## Research Themes

There are 8 research themes within CoSTAR-HS:

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<th>Research Themes</th>
<th>Specific Aims</th>
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| 1 Multiple Combination Bactericidal Test (MCBT) to guide XDR-GNB (especially CRE) treatment | ▪ To identify appropriate antimicrobial combination therapy for the treatment against Extensively Drug-Resistant Gram-Negative Bacilli (XDR-GNB) especially Carbapenem-Resistant Enterobacteriaceae (CRE) organisms via antimicrobial combination testing  
▪ To build rapid platforms for antimicrobial combination testing to impact clinical care in a timely manner |
| 2 Novel diagnostics for the identification of Antimicrobial Resistant (AMR) determinants | ▪ To build, validate and implement a rapid platform to determine clinically relevant AMR mechanism                                                                                                                                                  |
| 3 Novel infection control strategies assessment                                  | ▪ To evaluate the efficacy/cost-effectiveness of various environmental cleaning methods in the local clinical ward setting                                                                                                                                 |
| 4 Optimizing antimicrobial stewardship programmes (ASPs) in Singapore           | ▪ To evaluate various combinations of antimicrobial stewardship strategies to determine the most cost-effective ASP model  
▪ Establish the optimal ASP practitioner-to-bed ratio required for effective antimicrobial stewardship in various levels of patient care |
| 5 Carbapenemase producing Enterobacteriaceae in Singapore (CaPES): Epidemiology, risk factors and outcomes | ▪ To establish an ongoing surveillance network to:  
  i. Study the clinical and molecular epidemiology of Carbapenemase-producing CRE (CP-CRE) in Singapore  
  ii. Identify emerging AMR in Singapore  
  iii. Identify CP-CRE outbreak and facilitate the investigation of the outbreak |
| 6 Integration of whole genome sequencing (WGS) into infection control           | ▪ To assess if integration of WGS with current international standard-of-care infection control would increase the effectiveness of infection control interventions, and improve clinical outcomes. Specific outcomes assessed during interrupted-time-series modeling would include the following endpoints:  
  i. Rates of CP-CRE-carriage detection  
  ii. Rates of clonal CP-CRE-carriage with spatiotemporal overlap (direct internal ward transmission)  
  iii. Rates of admission screening detection of CP-CRE-carriage  
  iv. Crude and attributable CP-CRE mortality rates |
| 7 Combining shoe-leather epidemiology with WGS to                               | ▪ To further the understanding of CP-CRE transmission by linking WGS data from CP-CRE |
| model and predict CP-CRE transmission dynamics | isolates with the spatiotemporal movement of patients to enable modeling of CP-CRE transmissions within healthcare setting. This will allow the following specific aims to be achieved:  
  i. Infect the likely transmission routes and hidden sources of CP-CRE transmission  
  ii. Reveal the complex transmission network by which the CP-CRE isolates travel in healthcare settings  
  iii. Evaluate high risk spatiotemporal patterns (including contaminated area and healthcare processes) that may potentially contribute to the spread of CP-CRE  
  iv. Evidence-based suggestions to improve infection control measures in the healthcare setting |

| 8 Health systems and behavioral science (HSBS) research to address the drivers of AMR in hospitals | - To systematically review the existing literature on all aspects within the health-system related to tackling AMR adopting a multidisciplinary approach  
- To review existing policies, programmes and structures in place that address AMR  
- To examine the motivations, social constructs, contextual drives and power relations of policy actors that influence behaviors and decision-making processes in developing policies for AMR, specifically in relation to the appropriate use of antimicrobials  
- To identify the gaps that currently exist in the areas of surveillance, access to, and stewardship of antimicrobials at all levels of the health system  
- To understand the role of hospital-based interventions in curbing AMR  
- To assess comprehensively the health systems barriers and facilitators (including but not limited to surveillance, stewardship and infection prevention and control) to address AMR in Singapore hospitals  
- To develop conceptual frameworks and tools for health systems that will enable international comparisons and establish solutions for AMR in Singapore  
- To develop strategies and tools for working with policy makers to effectively implement policies for the responsible use of antimicrobials |