = 3,537	**Populations** Race/ethnicity: 58 – 87%	• **Provider referral:** DIS interview and either immediate	• **Provider:**

Review and PN approach	Meta-data	Populations and Settings	Interventions and Principal Effects	Major Conclusions or Recommendations
Patient & provider referral	Study type: RCT, program evaluations Range = 1988 – 2003 Aggregated data Grey literature = No Studies from: • N America (US only)	Black, 18 – 70% White Gender: 67% both, others unclear GLBTQ: 56% MSM **Settings and infections** Settings: STD clinics and varied HIV testing sites STI diagnoses: HIV	follow-up or contract referral offered. 67% of partners located through PN; 63% tested, if notified; 20% new HIV+ among those tested (1 – 8% of all partners).	○ Provider referral should be offered for all new HIV cases. ○ Benefits include earlier entry to care and reduced transmission.
Hogben (2007) *Clin Infect Dis* Patient & provider referral[2]	k = 39 studies (41 papers) N = 30 – 35,000 Study type: RCT, program evaluations, observational studies Range = 1999 – 2005 Narrative review Grey literature = No Studies from: • Africa • Asia • Australia • Europe • N America	**Populations** Race/ethnicity: varied Gender: 5% female, 13% male, 33% both, 13% not applicable[2] GLBTQ: 7% **Settings and infections** Settings: STD clinics, community clinics, hospitals, FP and primary care clinics (1 each), STI diagnoses: CT, GC, HIV, STI syndromes.	• **EPT** (including field-delivered therapy): Reductions in index patient reinfection, OR/RR estimates ranging from 0.38 to 0.80. One study used DIS assistance as requested. Partner treatment rates increased by 10 – 40% (2 studies). • **Internet-based PN (provider referral):** small N studies of people with large numbers of partners resulted in 26 – 44% of partners contacted; more than 5.9 partners per index patient average. • **Referral cards:** Mixed results compared to basic patient referral and counseling (48 – 73%, 2 studies); lower reinfection rates (1 study). • **Network PN (provider referral):** Interviewing social contacts yielded a 30% increase in syphilis infections found; interviewing uninfected social contacts yielded a 5.3% syphilis prevalence among partners (1 study).	• **Patient:** ○ A patient who can notify his partner but is unlikely to bring the partner to the clinic may need EPT if provider referral is unavailable. • **Provider:** ○ The role of the Internet emphasizes the need for broad collaboration among jurisdictions conducting PN. ○ Network analyses could produce a more efficient series of investigations over time. • **General:** ○ Protocols and procedures increase effectiveness and efficiency in programs.
Trelle et al. (2007) *BMJ* Patient referral	k = 14 studies N = 12,389 Study type: RCT Range = 1988 – 2006 Meta-analysis Grey literature = Yes Studies from:	**Populations** Race/ethnicity: varied Gender: 29% female, 21% males, 43% both, 7%	• **EPT:** Rate of persistent or recurrent infections in patients managed with patient delivered partner therapy was lower	• **Patient:** ○ Consider using PDPT ○ Consider using home sampling for partners

Review and PN approach	Meta-data	Populations and Settings	Interventions and Principal Effects	Major Conclusions or Recommendations
	• Africa • Europe • N America	unknown (1 study) GLBTQ: Minimal or none **Settings and infections** Settings: STD clinics (primarily, others unknown) STI diagnoses: CT, GC, TV, non-specific urethritis, STI syndrome.	than in controls, RR = 0.73 (0.57-0.93). Effect only shown for GC/CT (not TV). EPT also resulted in higher treatment rates, RR = 1.44, (1.12-1.86); effect sizes varied for reinfection and treatment. • **Counseling:** When EPT was compared to enhanced counseling, there were no differences in reinfection rates, although EPT resulted in more partners treated, RR= 1.25 (1.15-1.37). Didactic approaches were not effective alone, but approaches that were more interactive resulted in more partners notified. • **Home sampling:** The number of partners tested and infections identified increased if home sampling was available ($p < .001$); approximately 8 kits needed per test returned. • **Adverse events:** None found when measured (2 studies).	○Consider providing additional information for partners should be considered. • **General:** ○ Sharing responsibility between the provider and the index patient improves partner management outcomes.
Brewer (2005) *Sex Transm Dis* Provider referral	k = 91 studies N = unknown Study type: RCT, program evaluation Range = 1975 – 2004 Aggregated and narrative Grey literature = Yes Studies from: • N America	**Populations** Race/ethnicity: varied Gender: unclear, >50% M GLBTQ: At least 7 reports include MSM patients, but populations primarily heterosexual. **Settings and infections** Settings: STD clinics STI diagnoses: CT, GC, HIV, syphilis	• **Provider referral:** It takes about 4-5 interviews of patients in clinics to find a case of syphilis, GC or CT through DIS- based PN. It takes about 9 interviews of patients in clinics to find a case of HIV through DIS-based PN. Provider referral consistently resulted in a higher percentage of partners notified than did patient referral. • **Screening/testing:** Confidential testing results in 2-3 times more partners	• **Provider:** ○ Provider referral is more efficacious than patient-based methods ○ Intensified program PN efforts lead to decreasing incidence. • **General:** ○ Manage resource allocation by case-finding yield and contributions to epidemiologic understanding (because PN competes for resources with other

Review and PN approach	Meta-data	Populations and Settings	Interventions and Principal Effects	Major Conclusions or Recommendations
			notified through PN. The yield from screening (per dollar spent) is typically greater than for PN.	interventions and assessment)

Note. Overall N for some reviews could not be determined because some studies appeared in multiple comparisons, some studies were of institutional practice, or because individual studies were not listed with sample sizes. In these cases, we have provided a range.

PN = partner notification, CT = chlamydial infection, GC = gonorrhea, TV = trichomoniasis, grey literature = unpublished in peer-reviewed settings.

[1] Data are drawn from Chapters 2 and 5 on clinical and cost effectiveness of partner notification.

[2] This review included surveys of institutions and practices as well as patient or provider behaviors.

Table 2

Synthesis of review recommendations and associated STD prevention program roles

	Common recommendations	Potential STD Prevention program roles
Patient referral orientation	• Counseling enhancements to basic patient referral instruction ○ Can be from a mid-level provider or trained counselor ○ Should be based on a sound and comprehensive sexual history ○ Interactive counseling is superior to didactic instruction • EPT, typically in the form of PDPT, should be a component of a STD prevention program.	• Run an active DIS-based partner services program as a core function – HIV and syphilis: ○ Provide specialty assistance for important or hard to reach cases ○ Generate epidemiology for general STD prevention ○ Increase the value of HIV case-finding through linkage to care ○ STD clinics as models of excellence – provide wrap-around services for PN interventions primarily operated outside public clinics (e.g., PDPT) • Provide rules, technical assistance, coordination/ collaboration or (as permitted) advice on policy-making for: ○ EPT/PDPT ○ Follow-up with patients to assess PN ○ Interactive counseling for patient referral ○ Components of a sexual history or sexual health examination • Provide and assure use of good-quality information on: ○ Referral cards ○ Counseling content (including with PDPT) • Cost monitoring and resource allocation models ○ How much can be done through other clinical settings and for whom, and which infections? • Research and Evaluation (e.g., Ql evaluations) ○ Focus on efficacious components of interventions for efficient intervention ○ Focus on combinations of PN interventions for effective intervention ○Focus on context of PN intervention for impact
Provider referral orientation	• Because DIS are typically both more efficacious and costly than patients as agents of referral, they can serve a specialty role: ○ Partners who patients are unlikely to notify ○ Partners who are likely to be key to transmission ○Clusters (hidden infections and epidemiologically useful) ○ Network investigations can be useful in real time and increase the effectiveness of partner notification, especially over time. • Provider referral for HIV identifies enough new positives to make it worthwhile as a public health activity. ○ Linkage to care is a substantial benefit	
General	• Partner notification finds a higher than average proportion of infected persons (GC, CT, HIV, syphilis) ○ But screening and testing have yielded more cases • Increasing the proportion of partners treated through enhanced referral is cost-effective ○ More so than increasing screening • Use communication technology ○ Often population-specific • Community-level RCT needed for population-level infection management ○ Control groups are often “active,” so choose comparisons carefully	