Kirby Institute

Exploring the benefits of molecular testing for gonorrhoea antibiotic resistance surveillance in remote settings

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On behalf of GRAND investigator team

Gonorrhoea in remote Australia

- Disproportionately high diagnostic rate
  - 35 times higher than in urban setting
- Prevalence up to 8% among 16-34 age group
  - More than 10% for 16 -19 age group
- High community screening coverage (70%+)
- High treatment rate (75% +)

Gonorrhoea antimicrobial resistance (AMR)

Region	Number of isolates tested	Resistance to penicillin	
		Number	%
Australia (urban)	3647	1034	28
Australia (remote)	459	19	4.1
Western pacific region	8484	3013	36

Source: Lahra et al. 2013

Detecting and treating gonorrhoea

- Recommended treatment (www.sti.guidelines.org.au)
  - Principal treatment option: ceftriaxone + azithromycin
  - For regional/remote: amoxycillin (+ azithromycin when chlamydia not excluded)
- Diagnosis
  - Majority through nucleic acid amplification tests (NAAT) test, due to distance and transport consideration, convenience and high sensitivity
  - Not many samples available for culture, which is needed to test antibiotic susceptibility

Molecular test for AMR surveillance

- In NHMRC funded GRAND study, David Whiley and colleagues have been developing molecular PCR tests to identify genetic mutations that confer resistance
- Improve coverage and representativeness of AMR surveillance
- Inform clinical guidelines

Modelling

- We developed an individual-based mathematical model to describe the transmission of gonorrhoea in a remote Indigenous population in Australia
- Estimated the impact of the molecular test on the time delay between first occurrence and the first confirmation that the prevalence of gonorrhoea AMR has breached the WHO-recommended 5% threshold

AMR monitoring scheme

• Resistance proportion: the percentage of infection in the population that is attributable to treatment-resistant gonorrhoea

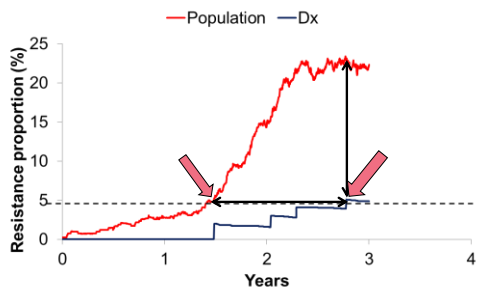
• An alert is triggered when more than 5% of the last 200 positive diagnoses (for which AMR is determined) are resistant to treatment

Outputs

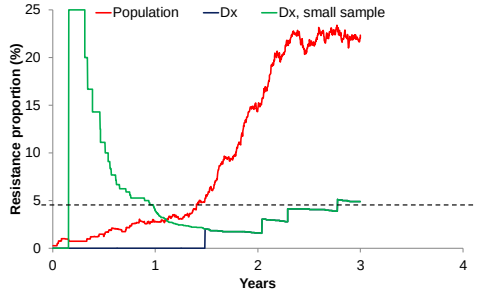
• The resistance proportion in the population when the alert is triggered

• The delay between the time when the actual resistance proportion in the population breaches the 5% threshold and time when the breached detected the surveillance system (i.e. triggering of the alert).

Example



Example – insufficient sample size



AMR surveillance – without molecular test

Percentage of diagnoses where AMR can be detected	17% (WA)	22% (NT)	30% in male, 50% in Female (FNQ)
Resistance proportion at the time alert is triggered	17.8%	12.5%	8.2%
Time between first instance of resistance proportion exceeding 5% and time of alert	36.5 months	26.2 months	11.7 months

AMR surveillance – with molecular test

Percentage of diagnoses where AMR can be detected	50%	75%	100%
Resistance proportion at the time alert is triggered	6.8%	6.2%	5.8%
Time between first instance of resistance proportion exceeding 5% and time of alert (months)	6.0 months	4.2 months	3.4 months

Findings

• AMR surveillance would be enhanced by the use of a molecular resistance test at diagnosis by enabling more timely detection of resistance

• This could facilitate earlier treatment switching, which has the potential to reduce the population impact of gonorrhoea AMR

• With increased number of sample available for AMR surveillance, adjustment to AMR monitoring scheme might be required to prevent premature triggering of the alert.

Disclosure of interest

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