Validating a clinical prediction rule for chlamydia and gonorrhea infection among online testers in British Columbia, Canada

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Introduction

- Previously, a clinical prediction rule (CPR) was developed to maximize detection of chlamydia and/or gonorrhea (CT/GC) infections and minimize the number of screening tests offered among asymptomatic women and heterosexual men attending sexually-transmitted infection (STI) clinics in Vancouver, British Columbia, Canada
- GetCheckedOnline (GCO), a provincial online STI testing program of the BC Centre for Disease Control (BCCDC), currently offers universal CT/GC urine screening to all clients

Objective

- To assess the external validity of retrospectively applying an STI clinic-based CPR to predict asymptomatic CT/GC infection among GCO testers

Methods

- **Data sources:**
  - GCO program database
  - BCCDC's STI Information System
- **Study population:**
  - Heterosexual men and all women who completed CT/GC testing between Oct 2015 and June 2018
  - Restricted to those who were asymptomatic and not contacts of possible STI cases at time of testing with complete data for all CPR variables
- **Description of CPR:**
  - The previously-developed CPR estimates risk of CT/GC infection based on 5 variables (**Table 1**): (1) age, (2) ethnicity, (3) number of sexual partners in the past 6 months, (4) previous chlamydia diagnosis, and (5) previous gonorrhea diagnosis
  - In the clinic derivation population, this CPR had an area under the receiver operating characteristic curve (AUC)=0.74, with a cut-off risk score ≥6 identifying 91% of infections and screening 68% of testers
- **Model accuracy:**
  - **Calibration** was assessed by calculating the Hosmer-Lemeshow (H-L) goodness-of-fit statistic
  - **Discrimination** was assessed by calculating the AUC
- **Performance measures:**
  - Sensitivity and proportion of GCO clients screened were calculated at different CPR cut-off scores

Results

- Among 2703 completed GCO CT/GC test episodes, the prevalence of CT/GC infection was 2%
- The H-L statistic p-value was 0.95 (χ2=2.69, d.f.=8), indicating good model fit within GCO
- The CPR showed reasonable discrimination within GCO (AUC=0.64, 95%CI: 0.57-0.71; **Figure 1**)

Table 1:
CPR for predicting CT/GC infection

Variable	Score
Age (years)	
14-19	8
20-24	3
25-29	1
30-39	-2
≥40	0
Ethnicity	
White	0
Non-white	5
# of sexual partners	
0	0
1-2	5
≥3	6
Previous CT diagnosis	
Yes	7
No	0
Previous GC diagnosis	
Yes	1
No	0

- Performance measures (**Figure 2**):
  - Using a CPR cut-off risk score of ≥6, we would have detected 79% of infections and screened 64% of testers
  - Using a cut-off score of ≥4 would have increased sensitivity to 95% while screening 85% of testers

Figure 1:
Receiver Operating Characteristic (ROC) Curve

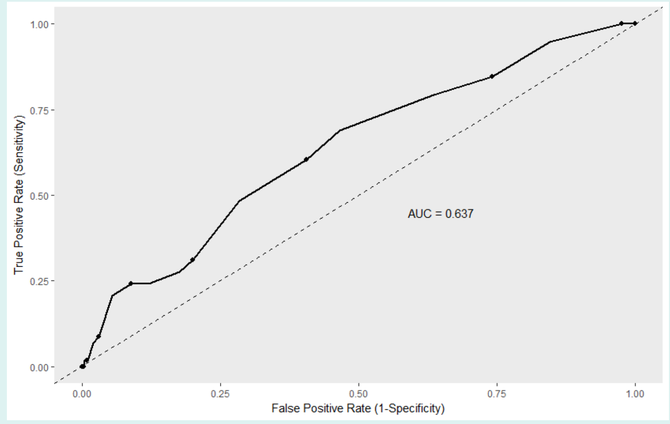

Figure 2:
Potential CT/GC tests averted and infections missed

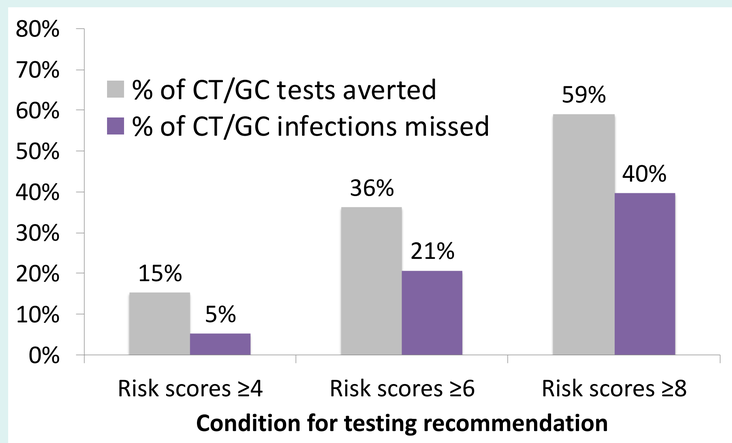

Table 2: Population characteristics of CT/GC testing episodes

Variable		Clinic Derivation Population, 2000-2006, n=10437 n	%	GCO Validation Population, 2015-2018, n=2703 n	%
Chlamydia/gonorrhea case*		184	2%	58	2%
Gender	Women	3496	34%	1243	46%
	Men	6941	67%	1460	54%
Age (years)	14-19	257	3%	50	2%
	20-24	1962	19%	474	18%
	25-29	2651	25%	638	24%
	30-39	3181	31%	907	34%
	≥40	2386	23%	634	24%
Ethnicity	White	7732	74%	2081	77%
	Non-white	2705	26%	622	23%
# sexual partners✣	0	644	6%	109	4%
	1-2	6857	66%	1456	54%
	≥3	2936	28%	1138	42%
Previous CT diagnosis△		1518	15%	169	6%
Previous GC diagnosis△		619	6%	15	1%

*In chi-square analyses comparing populations, p-value>0.01
✣STI clinics: previous 6 months; GCO: previous 3 months
△STI clinics: medical chart review, any diagnosis ever; GCO: self-report, diagnosis in past 12 months

Conclusions

- This is study validates the use of a clinic-derived CPR within an online setting
- Our CPR showed reasonable accuracy and performance when applied to GCO data
- Differences in model performance online compared with clinic-based settings highlight important differences in the populations who use online testing
- Use of CPRs in online contexts offers unique and novel opportunities for public health and STI testing
- By optimizing case detection among asymptomatic internet-based STI testers, overall testing burden and related costs could be reduced

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