



Evidence Review

Partner Notification

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New Technologies for Partner Notifications for Sexually Transmitted Infections

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Executive Summary

Partner notification is the process of informing partners of known cases of sexually transmitted infections (STIs) of their exposure and inviting them for testing and/or treatment. With the increasing use of internet, email, and text-based communication, many people seek sexual partners online, so they may only know an email address or a handle (an electronic identity) of their partner(s). These situations create a challenge for public health agencies (PHAs) because the traditional methods of contacting partners – i.e. phone or an address – are either unavailable or unsuccessful. This literature review summarizes and synthesizes the literature and practices of public health organizations relating to the use of these new technologies for STI partner notification.

The use of these new methods of partner notification can be categorized by the technology (internet/email and text messaging) and by the initiating party (public health or the patient). Public Health-Initiated internet or text messaging notification is generally used to obtain the traditional contact information to notify the partner and to offer testing and/or treatment as per protocol. In contrast, Patient-Initiated internet or text messaging notification can be used to inform partners of their exposure to a particular STI with a recommendation for follow-up with public health.

PHAs, including those in Canada, do use email and the internet to notify online partners. Internet and email partner notification (IPN) allows public health to notify partners who cannot be reached by traditional con-

tact methods, such as through a telephone call or postal mail. The success rates vary between 26-80% of partners notified. There is evidence that IPN can enhance traditional contact methods and result in increased medical evaluation rates and treatment rates among partners. Furthermore, internet and email contact is generally considered acceptable by partners, especially among men who have sex with men. The primary risk of IPN relates to maintaining privacy and confidentiality; however, the benefits of IPN outweigh the risks.

Evidence for Public Health-Initiated text messaging is relatively limited; however, text messaging has allowed partners who could not be reached by traditional methods to be notified. Therefore, Public Health-Initiated IPN and text notification should be strongly considered in cases where traditional methods either are not available or have failed. It is currently unclear from the research literature whether IPN is in general more effective or cost-effective than traditional methods. New research by PHAs would be useful in clarifying this uncertainty.

Patient-Initiated partner notification can supplement the efforts of PHAs (many of whom are coping with budget cuts and reduced funding). Web-based notification tools such as inSPOT and Let Them Know allow cases to notify their partners through email, internet, or text messaging. Although these notification methods are generally acceptable, they are considered to be less preferable than in-person or phone notification. Nonetheless, the decision



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to implement such programs may also depend on other factors including disease prevalence, frequency of online partner seeking in a given jurisdiction, and funding opportunities.

Introduction & Rationale

Partner notification is the process by which the sexual contacts of a patient with a sexually transmitted infection (STI) are informed and invited for testing with the goal of detecting undiagnosed and asymptomatic disease (1). At times, there is also empiric treatment of the sexual contacts regardless of testing results. In the context of partner notification, new technologies refer to contacting a sexual partner through venues such as chat room or dating websites; by email; or by text messaging (also known as Short Messaging Service or SMS).

The internet has become a common place for finding sexual partners (2). Many individuals, irrespective of age, gender, sexual orientation, or income status, find sexual partners through dating sites, chat rooms, and more recently, through social media such as Facebook (3). The estimates for those who had sought sex partners online in Seattle during 2005-2006, for example, varied from 8% in heterosexual women to 13% in heterosexual men to 69% in men who have sex with men (MSM) (4). With sexual activity, there is a risk of transmission of STIs. In fact, some evidence suggests that those who seek online sex partners might be at a higher risk of STIs (2, 5, 6).

The availability of online sexual partners can present a challenge for partner notification by public health personnel. When two partners who met online only know each other's electronic identity – an email address or a screen name, for example – and one of the partners is diagnosed with an STI, the information typically used for contact tracing, such as a telephone number or a home address, is unavailable. This means that the only way to contact the partner is through their electronic identity. In one study of 151 MSM with early syphilis, 21% reported partners for whom only an email address was known (7). Therefore, Public Health Agencies (PHAs) need to be equipped to contact online partners. Similarly, the use of text messaging can allow public health staff to reach partners who may have limited time on their cell phone plans. It has been noted that some contacts, especially youth, are unable

to use their airtime minutes (for calls) on their cell phone; they prefer to be communicated with through a text message because it is more affordable (Tammy King, Alberta Health Services, personal communication). Therefore, text messaging could facilitate partner notification for a specific segment of the population that would otherwise be difficult to reach.

Finally, new technologies may empower patients to notify their partners more effectively. Many PHAs in Canada and abroad are faced with budget cuts and limited financial resources; yet they are still expected to notify partners to limit the spread of STIs in their communities. Provision of electronic resources for patients such as email or texting may allow greater number of contacts to be reached, notified, tested and treated (9).

This evidence review intends to summarize and synthesize the literature relating to the use of these new technologies. This information can be used to inform public health practices as well as policies and procedures for implementing new technologies for STI partner notification.

Methods

A search for randomized and nonrandomized trials, cohort studies, case series, case reports, and reviews for new technologies in STI partner notification published in the English language between January 2000 and May 2012 was performed. The search strategy combined one technology term with a notification term as well as a disease term (Table 1).

The following search engines were used: PubMed/MEDLINE, EMBASE, PsychINFO, the Cochrane Library, the Centre for Reviews and Dissemination database, and Google Scholar. In addition, we reviewed the National STD Prevention Conference abstracts from 2008, 2010, and 2012 as well as the 2011 abstracts from the International Society of Sexually Transmitted Diseases Research. Three key informant interviews involving PHA staff were also conducted to understand the front-line perspective.

Table 1. Search terms used in the literature search

Search Concept	Search terms
Technology	Internet, social media, communications media, cellular phone, mobile phone, electronic mail, email, e-mail, twitter, facebook, chat room, discussion board, listserve*, message board, online, on-line, social network, text messaging, text messag*, digital media, virtual reality, chatroom, chat room, chat*, web 2.0, multimedia, cell* phone, texting, short message service, wireless communication, discussion group, bulletin board, instant messag*, myspace, youtube, viral marketing, internet based marketing, or online community*
Notification	Partner notification, contact tracing, contact notification, partner, disease notification, notification, disease outbreaks, and outbreak management
STI	Chlamydia, HIV, syphilis, gonorrhoea, sexually transmitted diseases, sexually transmitted infection

Results

The literature search yielded 379 articles, of which 65 were selected for a full review based on relevance. Of these, there were 21 cross-sectional surveys, nine reviews or other published secondary sources, six program evaluations, six commentaries, five case series or case reports, and one each of a cohort study, a case control study, current guidelines, existing protocol for STI partner notification, and current practices. One randomized controlled trial was also found, but it was stopped early due to low enrolment and poor uptake of the intervention. In addition, results from eleven abstracts from recent STI conferences are included in this review.

The data for new technologies for STI partner notification can be divided into two broad practices. The first category involves partner notification by PHAs. Generally speaking, public health has used new technologies when traditional contact methods are unavailable or unsuccessful. The second category refers to situations when new technologies are offered to the index patient as an option in addition to the traditional methods of contacting partners.

Public Health Use of Technology

Public Health-Initiated IPN

The earliest documented instance of internet and email partner notification (IPN) was published in a case series of a syphilis outbreak among MSM in San Francisco in 1999 (5). Sexual partners had met online through a chat room, and did not have the traditional contact information for most partners. The San Francisco Department of Public Health identified five cases of syphilis online with the help of electronic identification obtained from the two index patients. These seven cases reported another 87 partners, over 40% of whom were successfully notified online and were able to receive medical evaluation. Similar online investigations have reported successful notification rates as low as 26% (29 out of 111) in Los Angeles and as high as 80% (8 out of 10) in Chicago (10, 11). A 2010 report from the U.S. National Coalition of STD Directors includes information about the use of IPN in Chicago, San Francisco, Los Angeles, Boston, Philadelphia, and the state of Minnesota (12).

Similarly, many jurisdictions around the world, have demonstrated successful IPN (3, 13-17). Over a period of seven months in Philadelphia, 17 men named 70 online contacts. Of these 70, 31 (44%)

were notified of exposure to syphilis, 26 (37%) were notified of exposure to HIV, and 13 were notified of exposure to syphilis and HIV (3). In New York State, 84 internet partner notifications were conducted in the general population. Thirty seven (44%) of these were notified (responded), and 16 (19%) were informed (opened email, but did not respond) (14).

Similar online notifications have taken place in Canada. In one case, public health obtained electronic information for 23 contacts on a website used for meeting partners (Debbie Laughton, personal communication). The PHA created a membership using the name of their organization and contacted the individuals without divulging sensitive information. As a result of these efforts, the PHA was able to contact 22 of the 23 (96%) online contacts of the index case with HIV. Fifteen (65%) of them responded to public health, and received public health services. There have been similar cases of successful Public Health-Initiated IPN in Canada. It is noteworthy that public health interventions are not always welcome by the websites, and therefore some PHAs have had to create fictitious profiles in order to complete the partner notification on those websites (Colin Lee, personal communication).

In contrast to website-based communication, partners have also been notified of their exposure through email. In a review of early syphilis cases in San Francisco, 14 (21%) patients provided information about 44 sex partners for whom only an email address was available (7). As an example, one 36 year-old male was diagnosed with syphilis. He had at least 16 partners in the past 12 months, of which five were only identifiable through an email address. Public health staff emailed these five contacts allowing them to be tested and treated for syphilis (7).

Public Health-Initiated IPN Effectiveness

One study compared the effectiveness of Public Health-Initiated IPN with traditional notification methods (18). In this American study of persons with HIV/AIDS or syphilis, 177 partners of 53 cases notified by email were compared to 234 partners of 265 controls notified by traditional methods. The rates of notification (50% vs. 70%, $p < .0001$) and medical evaluation (81% vs. 95%, $p < .0001$) were lower in the email group compared to the tradi-

tional partner notification group. Although these figures suggest that email notification of partners is less effective than standard notification, it should be noted that confounding factors may have exaggerated the difference; the controls were unmatched and cases reported a higher prevalence of high risk behaviours, including multiple partners and presumably casual partners (19, 20).

In addition to the notification rates, one evaluative study investigated a number of downstream outcomes of Public Health-Initiated IPN (21). Over a period of 18 months, the Washington DC Department of Health identified 361 index cases of syphilis. These cases reported 888 partners, of which 381 had been investigated via the internet. As a result of IPN, the Department of Health was able to notify an additional 285 partners – an 83% increase over a baseline of 345 notifications by phone or a visit. In addition, 26% more partners were medically evaluated and treated resulting in an 8% increase in number of patients with at least one partner treated for syphilis. McFarlane et al. found that in Chicago, public health officials were able to use IPN during a syphilis outbreak; of their initial ten contacts, eight were notified, seven evaluated, and two were diagnosed with syphilis (11).

Public Health-Initiated IPN Acceptability

IPN not only appears to be an effective intervention for enhancing partner notification, it is also considered an acceptable practice – most strongly among MSM. During the first documented IPN campaign, published in 2000, 25/35 (71%) of those surveyed felt that IPN was appropriate and useful (5). In an English survey of 4974 MSM, 75% believed that Internet sites should allow health workers into chat rooms and 84% would like to find out what a health worker had to say if they met one online (22). Similarly, an American survey of 1848 MSM found that 87% - 94% would use IPN in some capacity and a great majority would use the information in an email notifying them of the exposure to a STI (23). For the heterosexual population, there are no data regarding acceptability for IPN for situations where an electronic identification is the only means to contact a partner. Where multiple options are feasible for partner notification, email is generally not the preferred method among the general population (24, 25).



Cost-effectiveness

There is little information on cost-effectiveness of Public Health-Initiated IPN. PHAs can expect to incur additional costs for staff training, IT support, and evaluations. Despite these costs, IPN may be cost-effective because it allows public health to reach partners who are unreachable through traditional methods (26).

Public Health-Initiated Text Messaging

One paper described a case series from New York where public health staff used text messaging to inform one partner for Chlamydia exposure and another partner for syphilis exposure after phone notification was unsuccessful (27). In the first case, the patient had moved out of the state, and wasn't able to respond to the phone notification. The second partner had limited airtime minutes and was only sending and receiving text messages. Public health successfully contacted both of them by text messaging.

Patient-Initiated Use of Technology for PN

Patient-Initiated Use of IPN

Survey data show that cases are often unable to contact their partners, and would use online methods if they were available. One study conducted in the early 2000s investigated the number of con-

tactable partners (via any modality) and another characterized the partner notification practices of young adults for Chlamydia in Melbourne, Australia (28, 29). The percentages of contactable partners for heterosexual women, heterosexual men, and MSM were 89-94%, 89-90%, and 51-73%, respectively (29). Consistent with these findings, it was found that MSM notified 15% of their partners; heterosexual men notified 31% of their partners; and heterosexual women notified 46% of their partners. Partners were contacted by phone (52%), in person (30%), text messaging (11%), and email (8%). Almost half the respondents felt that a website that allows anonymous email/text to be sent to partners would be useful. Of those who did not notify all of their partners, 34% said they would have contacted more partners if a web-based resource had been available.

Effectiveness of Patient-Initiated PN

Two web-based partner notification tools have been reported in the literature. InSPOT is an online notification system that allows cases to inform their partners via email (30). There is an option to send the email anonymously if desired. The tool was developed in San Francisco in 2004, and has been used across the United States as well as in Canada in Toronto, Ottawa, British Columbia, and in Romania. The second notification system is called Let Them Know in Melbourne, Australia (31). It provides index cases with an option to email or text their contacts about STI exposure.

Although there is some encouraging evidence of usage of these online tools, the data for effectiveness is somewhat weak (32). The first evaluation study of InSPOT reported 750 daily visits to the portal in the United States, and 30,000 people had sent 50,000 e-cards over a period of four years (30). There was considerable variation in the degree of use among the different American cities: from 280 e-cards in Portland to 9916 e-cards in Los Angeles during 2006. The e-cards were sent for gonorrhea (15%), syphilis (15%), Chlamydia (12%), HIV (9%), and other communicable diseases (49%). Almost one in three recipients clicked on testing site information. It is not known whether these notifications had led to increased medical evaluation, disease detection, and treatment. Data from Toronto suggests declining usage from approximately 1800 e-cards in 2008

to 300 e-cards in 2010 and 700 e-cards in 2011 although the health unit is promoting the service to encourage use (Bruce Clarke, personal communication).

Even in Los Angeles, where 50,000 e-cards were sent to 80,000 recipients between 2005 and 2009, there has been limited evidence of effectiveness of inSPOT (33). Approximately 15% of the clients in a STI clinic were aware of inSPOT before and after an advertising campaign. Furthermore, only one percent of their surveyed clients had either sent/received an e-card or sought testing as a result of an e-card notification. However, the investigators' methodology could not account for individuals who may have sought medical care outside the STI clinic.

In other studies of email notification, the use of the service has been fairly low. In Denver, for example, 1885 e-cards had been sent over an 18-month period; and one month accounted for 1300 of these e-cards (34). Despite an advertising campaign, the recognition and use of inSPOT remained low. Similarly, a randomized controlled trial of inSPOT in Seattle was ended early due to low enrollment, and only one of the 27 participants randomized to inSPOT actually sent an e-card (35). The Let Them Know notification service reported two emails per week although there appears to be an upward trend in 2010 (31).

Acceptability and Desirability of Patient-Initiated PN

Research has consistently demonstrated that there is support for sending and receiving email for STI partner notification in the general population, and MSM in particular (5, 28, 30, 36-41). In a survey, 65% of the general population and 74% of MSM endorsed sending an e-card (30). In another study, the acceptability of email increased for study participants from 24% to 60% if they had access to a private email (24, 25). Males tend to be more supportive of email compared to female respondents (25, 42).

The desirability of email notification where there are multiple options to contact partners contrasts with its acceptability (40). In one survey of MSM, for example, 56% of respondents supported using inSPOT to notify a partner but only 38% would choose an e-card if other options were available to

notify partners (39). In practice, 22% of the MSM used email and 2% used inSPOT while 72% chose either in person or telephone communication (35). In another study of young adults diagnosed with Chlamydia, 52% and 30% of clients informed their partners by phone and in person, respectively, and only 8% used email to notify their partners (28).

One qualitative study of men and women diagnosed with Chlamydia helps to understand the patient perspective on new technologies (43). Of the 40 interviewees, 56% chose in-person notification, 44% chose to phone their partner, and 17% used either email or text messaging. Face-to-face (in person) communication was judged as the "gold standard" as it conveyed caring, respect, and courage. While some considered telephone calls as insensitive, they were valued for their convenience as well as being quick and less confrontational in nature. Email was viewed as less personal, and text messaging was considered the least acceptable. Other study participants expressed that email and text messages might be misunderstood or not taken seriously. Nonetheless, participants felt that email and text messaging were still appropriate under certain circumstances; these include brief and casual relationships, relationships that ended badly, and when the partner does not answer phone calls (43). The idea that the method of contacting the partner should match the nature of the relationship has also been endorsed elsewhere (44). Misuse of email and text messaging (i.e. sending a message as a joke or as harassment), was not a significant concern, and according to the literature reviewed has been quite infrequent (31, 34). On the other hand, a frequent concern among the interviewees was the potential lack of privacy of information with both email and text messaging.

Cost Effectiveness of Patient-Initiated PN

There is little cost-effectiveness data for Patient-Initiated email and text message notification, but these systems are relatively inexpensive. For inSPOT, the start-up costs were estimated at \$15000 USD, and maintenance costs at \$3000 USD/year (30). For Let Them Know, the estimates were \$17000 AUD and \$2000 AUD/year, respectively (31). Toronto Public Health spends approximately \$60/week for ongoing costs of inSPOT (Bruce Clarke, personal communication). Assuming six notifications a week,

the notification cost of \$10/notification is likely to be cost-effective when compared with a health care provider cost of \$25/notification (45).

Patient-Initiated Use of Text Messaging for STI Partner Notification

The evidence about text message partner notification primarily consists of case reports and usage data (46). In one English case, described by Newell, a 26-year old male was texted using a medical code for exposure to a STI (47). He took this information to his physician who treated him for the infection. According to Newell, patients and health care workers appreciate the instant access as well as the security offered by cell phones as no other family members take calls. The Let Them Know notification service in Australia noted an average of 57 text messages per week compared to an average of 2 emails a week over a 10 month period during 2008-2009 (31).

There are recent studies which suggest that text messaging for partner notification is also less acceptable and less preferable than standard notification modalities (40, 41, 48). In a survey of 286 clients at sexual health clinics in, Australia, 11% of respondents used text messaging, whereas telephone, in-person notification, and email were used by 52%, 30%, and 8% of respondents, respectively (28). Similarly, a 2011 study of 393 MSM in Seattle demonstrated that only 1% of participants used texting to inform partners whereas 72% chose the phone or in-person notification (35). Based on a 2006 study, it appears that where partners have access to a mobile phone, the acceptability of text messaging rises significantly – demonstrated in one English survey to be from 17% to 93% (25). Factors associated with higher acceptability of text notification include being male (38, 42), younger age (adults under 25 years) (49, 50), having access to a mobile phone (25), and higher education (49). There is emerging evidence that text messaging may decrease the diagnosis to treatment interval in index cases, but this benefit has not been demonstrated in partner notification (50-52).

Challenges with New Technologies for STI PN

IPN is associated with unique risks and challenges. The most common concern relates to the potential for breach of privacy of confidential health information (7, 10, 45). Information sent over the

World Wide Web can be, at least in theory, read by unintended recipients. Some patients may also share email accounts with others. According to the literature found, although email is not considered a secure method of communication (45), the risks of a privacy breach are quite low (53). The information transmitted through emails is generally unencrypted and can theoretically be intercepted by an intruder, including the sender's and receiver's Internet Service Providers. Many larger organizations such as Public Health Ontario use the services of a third party to keep email communication encrypted and within a closed loop to enhance email security. There have been no reports of a privacy breach during the combined operational eleven years of inSPOT and Let Them Know. There has not been, to the best of our knowledge, a documented instance of privacy breach as a result of IPN. Another common concern is ensuring that electronic messages are not discarded as junk mail (7). Others worry that partners may be less likely to respond to online messages compared to a phone call (10).

The challenges associated with text message notification are similar to those implicated with email use – privacy, misuse, and not taking the message seriously. Text messages are potentially even less secure than email because messages can be displayed on a phone and viewed by unintended recipients (45). Although misuse by sending a hoax text message is a possibility, the reported occurrence has been extremely low (31, 34). To increase the likelihood that messages are read and acted upon, the sender could provide verifiable information about him- or herself, and by describing the reason for the text as an urgent health matter (7).

It would be expected that PHAs take reasonable measures to protect the confidentiality of sensitive health information and address other challenges associated with IPN. Some of the strategies described in the literature are listed below (7, 12, 45, 54, 55):

1. Encourage the index patient to notify the partner and have him/her contact the health unit.
2. Use a credible email address and provide verifiable information about the sender.
3. Use message headers that convey urgency without providing details of the STI exposure. For example, "Urgent Health Matter" is used by some jurisdictions.

4. Send messages to each partner individually rather than a group message.
5. If using a website to provide information for a STI, the health unit may provide a non-searchable link to a webpage, protected by a password, and valid for two logins to prevent potential misuse.
6. If using a website to provide information, program the website such that it removes the history or provides the user with instructions to clear the browsing history.
7. Use online communication to obtain other contact information, such as a phone number or an email address, to facilitate contact in the future.
8. When IPN results in the partner calling the Public Health Unit, the staff should verify the identification by referring to the descriptive information on file.
9. Convey the news of STI exposure in person.
10. If using social media such as Facebook, send messages privately so that they are not visible to other users.

Discussion

Partner notification is an essential public health intervention for the control of STIs in a given population (26, 56-58). With the greater ubiquity of technologies such as email, internet, and text messaging, we are presented with new challenges as well as opportunities to enhance partner notification. The primary challenge is our ability to reach partners who meet online and do not share traditional contact informa-

tion (i.e. phone number or an address), so Internet partner notification (including email) is the only option in such cases. In addition, a small segment of the population is unable to respond to phone calls from public health, likely due to limited airtime; this population may be more accessible through text messaging. Another opportunity lies in empowering index patients to notify their partners of a STI exposure using IPN and text messaging.

Public Health-Initiated IPN

A review of the scientific literature demonstrates Public Health-Initiated IPN has been used successfully to notify partners, resulting in increased rates of medical evaluation and enhanced the treatment rates for STIs (5, 7, 10, 18, 21). Many jurisdictions around the world, including those in Canada, have demonstrated successful partner notification as well as identification of new cases through the internet (3, 13-17). These reports demonstrate that Public Health-Initiated IPN has been successful in the MSM population and the general population, as well as for a number of different STIs and across many online social networking platforms. It is important to note that for evaluating the effectiveness, there is no true comparator for IPN because it has been used only when there was no alternative means to contact the partner. As a result of IPN, public health staff has been able to contact partners who would otherwise be unreachable (11, 21). On the other hand, there is reason to believe that the traditional methods of contacting partners are still relevant (18). These results are perhaps not surprising because establishing email contact is less efficacious than speaking to a partner directly (26). Nonetheless, study results are confounded by comparing higher risk online cases with lower risk offline controls. For example, those with online partners had multiple partners who were more likely to be casual partners; casual partners are less easily contacted than regular partners (19, 20). Therefore, these findings suggest that IPN should complement standard notification methods because in the absence of IPN, the notification rate would potentially be zero.

The benefits of IPN appear to extend beyond notification rates. In studies from Washington DC, and Chicago, public health was not only able to notify more partners, but also medically evaluate,



and treat more partners (11, 21). Notification via the internet and email is considered acceptable – especially among MSM, the population with highest frequency of online partners (5, 22, 23).

A true determination of cost-effectiveness of IPN is difficult, however, because there is no true comparator. Our literature review did not find a cost-effectiveness study. Nonetheless, public health can expect to incur additional costs for staff training, IT support, and evaluations. Despite these costs, expert opinion suggests that IPN may be cost-effective because it allows public health to reach partners who cannot be contacted through traditional methods (26).

The benefits of IPN related to enhanced disease detection and treatment likely outweighs the risk of privacy breaches associated with IPN (12). There is reasonable evidence to show that IPN leads to enhanced partner notification, medical evaluation, and subsequent treatment of STIs (11, 21). Meanwhile, the risk of a privacy breach appears to be mostly theoretical. In fact, public health generally uses IPN to establish initial contact and collect the traditional information before revealing the STI exposure history. Furthermore, it should be recognized that traditional methods of contacting partners – telephone call/voicemail, letter, or a visit – are not immune to breaches of privacy and may carry a similar risk. According to a 2010 report from the National Coalition of STD Directors, many STI programs in the United States maintain that online patient confidentiality is comparable to the traditional methods (12).

There was limited evidence of Public Health-Initiated text messaging for STI partner notification.

Based on a few published papers, public health staff would be justified in using new technologies when traditional methods are not available or have been unsuccessful. For example, when partners have met online and only know each other's electronic identity, then IPN is the only feasible method of partner notification. In cases when public health is unable to reach a contact via a cell phone, a text message requesting the partner to call the clinic for an important health matter would be appropriate (27, 47). If standard attempts to reach a partner by phone or letter have been unsuccessful, then emailing the contact, or searching for the person on social media such as Facebook may be justified. It is

critical that appropriate measures are taken to protect the privacy of the individual. A list of strategies to mitigate risks of online notification is provided above.

In order to formulate and implement policies and procedures for IPN and text messaging, PHAs should facilitate a collaborative effort among the relevant stakeholders. These stakeholders may include the Information Technology (IT) department, the legal department / consultation, the Medical Officers of Health, community physicians, the STI program managers, front-line workers as well as community representatives. It is also important for Public Health Units to document their IPN activities, so that the initiative can be evaluated for effectiveness, appropriate use, and quality assurance. A sample protocol is shown in the Appendix. Additional guidelines for Public Health-Initiated IPN can be found online (12, 55).

Patient-Initiated IPN

Unlike Public Health-Initiated IPN or text messaging, Patient-Initiated use of new technologies generally involves an element of choice. It is typically applicable in situations where the index case is responsible for informing the partner(s), and has the option to use IPN or text messaging in addition to the traditional notification methods.

The primary rationale for facilitating patient initiated-IPN and/or text messaging is to empower patients to notify their partners, and enhance notification rates. In an Australian study, half of respondents endorsed an email/text messaging platform and over one-third of those who did not contact all of their partners would use such a service (28). Therefore, there appears to be at least some desire for partner notification using electronic means.

The experiences of Patient-Initiated email notification have shown a varying level of usage in North American cities using inSPOT and low usage in Melbourne where Let Them Know was developed. The Let Them Know service reported only two emails per week (approximately 100 notifications / year). An advertising campaign did not increase usage of inSPOT. The only randomized trial of inSPOT was ended early due to poor usage of the service in the intervention group (35). In general, email notification is more popular among males and among

those who have a private email (24, 25, 42).

Despite the usage statistics, it appears that inSPOT has not led to increased rates of medical evaluation, disease detection, or treatment. In Los Angeles, where inSPOT has been the most popular only one percent of surveyed clients at the STI clinic has sent an e-card, received one, or sought testing as a result of e-card notification (33). It is possible that e-card recipients might have sought medical care elsewhere and were not captured by the study design. Similar to the experience in Denver, an advertising campaign did not increase awareness of inSPOT in Los Angeles. Furthermore, only half of the e-cards sent in the United States were for typical STIs: Chlamydia, gonorrhea, syphilis, and HIV. The other half were sent for other communicable diseases such as crabs, scabies, and hepatitis (30).

The unintended use of inSPOT to inform partners of other communicable diseases may explain the lack of effectiveness of Patient-Initiated email notification. Another reason for low usage might be because partners who meet online through dating sites and chat rooms know each other by their screen name and do not necessarily exchange emails (Bruce Clarke, personal communication).

While studies found a majority of survey respondents support sending and receiving email notification (5, 28, 30, 36-41), most people prefer person or phone notification rather than email or text messaging (28, 35). Patient interviews tell us that these traditional methods of notification convey caring, respect, and courage whereas the new technologies were considered impersonal and insensitive. This thought is consistent with the observation that with a more serious disease such as HIV, the preference for in-person notification becomes even greater (48). Nevertheless, electronic notifications may be acceptable in specific circumstances such as brief and casual relationships, relationships that ended badly, or when the partner does not answer phone calls.

Patient-Initiated text message notification is even less popular than email in North America and slightly more popular than email in Australia. Text messaging was considerably more acceptable to individuals who had access to a mobile phone, and also among males, youth, and those with higher education (25, 49). Overall, it appears that there

may be a small appetite for Patient-Initiated text message notification.

Although aggregate data do not demonstrate great effectiveness of, or preference for email and text messaging systems for partner notification in the general population, there may be segments of the population for whom new technologies would be more preferable than the general population (32). Youth, especially, appreciate the convenience, privacy, and expedient access of online and mobile sexual health services (49, 50, 59). The nature of the relationship may also determine whether email or text notification is used instead of phone or in-person notification. If there is a possibility of abuse by the partner, electronic methods may be encouraged. Ultimately, email and text notification should be viewed as additional tools for all patients to contact their partners with the goal of increasing rates of partner notification, especially among MSM (60, 61).

Each jurisdiction will need to determine whether it is cost-effective and feasible to use any third-party notification systems such as inSPOT and Let Them Know by assessing the needs for new technologies, the potential benefits, and the expected costs in their local context. Additional costs may be expected as a result of staff training, monitoring, and program evaluation. Crude calculations suggest patient initiated-notifications at \$10/notification may be more cost-effective than provider notification at \$25/notification (45). Expert opinions also suggest that there is potential for email and text notification to improve the efficiency and cost-effectiveness of partner notification (45, 61).

Conclusion

Successful partner notification is a key element of STI control efforts. Public health should be prepared to intervene in cyberspace to notify partners of exposure to STIs when traditional methods are unacceptable or not feasible as this is a method partners use to connect initially. Moreover, many PHAs do not have the resources to conduct provider notification for all STIs as demonstrated in the survey of Ontario's Public Health Units. In such cases, index cases are encouraged to inform their partners of the exposure. Providing patients with a variety of methods to notify their partners, including email and text

notification, might enhance the cases' ability to notify their partners, and allow them to get tested and treated. With increasing diffusion of technology, the role of technology in prevention and treatment of STIs is only expected to increase (62).

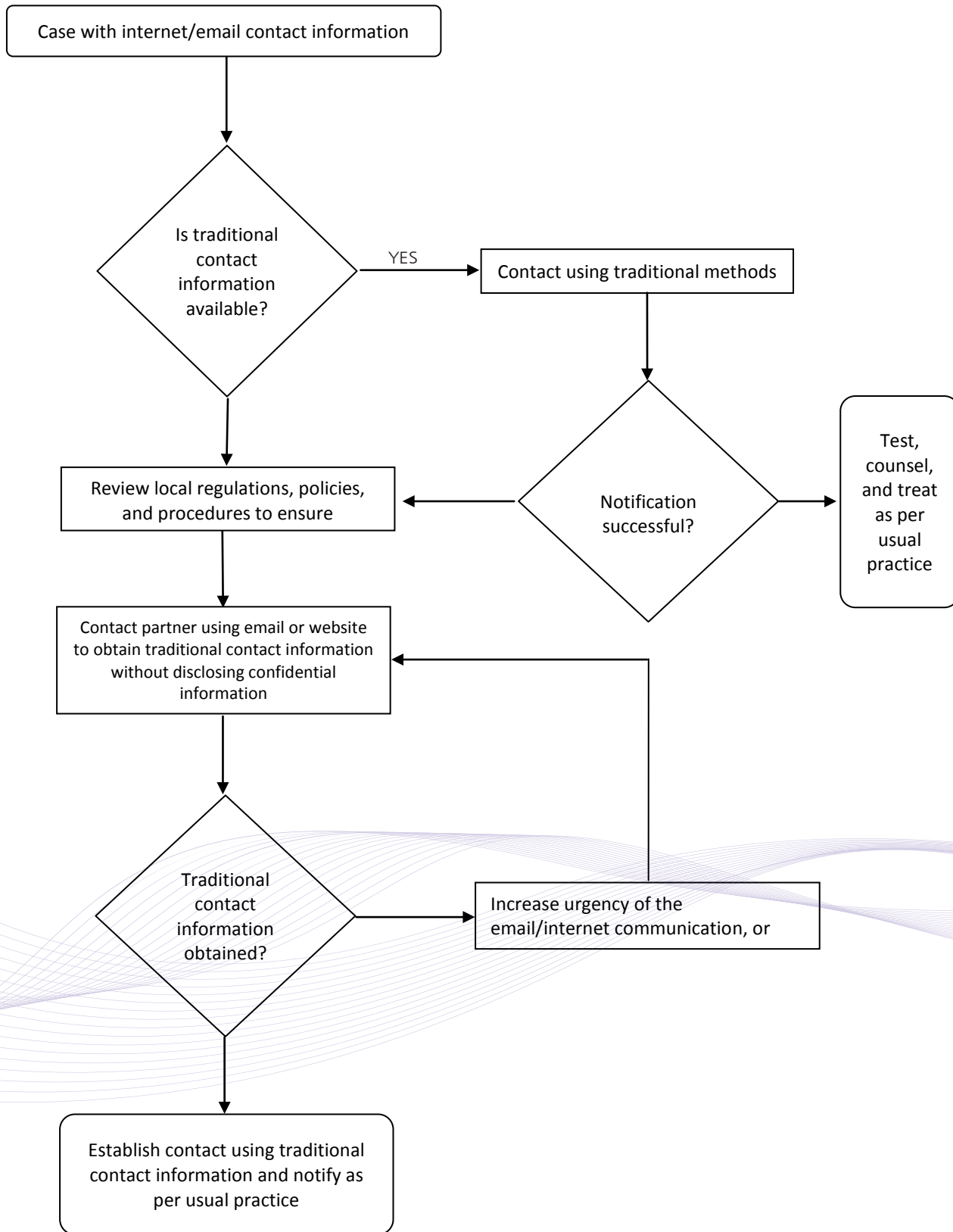
Future Directions

The conclusions of this review are based on effectiveness and acceptability data that generally originate in jurisdictions outside Canada. Although there is no compelling reason to suspect that these findings are not applicable in Canada, local research would allow public health to identify the specific needs of the community, and confirm the effectiveness and acceptability of Public Health-Initiated IPN in Canada. In addition, it would be helpful to understand the expected costs incurred by public health for staff training, additional IT support, and potential savings for IPN compared to traditional public health partner notification alone.

There is also considerable opportunity to further investigate the effectiveness of Patient-Initiated email and text messaging partner notification for STIs (63). Much of the evidence thus far reports the usage statistics, but does not measure the downstream outcomes in terms of increased rates of notification, testing, or treatment. This information is critical to determine the true effectiveness of the interventions. It would also be helpful to obtain local data, so that partner notification programs can be tailored to best meet the needs of the community.



Appendix: Suggested protocol for internet and email partner notification for exposure to sexually transmitted infections



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