Infectious Diseases-HAI,

Tennessee Department of Health, Healthcare Associated Infections and Antimicrobial Resistance
 Nashville, Tennessee

Assignment Description

The Fellow will be located within the Healthcare Associated Infections and Antimicrobial Resistance Program located within the Communicable and Environmental Diseases and Emergency Preparedness Division. and in turn, to the Commissioner of Health. The Fellow will perform job functions similar to an introductory level epidemiologist. They are expected to have strong data analytical skills and the potential for continued learning and improvement of those skills.

Tennessee is fortunate to have received significant funding for HAI activities under the emerging infections program and the epidemiology and laboratory capacity grant.

Program goals include 1) Elimination of Preventable Healthcare Associated Infections (HAI) across spectrum of healthcare; 2) Prevent emergence and spread of multidrug-resistant organisms [MDRO], C. difficile, emerging pathogens (e.g., Ebola, MERS CoV) and 3) Optimization of antimicrobial use and healthcare worker influenza vaccination.

Program strategies include: (1) Analyze data reported to the National Healthcare Safety Network [NHSN] and integrated disease surveillance system [NBS], issue reports & use data for action (including prioritization of healthcare facilities, HAIs, MDROs); (2) Assure quality of data reported (e.g., education, quality data reports, data validation); (3) Provide technical expertise and work with partners (e.g., THA, TIPQC, QIN, Network 8, APIC) on quality improvement initiatives/ prevention collaboratives to achieve above goals, (4) Perform research studies on the burden, epidemiology of HAI in different settings (e.g., acute care hospitals, nursing homes, dialysis) and emerging pathogens (e.g., carbapnenem resistant enterococci [CRE]), HAI mortality, MDRO mortality and piloting of innovative surveillance strategies and/or interventions.

The Fellow will receive substantial and continuous support from mentors, peers, and office and administrative staff. The Fellow will interact closely with members of the HAI team. They will have substantial input in determining the projects they pursue. The Fellow will be able to interact and work with team members and receive epidemiological and statistical support from the team. They will also be able to network with other epidemiologists and analysts outside the HAI program.

The Fellow will have the opportunity to work with a variety of different data sets/sources, utilize various types of methods/analyses, engage in primary data collection (including sample selection) as well as data management, linkage of databases, and mapping of data using GIS, visualizing data using Tableau and performing social network analyses.

Day-to-Day Activities

Depending on their interests and analytic skill level, and the project(s) they choose to participate in, the Fellow's day-to-day activities may vary. However, the Fellow will, in general, perform the following activities under the supervisions of their mentors:

- Working on assigned projects (see examples below) and acute outbreak investigations.
- Become familiar with the current projects in HAI/AR program and identify projects they want to participate in.
- Provide epidemiological support to HAI/AR program, including surveillance.
- Write research articles or manuscripts for publication.
- Recommend improvements to existing disease surveillance systems and/or initiate the development of new systems.
- Write SAS or R programs to clean data, perform descriptive and analytical statistical analyses, and output results.
- Create visualizations using Tableau
- Develop written communications (burden report, factsheets, etc.)
- Participate in HAI/AR team meetings and multiple educational opportunities as they arise.
- Work collaboratively with other HAI/AR team members and stakeholders on various prevention collaboratives (prevention of catheter associated urinary tract infections, dialysis events, CDI, MRSA, CRE; antimicrobial stewardship) especially across the healthcare spectrum (beyond just acute care hospitals).
- Participate in other activities within HAI/AR program and work interactively and effectively as a member of the HAI/AR team.
- Participate in infection control assessments of hospitals, outpatient settings (e.g., urgent care), nursing homes, dialysis facilities.
- Analyze data from the Antimicrobial Resistance Laboratory Network (ARLabNet). The State Public Health Laboratory in Nashville has been named the Regional Laboratory for the South East (TN, LA, MS, AL, GA, FL, PR).
- Meet with primary, secondary and tertiary mentors

Potential Projects

Surveillance Activity   **Real time surveillance and situational awareness of Carbapenem Resistant Enterobacteriaceae**

CRE, also named the "nightmare bacteria" by Tom Frieden, former director of CDC, has a mortality of 40-50% among patients with blood stream infections. The resistance element is on a mobile element, which means that resistance could pass from an E. coli to a Salmonella or Shigella. Real time surveillance and situational awareness are critical in controlling antimicrobial resistance as outlined in the August 2015 CDC Vital signs report (see http://www.cdc.gov/vitalsigns/stop-spread/index.html).

The Fellow would expand on the work performed on the "Big 3" (E. coli, Klebsiella, Enterobacter). In January 2018, the definition for what is reportable in Tennessee expanded to beyond the Big 3 (to over 70 genera). The Fellow would consider how data from these non Big 3 will be integrated into existing data, and best visualized using Tableau. The Fellow also would have the opportunity of assisting in the roll-out of a proposed XDRO registry for CRE and other Tier 1, 2 or 3 organisms (see https://www.cdc.gov/hai/outbreaks/mdro/index.html) that would allow healthcare facilities to identify patients already known to be colonized/infected with CRE. The XDRO registry will track how frequently patients were already in appropriate contact precautions at time of alert.

To really leverage these data, we also wish to get a better understanding of the degree of connectivity of individual healthcare facilities to each other across the spectrum of healthcare within TN and our neighboring states, especially in our areas of high incidence. Understanding connectivity better will likely help us target our interventions even more specifically within those regions, if it turns out that much of the problem is in a subset of facilities that are highly interconnected with regard to sharing of patients or that are facilities that seem to be amplifying or disseminating CRE to other facilities in the region.

NOTE: the Fellow will have substantial input on which surveillance activity they would like to pursue; there are multiple other projects for the fellow to pursue if they wish. Specific assignments will be finalized after the Fellow matches with TDH and after consideration of the Fellow's interest and professional needs as well as needs of the HAI/AR program.

Surveillance Evaluation   **Evaluation of the Regional Antibiotic Resistance Laboratory Network (ARLabNet)**

Tennessee received funding starting August 2016 to be the regional ARLN laboratory for the SouthEast. The aim is to create Gold- standard labs with cutting-edge technology, allow for faster outbreak detection and response support, better tracking of resistance and provide real-time, actionable data to prevent and combat future AR threats.

There are multiple components, including colonization screening for CRE and Candida auris, surveillance for colistin resistance (mcr) from ESBL producing E. coli and Klebsiella, Candida glabrata and Neisseria gonorrhea. The fellow would select one of these components for evaluation. Findings would be shared with CDC, other regional ARLNs and our partners, to improve detection and response to antimicrobial resistance.

NOTE: the Fellow will have substantial input on which surveillance system they would like to evaluate. There are multiple other projects for the fellow to pursue if they wish. Specific assignments will be

finalized after the Fellow matches with TDH and after consideration of the Fellow's interest and professional needs, as well as needs of the HAI/AR program.

Major Project   **Analysis of Outpatient Antibiotic Prescription Data from Tennessee Providers for 2016**

Tennessee has the sixth highest outpatient antibiotic prescription rate in the country; antibiotic prescription rates are twice that of California, Alaska and Hawaii. Descriptive epidemiology of provider types, geographic distribution, types of antibiotics prescribed will allow for a more targeted approach to antimicrobial stewardship interventions in the community.

Evaluate whether any of the following influence antimicrobial prescription rates, rural vs urban, medical school training of providers, provider type (physician vs nurse practitioner vs dentist). Findings from this analysis would directly feed into targeting prevention activities. The HAI/AR program has a strong interest and history of using data for action.

NOTE: the Fellow will have substantial input--- there are multiple other projects for the fellow to pursue if they wish. Specific assignments will be finalized after the Fellow matches with TDH and after consideration of the Fellow's interest and professional needs as well as needs of the HAI/AR program.

Additional Project   **Examine the utility of thresholds for reporting CRE cases to public health to identify potential outbreak as described in Council for Outbreak Response: Healthcare Associated Infections and Antimicrobial Resistance (CORHA)**

CORHA has described certain thresholds for reporting to public health for certain organisms such as CRE in order to identify outbreaks. These vary according the prevalence of CRE in the region. The fellow will apply these thresholds to data reported to NBS and examine the number of "alerts" and distribution of these alerts among facilities in Tennessee. Results will be fed back to CORHA and may result in readjustment of these thresholds.

Additional Project   **Examine utility of tools such as SATSCAN and WHONET to better analyze susceptibility data captured within NHSN, NBS or ARLabNet**

Use two tools (SATSCAN and WHONET) to characterize and describe susceptibility data of organisms reported to NHSN and use these tools for outbreak detection in hospitals, LTACS, dialysis facilities and other healthcare facilities. Examine use of SATSCAN for hospital locations, rather than latitude and longitude; potential collaboration with developer of SATSCAN to assist in outbreak or cluster detection. Examine the impact of different methods of creating antibiograms on ability to detect outbreaks across facilities.

Preparedness Role

In the event of a public health emergency, the fellow would be part of the CEDEP response team. The Fellow would serve in either the epidemiologic/surveillance or data-management sub-teams. The Fellow also may participate in Community Assessments for Public Health Emergency Response (CASPER) or other exercises.

Previous CSTE fellows were involved in Ebola response, fungal meningitis, measles, and hepatitis A and MERS CO-V preparedness activities.

Additional Activities

Based on the Fellow's particular interests or needs, they may participate in additional activities. These include:

- Outbreak field investigation - There are a plethora of opportunities to investigate a wide variety of outbreaks (in the community or healthcare associated) as the lead epidemiologist, with close supervision and support.
- Participate in containment response for novel, highly resistant organisms or Candida auris
- Capture-recapture analysis of Clostridium difficile data between NHSN and Emerging Infections Program data
- Analysis of data gathered through the Emerging Infections Program (e.g., C.difficile)
- Analysis of data gathered through the National Healthcare Safety Network (NHSN), including data on:
    1. Central line associated blood stream infections (CLABSI)
    2. Catheter associated urinary tract infections (CAUTI)
    3. Surgical site infection (SSI) data following: (a)Coronary artery bypass graft surgery;(b) Abdominal hysterectomy and (c) Colon surgery
    4. Ventilator associated events
    5. Healthcare worker influenza vaccination rates
    6. Clostridium difficile infection (CDI)- acute care
    7. Methicillin resistant Staphylococcus aureus (MRSA)
    8. Dialysis events from outpatient hemodialysis facilities
    9. Antimicrobial usage data (AU module)
    10. Antimicrobial resistance data (AR module)
- Analysis of data captured as part of the Antibiotic Resistance Laboratory Network (ARLabNet)
- Evaluation of NHSN as a surveillance system for collecting data on:
    1. central line associated blood stream infections (CLABSI)
    2. catheter associated urinary tract infections (CAUTI)
    3. surgical site infection (SSI) data following (a) coronary artery bypass graft surgery; (b) abdominal hysterectomy, (c) colon surgery
    4. ventilator associated events
    5. healthcare worker influenza vaccination rates
    6. Clostridium difficile infection (CDI)
    7. methicillin resistant Staphylococcus aureus (MRSA) in different types of healthcare facilities and patient locations within healthcare facilities, and in Emergency Departments
    8. Antimicrobial usage (AU module)
    9. Antimicrobial resistance (AR module)
    10. Dialysis events in outpatient dialysis facilities
- Perform validation of CLABSI, CAUTI, SSI and methicillin resistant Staphylococcus aureus (MRSA), CDI and dialysis event data reported through NHSN. Of particular interest is validation of data reported to NHSN by Nursing homes (CDI), Inpatient Rehab Facilities (CDI and CAUTI) and long term acute care hospitals (MRSA, CDI, CLABSI, CAUTI, VAE)

- Analyses of vancomycin-resistant enterococcus (VRE) infection reported through the NEDSS Base System (NBS).
- Use SATSCAN and WHONET to characterize and describe susceptibility data of organisms reported to NEDSS Base system (complex relational database)
- Analysis of Tennessee antimicrobial susceptibility testing data in NEDSS Base System
- Assist facilities in reporting data to NHSN's new Antimicrobial Use and Resistance module (interaction with informatics team)
- Develop report cards on HAI and AR metrics for various healthcare facilities (private and public) using Tableau
- Analysis of NHSN AUR data. Develop measures that are helpful and meaningful. Note as of Oct 12, 33 facilities have reported data to NHSN AU module and 23 to the NHSN AR module). Encouraging reporting to the NHSN AUR module is a priority for the HAI team.
- Perform social network analyses to determine facility connectivity to target interventions
- Evaluate CDC/CMS statement on adherence to NHSN definition and impact on clinical practice and/or reporting.
- Analysis of infection control assessment data across healthcare spectrum.
- Descriptive analysis of organisms/susceptibility profiles and resistance mechanisms that are submitted to the State Public Health Laboratory as part of a new reporting requirement for pan-nonsusceptible organisms (reportable from Jan 2019 onward)
- Participate in HAI team meetings and multiple educational opportunities (e.g., conferences, meetings, webinars, training in REDCap, Tableau, SAS)

Mentors

Primary	Marion Kainer MD, MPH Director, Healthcare Associated Infections and Antimicrobial Resistance Program
Secondary	Tim Jones MD State Epidemiologist