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Expert Commentary

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Testing for Chlamydia and Other Sexually Transmitted Infections Outside the Traditional Clinical Venue: A Three-Part Series

1. Rapid Testing for Chlamydia and Gonorrhea in Emergency Departments

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SPECIAL POINTS OF INTEREST:

- **STI screenings in non-traditional settings offers a more accessible route to care for at-risk patients and communities with difficulty accessing medical care.**
- **Although not yet routine practice, rapid testing in EDs could lead to increased identification and treatment of individuals with undiagnosed CT/NG, as well as potential avoidance of downstream harm.**
- **STI screening in mobile settings can increase access to chlamydia screening for populations at risk for STIs and populations faced with barriers to accessing screening in traditional settings.**
- **New venue approaches, such as Internet recruitment and home-collection, present the opportunity to test more susceptible persons, who may not attend clinics.**

Chlamydia trachomatis (CT) is the most commonly reported bacterial sexually transmitted infection (STI) with approximately 1.4 million cases reported in the United States in 2014, representing an increase of 2.8% from the previous year and the highest number of cases ever reported to the Centers for Disease Control and Prevention (CDC). Rates of reported cases of *Neisseria gonorrhoeae* (NG) rose 5.1% from 2013 data, with approximately 350,000 cases reported in 2014. Women and young people (15-24) are disproportionally affected by CT/NG, with 20-24 year olds representing 39% and 33% of reported cases, respectively. Despite CDC and United States Preventive Services Task Force recommendations that sexually active women under 25 be screened annually for chlamydia and gonorrhea, screening coverage remains sub-optimal.[1]

Emergency departments (EDs) are an important site for the diagnosis and treatment of STIs, particularly among those with higher behavioral/demographic risks.[2-5] One previous report of CT/NG screening in EDs found that the unrecognized rate of CT/NG infections ranged from 38% to 82%. Follow-up treatment rates for those missed (i.e. not treated during their ED visit) ranged from 59% to 100%.[4] Another very recent study which instituted broad screening for *asymptomatic* chlamydia or gonorrhea in a pediatric ED found a positivity of 9.9%.[6] Notably, this underestimated the true STI prevalence, since the study excluded symptomatic patients and further highlights the importance of potential missed diagnoses among adolescents.

Among patients presenting to an ED with genitourinary complaints that warrant STI testing, diagnosis is challenged by the fact that traditional standard of care tests do not provide results in the time frame of a typical ED visit. Thus, up until recently, ED clinicians often made empiric treatment decisions due to lack of reliable, rapid, and near-patient tests being available to them. Empiric treatment results in antibiotic overtreatment for suspected STIs as high as 30-46% of patients, and up to 15-40% of patients with confirmed CT/NG not being treated.[7,8] This has important implications both for patient care and the public health. First, missed diagnosis in the individual can result in increased transmission of STIs (including HIV) with long-term adverse sequelae, including serious reproductive health complications. The CDC estimates that 20,000 women become infertile each year due to undiagnosed STIs.[9] Second, inappropriate use of antibiotics not only leads to medical complications, but also unnecessary side effects and increased antibiotic resistance in the community.[10] Integrating reliable and rapid testing for CT/NG in EDs could impact both individual patient care and antimicrobial stewardship.

The Center for Point-of-Care Tests for Sexually Transmitted

Diseases at Johns Hopkins recently explored the use of rapid screening in EDs. For that pilot intervention study, researchers prospectively enrolled female patients undergoing examination for STIs in an adult emergency department. Following enrollment, patients were randomized to either the control group, which received the standard of care testing, consisting of polymerase chain reaction (PCR) CT/NG testing with a two to three day turnaround time, or a rapid testing group, which received rapid Xpert CT/NG testing (with 100-minute turnaround and delivery of results to providers in the ED). Preliminary analyses indicates improved treatment rates: 100% of positive CT/NG patients in the rapid testing group were treated compared to only about 40% of CT-positive patients and 33% of NG-positive patients in the control group. Although not yet routine practice, rapid testing in EDs could lead to increased identification and subsequent treatment of individuals with undiagnosed CT/NG, as well as potential avoidance of downstream harm.

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2. Testing for Chlamydia in Mobile Settings

Commentary by Ellen Pittman, Lea E. Widdice, MD, University of Cincinnati

Screening, treatment, and education to prevent future infections among populations at risk for sexually transmitted infections (STIs) are critical components of public health efforts to control STIs, including chlamydia. Typically, chlamydia screening is accessible only in traditional health care settings, such as medical provider's offices, health care clinics, or hospitals. However, to increase access to screening, some health care systems, nongovernmental organizations and community based health outreach programs are offering screening in mobile health care settings. Mobile screening can be offered in a variety of locations, including vans or large recreational vehicles converted to provide medical services; rooms in churches, brothels or bars; and outdoor, community gathering places.

STI screening in mobile settings can increase access to chlamydia screening for populations at risk for STIs and

populations faced with barriers to accessing screening in traditional settings. Mobile screening programs for STIs, including HIV, have been established and evaluated in both low-resource and high-resource settings. Results of evaluations suggest programs can be acceptable, feasible, and effective.[1-12] Successful programs have demonstrated reaching populations with high prevalence of infection and reaching populations with low prevalence of testing. At least one evaluation has demonstrated increased risk reduction behaviors and decreases prevalence of chlamydia among female sex workers.[1] In addition, other components of successful programs include ensuring treatment of detected infections and linking clients with the traditional health care setting.

A potential barrier for programs offering chlamydia screening in mobile settings is loss of privacy for clients when they are seen by others entering a van or speaking with program staff known to be offering screening. However, this appears to not deter at-risk individuals from seeking screening. In fact, visibility of the mobile site and clearly published schedule announcing upcoming visits are identified as motivators to seek screening.[3,6] In the United States, we have offered chlamydia screening to men and women at outdoor, community-organized, family-focused events and on a public square in a metropolitan business district during the lunch hour. At each event, the requests for screening outnumbered our capacity to provide on-site screening.

Another potential barrier for mobile chlamydia screening are costs, including startup, infrastructure, and staffing. Few reports of mobile STI screening programs provide programmatic cost data despite cost considerations being critical for program initiation and sustainability.[13] If mobile screening programs reach populations already accessing health care in traditional settings and not uncovering hidden disease, they will only be cost-effective if they can deliver care at a lower cost per case treated than screening in a clinical screening.[14]

Rapid, easy to use, point of care (POC) testing for chlamydia may increase the feasibility and impact of screening programs. At this time, no POC, CLIA-waived diagnostic test for chlamydia is available in the United States. Most chlamydia screening programs obtain specimens that are transported to an off-site laboratory for testing. Therefore, mobile screening programs must have staff, expertise, and materials dedicated to packaging and transporting samples, receiving results days after sampling, and contacting clients who have positive test results. Additionally, diagnostic tests for chlamydia are not routinely validated for sample collection outside of a fixed health care clinic. We have assessed the feasibility of POC testing as part of a mobile screening program on a health van using a diagnostic test for trichomonas that is FDA-cleared, CLIA-waived and provides results from a self-collected vaginal sample in 10 minutes.[12] During two community events, we provided STI screening from a mobile health van. Uptake of the POC trichomonas test was 100% (31 women tested) and 100% of those infected (four women) were successfully contacted with their results and treated. Acceptability among men and women of point-of-care testing in mobile settings was measured using a written survey. The proportion of men and women who reported getting POC testing on a health van as acceptable was higher if the wait time was shorter; of the 30 respondents, 76% reported that a wait time of less than an hour was very acceptable, 58% reported that wait times of one to two hours was very acceptable, 48% reported that wait times of two hours but less than a day was acceptable.

We have also demonstrated the use of a POC chlamydia diagnostic test during a mobile screening event.[12] Attendees at a community event requesting chlamydia screening on a mobile health van were offered participation in a research study; participants were given a choice between getting results from a non-validated POC chlamydia test on the same day or a validated, laboratory-based chlamydia test in two-weeks. Each research POC test was confirmed, with 100% agreement, with a laboratory-based confirmation test. A majority (22/25, 88%) of men and women chose to get results from the non-validated, POC test. Of the 22 participants tested, two had positive results and both received treatment.

Screening for chlamydia requires sample collection of urine or genitals, limiting mobile screening programs to locations with access to bathrooms or private rooms for sample collection.[2] During our efforts to provide screening at community events with a mobile health van, our capacity to offer testing was limited by having only one bathroom on the van for sample collection and limited space for counselling, education, testing, and reporting results. Therefore, we explored the feasibility and acceptability of offering screening without a van by using vendor's booths—for education, counselling, and result notification—and privacy shelters for patients to self-collect genital samples. Privacy shelters are pop-up tents designed for standing or sitting. At two outdoor community gatherings, we offered chlamydia and gonorrhea screening without a van. Privacy shelters were set up next to the vendor booth. We used commercially available tents as privacy shelters. Staff offered clients either a privacy shelter or nearby public bathrooms to self-collect vaginal or penile samples. When given the choice, all men and women used the privacy shelter. We assessed attitudes about sample collection in privacy shelters compared to other locations. More men and women reported that self-sampling in a privacy shelter (62% and 67%, respectively) was acceptable compared to a mobile public toilet, e.g. a Porta Potty (32% and 12%, respectively). Fewer men and women reported self-sampling was acceptable in a privacy shelter as a doctor's office or home (89% and 95%, respectively) (unpublished data). Using privacy shelters has the possibility of expand-

ing access of STI screening into environments without access to bathrooms or built-in private settings.

STI screenings in non-traditional settings offers a more accessible route to care for at-risk patients and communities with difficulty accessing medical care. Effective programs utilizing screening in mobile settings can be developed by working with community-based partners to identify barriers and solutions to offering STI screening. Programs offering STI screening have demonstrated that individuals at risk for STIs will get tested at community events. POC testing in mobile settings is acceptable and self-sample collection on vans and in privacy shelters is acceptable. A current barrier preventing wider adoption of screening in community settings is the lack of a CLIA-waived POC test for chlamydia and poor understanding of the costs for initiating and sustaining mobile screening programs.

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3. Testing for Sexually Transmitted Infections via the Internet

Commentary by Charlotte Gaydos, MS, MPH, DrPH, Johns Hopkins University

Sexually transmitted infections (STIs) are a significant health burden in the United States, having an estimated prevalence of over 110 million, with approximately 19 million incident infections annually.[1] The most common bacterial infection of these is caused by *Chlamydia trach*omatis with 1,441,789 cases reported to the Centers of Disease Control and Prevention (CDC), followed by infections caused by *Neisseria gonorrhoeae* with 350,062 cases reported in 2014.[2] *Trichomonas vaginalis* is not reportable to CDC, but incidence is estimated at over one million new cases per year.[1] Direct medical costs just for chlamydial infections alone exceed $500 million per year.[3] Since STIs and altered vaginal microbiota can cause serious reproductive sequelae, such as pelvic inflammatory disease, infertility, ectopic pregnancy and chronic pelvic pain, and are likely to influence the transmission of human immunodeficiency virus (HIV), control of STIs is imperative.[4-6]

New approaches are needed to help diagnose these infections, including the development of new molecular and accurate rapid point-of-care (POC) tests that allow patients to be tested, diagnosed, and treated outside the routine clinical setting and/or at one clinical encounter in special venues. New out-of-clinic venues and tactics such as self-collection, self-testing at home, and Internet availability of tests can reach out to persons who may not attend routine medical clinics. Many new such tests are in the pipeline and will support use of special venues such as the Internet.

One Internet-based program is I Want the Kit (IWTK). IWTK ((www.iwantthekit.org) is an Internet recruitment and educational outreach program that tests for chlamydia, gonorrhea, and trichomonas from self-collected genital and rectal swabs obtained at home and mailed to the laboratory for molecular testing.[7-8] Since the tests are performed by a lab, cases are reported to the appropriate public health authority. The educational component of IWTK informs users about STIs and uses a short online quiz for sexually active individuals to estimate their risk of having an STI.[9-10]

The IWTK website is currently active in Maryland, the District of Columbia, and Alaska. Website features include: a secure, password-protected login on a HIPAA-compliant server; selection of a potential treatment clinic before ordering a kit; a simple risk quiz on the website, with an automatic-tally of final risk scores; new sample collection instructions; automatic site-generated text/email to notify user that a kit was "mailed," "received," and "your results are ready"; ability for the participant to obtain their own results from the website; and new revised information about STIs. An email is sent at three months to remind a participant to get rescreened if previously infected with one of the STIs.[9] Additionally, the site has been made mobile-friendly since mobile device engagement has exponentially increased in the last couple of years.

Since its inception in 2004 for female testing for chlamydia and gonorrhea, males were added in 2006, trichomonas testing was added in 2006, and rectal screening was added in 2009. The table shows total positivity for females and males for the three infections since 2004, when the beginning positivity for chlamydia was 10%, through March 2016.[7,8]

		N* tested	Chlamydia	Gonorrhea	Trichomonas
Female	Vaginal	6777	7.05%	0.86%	6.5%
	Rectal	1198	7.10%	0.92%	5.85%
Male	Penile	3658	7.82%	0.74%	2.38%
	Rectal	769	7.28%	4.16%	0.65%

*Denominators are less for vaginal trichomonas for women since the test was added in 2006; denominators are lower for men who were added in 2006; denominators are lower for rectal specimens which were added in 2009.

This IWTK program is provides free collection kits and free testing for users as a pilot research project, and for the past two years has required postage to be added by participants to mail the kit back for testing. Most of the available clinic choices listed on the website for treatment of infected persons are either free (city or state health departments or STI clinics) or charge minimally (some family planning clinics).

The proof of concept that this type of program is acceptable and feasible to women and men to self-collect urogenital and rectal samples at home has been demonstrated, as well as the fact that infected persons are able to receive treatment based on IWTK test results. Surveys have indicated that approximately 80% of patients attend a clinic for treatment after obtaining their results via IWTK.[9]

There have been other Internet-focused STI test offerings and many home-self-collection and mail-in testing programs that have proliferated in the last few years. Some have been research studies and public health focused programs.[11] The review of home-based sampling by Odesanmi et al. concluded that "evidence [indicates] that home-based testing results in greater uptake of STI screening in females (14–50 years) than clinic-based testing without compromising quality in the developed world. Home collection strategies should be added to clinic-based screening programs to enhance up-

take."[12] Cost–effectiveness has been demonstrated.[13-14] Ongoing IWTK Internet initiatives involve research projects to allow participants to order home trichomonas tests to perform themselves and home HIV oral fluid tests to be ordered for self-testing.

However, many more entrepreneurial-type programs for the online testing of STIs have high costs for services and are not Federal Drug Administration (FDA) regulated. These may be a barrier to future outreach venue programs by public health officials. A quick Google search will lead unsuspecting patients to these potentially unregulated services.[15] Care will be needed to prevent unscrupulous and unregulated offerings.

In summary, many of these new venue approaches such as Internet recruitment and home-collection, if carefully controlled, present the opportunity to test more susceptible persons, who may not attend clinics. Since many STIs are asymptomatic, education will be an important component of such outreach, which if successful, can help enhance care and reduce the burden of STIs.

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