The cost of antibiotic-resistant infections in the Northern Territory

...3 months into the PhD...

Will Cuningham

(Hot North / CDU PhD student)

Supervisors: Steve Tong, Teresa Wozniak, Hannah Carter, Jodie McVernon
↑↑Antibiotic resistance

- High infectious disease burden
- Antibiotic use (overuse / misuse)
- Natural selection / horizontal gene transfer
- Hygiene / hospital setting
- Lack of public awareness
- Antibiotic use in animal production / environmental waste
- Decrease in antibiotic R&D
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NT
- Climate
- Geography

Aboriginal population
- Remote
- Living conditions
Number of new antimicrobials approved by the United States Food and Drug Administration since 1983


No. of new antibiotics

Adapted from Silver et al (2011), Challenges of antibacterial discovery
(https://www.reactgroup.org/toolbox/understand/how-did-we-end-up-here/few-antibiotics-under-development/)
Antibiotic resistance $\Rightarrow$ Healthcare perspective (Hospital & PHC)

$\Rightarrow$ $\uparrow$$\$\$

$\Rightarrow$ Patient perspective

$\Rightarrow$ Societal perspective
Antibiotic resistance = \( \uparrow \) $$$

- Increased length of stay
- Infection control programs
- Increased morbidity / mortality
- Surveillance / stewardship programs
- Lost labour
- Loss of productivity / labour
- Loss of modern healthcare
- Decreased quality of life
- Lost staff hours
- Diagnostic tests
Primary objectives

• Epidemiology of bacterial infections (stratified by susceptibility)
  - Spatiotemporal analyses

• Economic burden
  1. Hospital setting
  2. PHC / remote communities
Data

• Data linkage
  - Hospital inpatient activity datasets
    • RDH/Katherine/Alice Springs/Tenant Creek/Gove District
    • Variables: LOS, infection onset, ICD-10 codes, clinical management
  - Pathology data
    • Territory Pathology cover entire NT
    • Variables: susceptibility
  - Costing data
    • Activity Based Funding (ABF) data
    • Variables: incremental costs (treatment, staff, equipment/consumables), cost of a bed-day, etc.
Analysis

• Epidemiological analyses

• Economic modelling
  - multi-state models, computable equilibrium models, generalised linear models, Monte Carlo simulations, cox proportional hazards models
  - Important considerations:
    • Infection is time-dependent variable
    • Adjust for LOS prior to infection onset, comorbidities, severity of disease, inappropriate antibiotic therapy
    • Compare resistant infections with susceptible infections
    • Accounting vs opportunity cost
Secondary objectives

• Modelling of future burden

• Intermediate projects
  - Quality of life surveys
    • Include in economic analyses (QALYs)
  - More specific questions:
    e.g. how much does 1 case of melioidosis at RDH cost?
  - Appropriateness of prescribing in remote communities
    (National Antimicrobial Prescribing Survey)
Summary

• AMR big issue in Top End

• Aim to quantify the health and economic burden
  - In the hospital setting
  - PHC setting

• Important for policy decisions, targeted interventions, ongoing evaluation
It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.