

# Clinical utility of genomics in screening for antibiotic-resistant microbes

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## Background

Melbourne Genomics' 16 Clinical Flagships have been at the forefront of determining when genomic testing makes a demonstrable difference to the safety and quality of patient care.

The Melbourne Genomics Controlling Superbugs Clinical Flagship was a world-leading study, exploring the value of genomics in identifying and preventing superbug transmission among hospital in-patients.

Superbugs (antibiotic-resistant bacteria) are increasing globally and locally, and are over-represented in hospital-acquired infections. Conservatively, antibiotic resistance to the superbugs included in this study is estimated to cost the Australian Government \$14 million annually. Superbug infections are difficult to treat, cause significant morbidity and mortality, increase the length of hospital stays and are a significant burden on hospital resources.

Current hospital laboratory methods are not able to distinguish between superbugs acquired *in hospital* and those brought *to hospital* from the community. Thus, experts cannot accurately detect patient-to-patient superbug transmissions or outbreaks that occur in hospitals.

## Project description

The objective: to determine the feasibility and impact of using genomic sequencing to detect patient-to-patient superbug transmissions or outbreaks occurring in hospitals in real time.

This Flagship had a pilot phase (2017) and an implementation phase (2018 to 2019); both phases involved eight hospitals across four health networks – Austin Health, Monash Health, Melbourne Health and the Peter MacCallum Cancer Centre.

The pilot phase surveyed six multi-drug-resistant organisms in Victoria: *vanA* VRE, MRSA, ESBL *E. coli*, ESBL *K. pneumoniae*, *Pseudomonas* and *Acinetobacter*<sup>1</sup>.

The implementation phase ran for 13 months, focusing on the use of genomics to identify superbug transmission. This phase enabled near-real-time reporting to hospitals and assessed the impact of this on hospital infection control procedures.

The Controlling Superbugs Flagship was co-led by Professor Lindsay Grayson from Austin Health and Professor Benjamin Howden from the Microbiological Diagnostic Unit Public Health Laboratory at the Peter Doherty Institute. Dr Norelle Sherry and Dr Jason Kwong (both from Austin Health) provided key coordination. At least 20 other professionals were directly involved.

## Activities, outcomes and lessons learnt

Findings from this project will be made available following publication of results.

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<sup>1</sup> Sherry NL, Lee RS, Gorrie CL, et al. Genomic interrogation of the burden and transmission of multidrug-resistant pathogens within and across hospital networks. bioRxiv. 2019.

## Impact

The Controlling Superbugs Flagship is the first project worldwide to incorporate multiple sites and multiple organisms in investigating the prospective role of genomic testing in detection of antimicrobial drug-resistant organisms.

As a result of the Flagship's findings, additional superbugs are now included on the state-wide list of notifiable diseases in Victoria.

One hospital instituted network-wide changes in cleaning practices as a result of Flagship findings and the open collaboration and comparison engendered by the project.

A new template for genomic reporting for infection control, based on feedback from participating teams, has been developed and will be further refined.

## Clinical Flagship team

Name	Organisation	Role
Lindsay Grayson	Austin Health	Infectious diseases physician
Benjamin Howden	UoM (Peter Doherty Inst)	Infectious diseases physician/ clinical microbiologist
Norelle Sherry	Austin Health	Infectious diseases physician/ clinical microbiologist
Jason Kwong	Austin Health	Infectious diseases physician
Caroline Marshall	RMH	Infectious diseases physician
Caroline Reed	PeterMac	Clinical microbiologist
Carolyn Tullett	Austin Health	Infection control practitioner
Claire Gorrie	UoM	Bioinformatician
Hiu Tat (Mark) Chan	RMH	Clinical microbiologist
Jeni Mitchell	RMH	Research nurse
Joanna Price	Austin Health	Infection control practitioner
Leon Worth	PeterMac	Infectious diseases physician
Louise Wright	Monash Health	Infectious diseases physician/ clinical microbiologist
Marcel Leroi	Austin Health	Infectious diseases physician/ clinical microbiologist
Maryza Graham	Monash Health	Infectious diseases physician/ clinical microbiologist
Michael Richards	RMH	Infectious diseases physician
Monica Slavin	PeterMac (VCCC)	Infectious diseases physician
Paul Johnson	Austin Health	Infectious diseases physician
Rhonda Stuart	Monash Health	Infectious diseases physician
Tony Korman	Monash Health	Infectious diseases physician/ clinical microbiologist