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# Development and Evaluation of a Procedure to Identify Possible Gonorrhea Treatment Failure Cases in Illinois

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**Background:** Cephalosporins are the last effective class of antibiotics to treat gonorrhea infections. In Illinois, gonorrhea cases have increased by 70.9% from 2015 to 2019. Because of the concern of antimicrobial resistance and the increasing number of cases, the Illinois Department of Public Health Sexually Transmitted Diseases Section established a procedure to identify possible gonorrhea treatment failure cases.

**Materials and Methods:** A procedure was developed that identifies patients who have had 2 gonorrhea cases in the last 60 days, and the first case was treated with the Centers for Disease Control and Prevention–recommended treatment. Interview records were faxed to the local health department (LHD) where the patient resides. Descriptive statistics were used to analyze interview record data. A process evaluation was conducted using telephone interviews with LHDs to obtain qualitative feedback on the procedure.

**Results:** A total of 310 interview records were sent for investigation in 2018 and 2019 with 263 returned. Of those returned, 140 identified reexposure, 104 were unable to be located, 12 refused to be interviewed, 6 had treatment reported incorrectly, and 1 had a possible treatment failure. From telephone interviews with 6 LHDs, 1 question was removed and 2 questions were added to the interview record.

**Conclusions:** Antibiotic-resistant gonorrhea could occur in Illinois at any time. Monitoring for antibiotic-resistant gonorrhea cases is necessary as gonorrhea morbidity continues to increase. This procedure may prove to be a model for other states.

Gonorrhea is the second most reported disease in the United States<sup>1</sup> and has developed resistance to all classes of antibiotics used for its treatment, except the cephalosporins.<sup>2</sup> Although many infections are asymptomatic, untreated infections can lead to serious health effects including infertility or ectopic pregnancy.<sup>2</sup> The Centers for Disease Control and Prevention (CDC) listed antibiotic-resistant gonorrhea as an urgent public health threat because of these factors.<sup>3</sup> As an urgent public health threat, it is important to have surveillance systems in place to monitor for any antibiotic resistance in gonorrhea.

In Illinois, gonorrhea cases have increased 70.9% from 2015 to 2019, with a total of 29,272 cases reported in 2019. Nationally,

Illinois ranked 16th by gonorrhea rate in 2018.<sup>1</sup> Antibiotic susceptibility testing (AST) for gonorrhea is not widely available to Illinois' local health departments (LHDs) and is not performed at the state public health laboratory. Because of the growing concern of antibiotic resistance in gonorrhea and the increasing number of gonorrhea cases, the Illinois Department of Public Health (IDPH) Sexually Transmitted Diseases (STD) Section needed a passive surveillance system to identify antibiotic-resistant gonorrhea cases. A procedure was established to identify possible gonorrhea treatment failure cases as a proxy for antibiotic resistance in the absence of AST. The strategy was to accomplish this by using patient interview records to determine if a patient had a reexposure or true treatment failure. To determine the effectiveness and efficacy of this new procedure on LHDs, a process evaluation was conducted.

## MATERIALS AND METHODS

The IDPH STD Section developed a procedure using a Microsoft Access database to identify possible gonorrhea treatment failure cases. Case data were imported from the Web-based state-wide disease reporting system, Illinois National Electronic Disease Surveillance System (INEDSS), into the database. The database was used to automate the selection process using Visual Basic for Applications coding since the INEDSS does not have the capabilities to identify and notify LHDs of treatment failure events. The database procedure identified patients who had 2 reported gonorrhea cases in the last 60 days, and the first case was treated with the CDC's 2015 STD treatment guidelines recommended or alternative treatment of gonorrhea. The procedure was run quarterly in the database, and interview records were printed and faxed manually by IDPH staff to the LHD where the patient resided. Once the LHD received the interview record, they verified the accuracy of treatment by checking electronic medical records, reaching out to the testing or treating provider as well as contacting the patient. Completed interview records were returned to IDPH via fax and entered in the database (Fig. 1). Descriptive statistics were used to analyze interview record data.

The interview record contained data on patient demographics, testing information, treatment, risk factors, signs and symptoms, and partner information (Fig. 2). Patient information, STD testing, and STD treatment were prepopulated on the interview record from the database before they were printed and faxed to LHDs to aide in data collection and interview.

If a patient was suspected to have a gonorrhea treatment failure, a second procedure was in place to obtain specimens from the patient for AST. The IDPH STD Section worked with state and CDC laboratory staff to establish the feasibility of collecting a specimen from a patient, transferring it to the state public health laboratory for culture, and then submitting the culture to CDC for AST (Fig. 3). This procedure was tested using CDC proficiency samples.

The possible gonorrhea treatment failure procedure was piloted with 2 LHDs in 2017 and expanded to 94 LHDs in Illinois

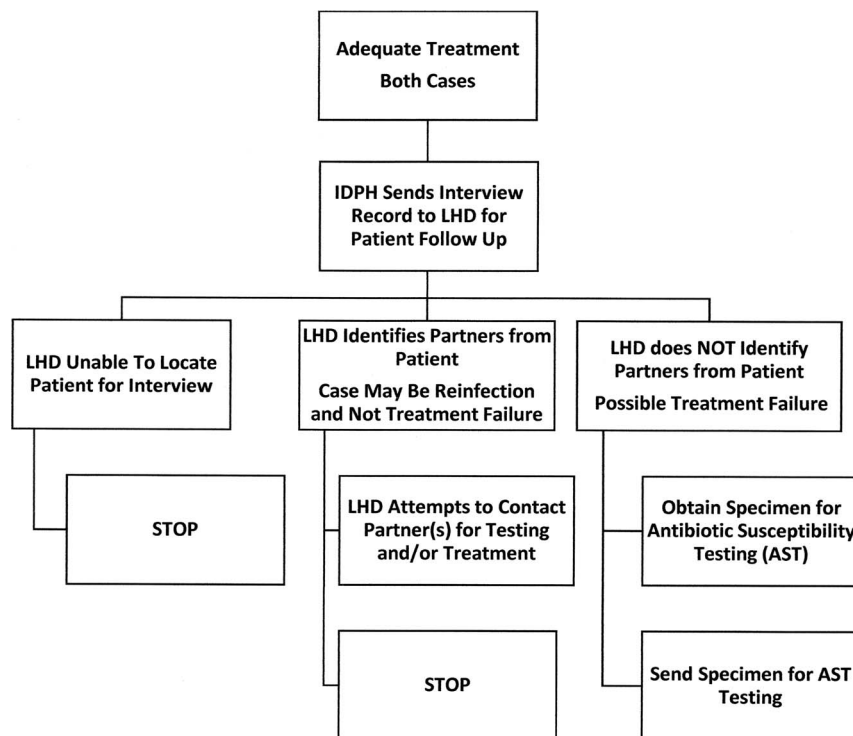
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**Figure 1.** Workflow of possible gonorrhea treatment failure cases.

in 2018 after reviewing the data received and discussing with the pilot sites that the patient interview records were manageable without additional resources from IDPH. The city of Chicago and 2 other LHDs were excluded. Chicago was excluded because it is a separately funded CDC project area. The other 2 LHDs were excluded because one already receives funding to perform enhanced gonorrhea surveillance, and the other is a high-morbidity area that does not currently have the capacity to perform this additional surveillance activity.

To determine the impact of this procedure, a process evaluation to obtain qualitative feedback was performed. Nine questions were developed covering the topics of gonorrhea antibiotic resistance general knowledge, the procedure for gonorrhea treatment failure surveillance, the interview record format, and the logistics of how the procedure was run (Table 1). A total of 45 LHDs had received at least one interview record for follow-up in 2018 or 2019. To hear from a diverse population of LHDs, the number of interview records LHDs had received and the gonorrhea morbidity in their jurisdiction were analyzed to select 8 LHDs to contact (Table 2). Two medium and 4 large LHDs, based on the number of interview records they had received, agreed to participate in telephone interviews. One small and one medium jurisdiction, based on interview records received and gonorrhea morbidity, did not return requests to participate. Telephone interviews were conducted in November 2019 using scripted dialogue to remove bias during data collection. Responses from the telephone interviews were compiled into similar themes and analyzed.

## RESULTS

A total of 310 interview records were sent for investigation from January 2018 to December 2019. Of those, 263 (84.8%) were completed and returned to IDPH. Of the 263 records returned to IDPH, 140 (53.2%) patients were identified as having a reexposure, 104 (39.5%) patients were deemed unable to be located, 12 (4.6%)

patients refused to be interviewed, 6 (2.3%) patients had cases with original treatment reported incorrectly in INEDSS, and 1 (0.4%) patient was identified with a possible treatment failure (Table 3). Small differences were noted by sex, race/ethnicity, and age in those who were interviewed versus not interviewed (Table 4).

The process evaluation resulted in 6 LHDs participating in telephone interviews. All LHDs stated that antibiotic-resistant gonorrhea was a very important issue to them but felt that provider awareness of the threat of antibiotic-resistant gonorrhea in their jurisdictions varied. Most LHDs stated that the interview records took less priority than current STD cases they were working but they were, “not a difficult interview to do if you can get ahold of the patient.” Regarding the priority of the interview records, LHDs stated they were “not as high priority due to so many other syphilis, chlamydia, and gonorrhea cases” and there is “more focus on current infections and patients as it’s easier to discuss current infections, symptoms, and partners.”

It was determined that each LHD had unique steps for follow-up on the possible treatment failure interview records. The methods to contact patients for interview ranged from sending letters and telephone calls to attempting to contact the patient on social media. All LHDs attempted to contact the patients by telephone. Five of the 6 LHDs sent letters to the patient if they did not hear back from the patient by telephone or if the telephone number was no longer working. None of the LHDs went into the field to attempt to find the patient and complete the interview. Four of the LHDs followed up with the provider to verify treatment, obtain or verify patient symptoms, or obtain additional information if the patient was not located. Most LHDs mentioned following up with partners but they “do not get partner information,” “have not been able to elicit partner locating info,” or “only had one or two partners identified.”

All 6 jurisdictions agreed it would be easier to follow up with patients if they received the records closer to the last positive test date. Local health departments gave reasons for running the

INTERVIEW RECORD FOR POSSIBLE GONORRHEA TREATMENT FAILURE

PATIENT INFORMATION						I-NEDSS CASE NUMBERS							
Last Name:			First Name:										
Date of Birth:			Phone:										
Address:													
STD TESTING													
Date Collected	Provider					Specimen Source							
STD TREATMENT													
Treatment Date	Provider					Treatment							
RISK FACTORS													
How many days did you wait to have sex after treatment?			Were your partners treated for gonorrhea?			Yes	No	Unknown					
From the first diagnosis date to the second (see Date Collected), have you...						If yes, select all that apply							
Had sex with a male?	Yes	No	R	D	Anal	Vaginal	Oral	Unsp					
Had sex with a female?	Yes	No	R	D	Anal	Vaginal	Oral	Unsp					
Had sex with an anonymous partner?	Yes	No	R	D	Anal	Vaginal	Oral	Unsp					
In the last six months, have you...													
Had sex with someone while you were traveling outside the United States?	Yes	No	R	D	Anal	Vaginal	Oral	Unsp					
If yes, where did you travel?													
Had sex with someone who traveled outside the United States?	Yes	No	R	D	Anal	Vaginal	Oral	Unsp					
If yes, where did they travel?													
SIGNS AND SYMPTOMS													
Signs/Symptoms		Earliest Observation Date		Anatomic Site		Duration (Days)							
PARTNER/SOCIAL CONTACT INFORMATION #1					PARTNER/SOCIAL CONTACT INFORMATION #2								
Last Name, First Name					Last Name, First Name								
Address					Address								
City		State	ZIP Code		City		State	ZIP Code					
Phone		DOB			Phone		DOB						
Current Gender				Age (Approx)		Current Gender				Age (Approx)			
M	F	MTF	FTM	O	R	Unk	M	F	MTF	FTM	O	R	Unk
First Exposure Date		Frequency		Last Exposure Date		First Exposure Date		Frequency		Last Exposure Date			
INTERVIEW/INVESTIGATOR COMMENTS													
												Submitter	

Submit by faxing this report to: Illinois Department of Public Health STD Section  
 Questions? Contact the STD Section at 217-782-2747 **FAX (217)-524-5443**

Figure 2. Possible gonorrhea treatment failure interview record.

procedure more frequently stating, “it would be easier for patients to recall symptoms and partners,” “phone number may be more accurate,” and “students leave town at the end of the semester.” Other recommendations were to remove the question regarding HIV status on the interview record and to add 2 additional questions involving how long the patient waited after treatment to have sex and if the patient’s partners had been treated after their diagnosis and treatment. These were important additions because, as one LHD stated, the patient “typically identify they were re-exposed or had sex too soon after treatment.”

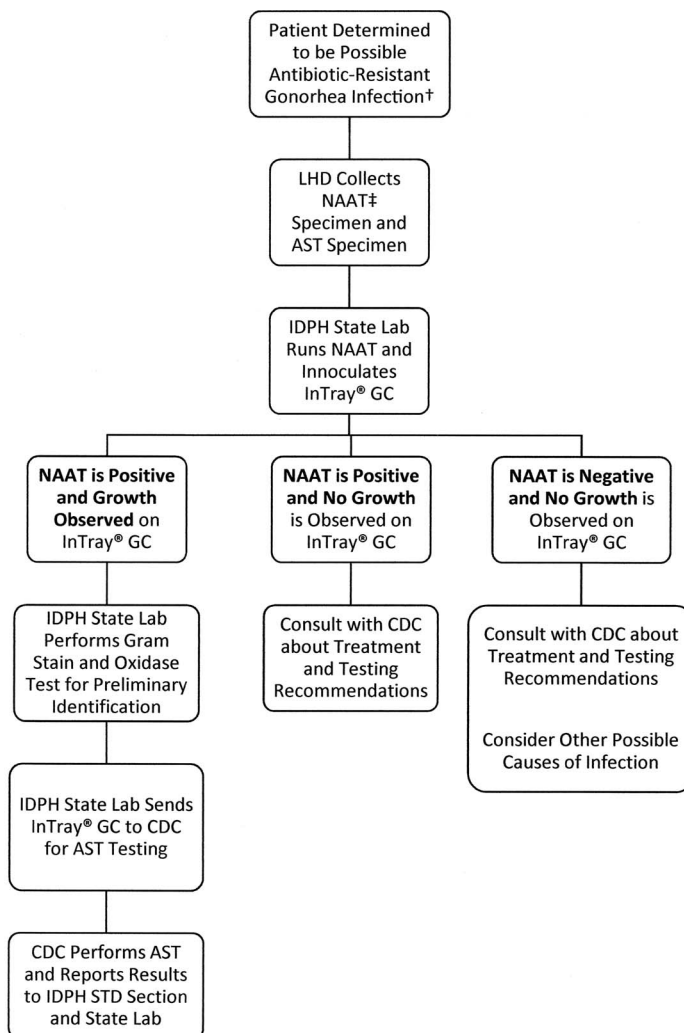
To share findings from this evaluation with all LHDs, a fact sheet summarizing the procedure, the threat of resistant gonorrhea, the recommended treatments for gonorrhea, the commonality of reexposure, and evaluation results was distributed in January 2020 via e-mail.

**DISCUSSION**

The gonorrhea treatment failure procedure developed in Illinois had a high volume of records returned to IDPH establishing that LHDs are willing to participate in this passive monitoring

surveillance system. More time and data are needed to determine if this will be successful to detect antibiotic-resistant gonorrhea cases, as there was only one case that was a possible treatment failure during this time frame. The case that was identified as treatment failure was ultimately resolved with additional treatment. This patient had initially tested positive at all 3 anatomic sites—pharynx, genitourinary, and rectum. After dual treatment with the CDC–recommended therapy at that time of ceftriaxone and azithromycin, the patient remained positive at the pharynx site. This anatomic site is known to be more difficult to adequately treat.<sup>2</sup> The patient claimed no sexual activity between their 2 tests and was retreated with the same dual therapy. The patient was negative at all anatomic sites at their next test of cure. Specimens for AST were not collected as the patient tested negative after retreatment with dual therapy.

Although the most common finding from the interview records was not antibiotic resistance, other valuable information was obtained from the interview records that were returned. More than half (53.3%) of the records identified at least one exposure between their 2 gonorrhea cases indicating reinfection and not treatment failure as the most likely cause of their second infection. This



†Patient was treated with recommended dual therapy of ceftriaxone and azithromycin and re-infection is ruled out

‡ NAAT: Nucleic Acid Amplification Test

**Figure 3.** Workflow for submission of patient samples for antibiotic susceptibility testing.

information will assist in the formulation of prevention messages for STD programs in Illinois. This also highlights the need to work on partner notification, testing, and treatment to address the rise in gonorrhea morbidity. In addition, 2.3% of the records had treatment

improperly reported in INEDSS. This stresses the need to educate on the importance of accurately reporting treatment.

The telephone interviews were designed to gain information from the LHDs, but they also proved to be a great communication

**TABLE 1.** Interview Questions to Local Health Departments for Process Evaluation

**Question**

1. How important is antibiotic-resistant gonorrhea to your local health department?
2. How aware do you think your local health department staff and local providers are about antibiotic-resistant gonorrhea?
3. How do these possible gonorrhea treatment failure interview records rank compared with other sexually transmitted infection follow-up work?
4. Please describe the steps you take after you receive a possible treatment failure interview record. Include actions you take at your health department, with providers, and with patients.
5. What information do you feel is missing to effectively implement the possible gonorrhea treatment failure interviews in your county?
6. What changes to the interview record form would help you during follow-up to identify possible treatment failures?
7. Would it be beneficial if this procedure was run monthly instead of quarterly? Why or why not?
8. What can the Illinois Department of Public Health Sexually Transmitted Diseases Section do to improve this procedure for you?
9. Any questions or comments for the Sexually Transmitted Diseases Section about antibiotic-resistant gonorrhea or the procedure for possible gonorrhea treatment failure cases?

**TABLE 2.** Jurisdictions Contacted for Interview by Morbidity and Interview Record (IR) Data

Health Department	2018	Morbidity Group	Total IR Sent	IR Group	Total IR Not Returned to IDPH	% IR Not Returned	Total Unable to Locate	% Unable to Locate
	Gonorrhea Cases							
Health Department A*	4	S	1	S	0	0.0	0	0.0
Health Department B*	132	M	6	M	0	0.0	2	33.3
Health Department C	416	L	7	M	0	0.0	3	42.9
Health Department D	210	L	7	M	0	0.0	1	14.3
Health Department E	196	M	12	L	1	8.3	2	16.7
Health Department F	363	L	17	L	0	0.0	2	11.8
Health Department G	603	L	25	L	1	4.0	15	60.0
Health Department H	641	L	28	L	2	7.1	5	17.9

Interview record data were from January 2018 to October 2019. Morbidity size categories: S, 10–52 cases; M, 77–196 cases; L, 210–741 cases. Interview record group categories: S, 1–2 interview records; M, 3–10 interview records; L, 11–26 interview records.

\*Were contacted to participate in telephone interview but did not respond to participate.

tool for IDPH to provide additional information and explain the importance of this procedure to the LHDs. Participating in evaluation calls with the LHDs gave IDPH a greater understanding of how this procedure affected their workload. It also gave the LHDs a chance to provide input on items that had not been considered that could enhance the procedure. One example is the question regarding HIV status of the patient being removed since patients were less likely to continue with the interview once that question was asked, and the information was not being analyzed by the IDPH STD Section. Two questions regarding time after treatment to sexual activity and if partners were treated were added based on recommendations made by the LHDs. Not only does this information fill in the gaps of the interview record data to differentiate between a reinfection or true treatment failure, but it will also guide the LHD staff conducting the interview in counseling their patients. The telephone calls also increased LHD understanding of the importance of the project and the threat of antibiotic-resistant gonorrhea.

After speaking with the LHDs, another recommendation was to run the procedure monthly instead of quarterly. Of the interview records returned to IDPH, 39.5% of the patients were unable to be located. Running the procedure monthly could help improve the percent of patients located if they are contacted closer to the time of their second infection. Local health departments also responded that patients could provide better symptom and partner information if the interview was closer to their second test date. This procedural change was implemented from January 2020 to March 2020 until state and local staff began to be reassigned to work on the COVID-19 pandemic response. Unfortunately, this procedure has not been run since March 2020 as response to the COVID-19 pandemic continues. Monitoring for resistant gonorrhea continues to be vital despite the COVID-19 pandemic, as Illinois saw a rise in gonorrhea morbidity in 2020 while observing a 43% decrease in STD testing during the same time at our state public health laboratory.

**TABLE 3.** Disposition of Returned Patient Interview Records

Disposition	Interview Records (n = 263)	
	Records	%
Identified reexposure	140	53.2
Unable to locate	104	39.5
Refused to be interviewed	12	4.6
Original treatment reported incorrectly	6	2.3
Possible treatment failure	1	0.4

A limitation of this procedure is that it requires a manual data import from the INEDSS system for use in the Access database. The data import occurs weekly, but IDPH staff lack the time to manually run the Access procedure to identify possible gonorrhea treatment failure cases and manually fax the interview records to LHDs more frequently. If more time were available by IDPH staff, this procedure could be run weekly and should not add to the workload of LHDs as they should receive less interview records at a time for follow up.

As gonorrhea continues to evolve, antibiotic-resistant gonorrhea could occur in the United States or Illinois at any time. Although actual treatment failure cases identified may be few, the implications for missing these few cases could prove devastating. Identification of possible treatment failure cases is the initial step and achievable with various electronic case reporting systems along with data analysis software. Although the creation of this

**TABLE 4.** Demographics of Patients by Interview Status

Demographics	Interviewed (n = 147)		Not Interviewed* (n = 163)	
	n	%	n	%
Sex				
Male	88	59.9	100	61.3
Female	59	40.1	63	38.7
Race/Ethnicity				
Asian	2	1.4	1	0.6
Black	94	63.9	111	68.1
White	25	17.0	38	23.3
Hispanic	11	7.5	6	3.7
Multiple races	8	5.4	3	1.8
Other race	2	1.4	1	0.6
Unknown	5	3.4	3	1.8
Age, y				
10–14	0	0.0	1	0.6
15–19	50	34.0	40	24.5
20–24	45	30.6	65	39.9
25–29	28	19.0	36	22.1
30–34	13	8.8	13	8.0
35–39	8	5.4	6	3.7
40–44	0	0.0	0	0.0
45–49	2	1.4	2	1.2
50–54	0	0.0	0	0.0
55–59	1	0.7	0	0.0

\*Not interviewed includes patients who were unable to be located, patients who refused to be interviewed, and records that were not returned to IDPH.

procedure was challenging, the IDPH STD Section believes monitoring for gonorrhea treatment failure cases is vital and aligns with the CDC's urgent threat classification for antibiotic-resistant gonorrhea. The minimum requirements needed to replicate this procedure are staff time, ability to import surveillance data, and a database using coded procedures to automate the process of identifying possible gonorrhea treatment failure cases. Illinois is hopeful that, with minimal modifications, this procedure may prove to be a model for other programs that do not have access to AST but need a method to monitor for antibiotic-resistant gonorrhea.

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