**Supplemental Information**

**Table S1. Summary Demographics for Unique Encounters at Northwestern Memorial Hospital (NMH) and Henry Ford Hospital (HFH)**

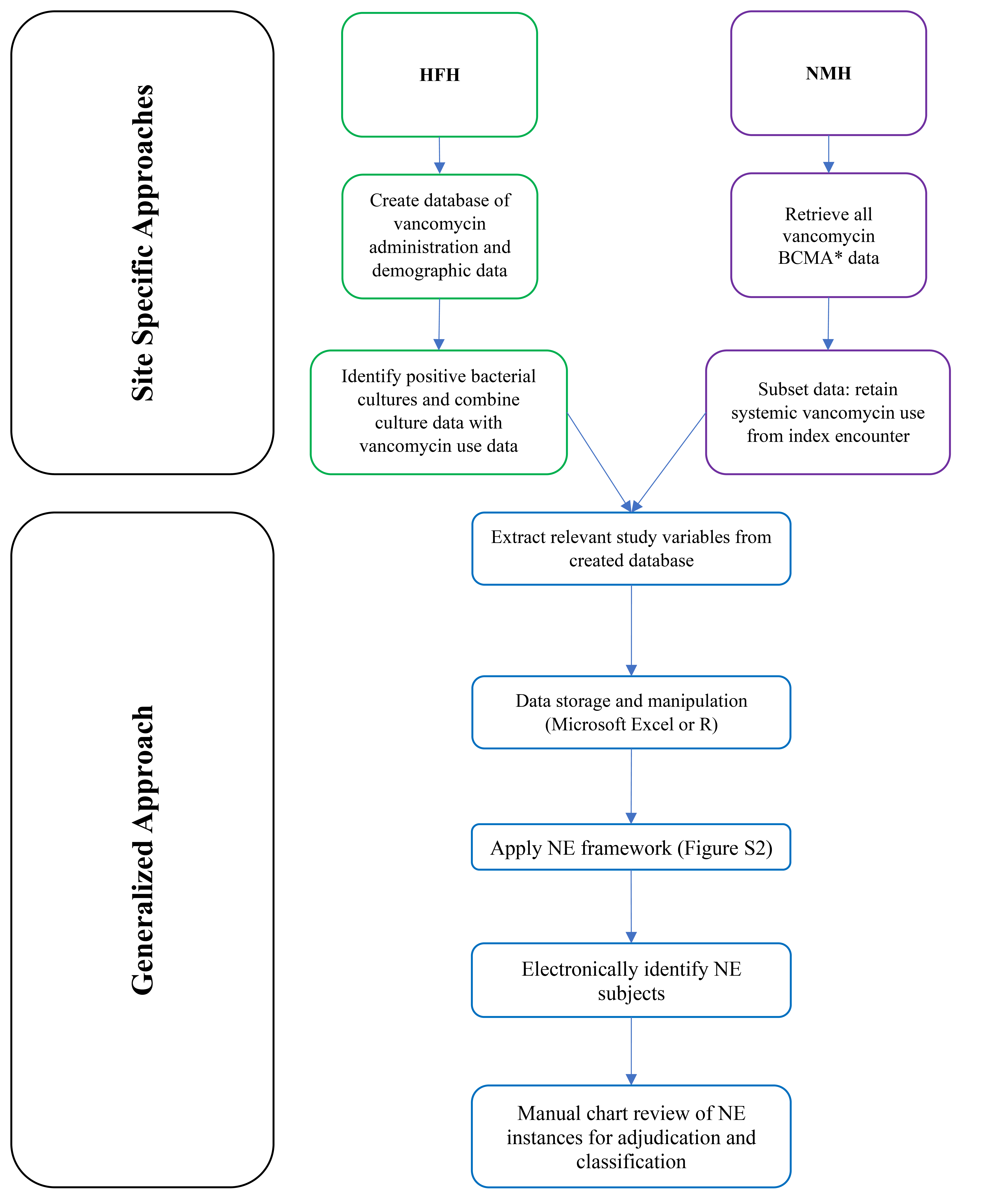
|  |  |  |
| --- | --- | --- |
| **Characteristics** | **NMH**  **(n=38,232)** | **HFH**  **(n=1,034)** |
| **Age (years), mean (±SD)** | 59.2 (16.2) | 57.9 (16.4) |
| **Female (%)** | 18,159 (47.5) | 522 (50.5) |
| **Weight (kg), mean (±SD)** | 83.5 (24.9) | 88.5 (29.0) |
| **Race** |  |  |
| *White or Caucasian* | 23,761 (62.1) | 438 (42.4) |
| *Black or African American* | 7,035 (18.4) | 422 (40.8) |
| *Asian* | 938 (2.5) | 11 (1.0) |
| *Hispanic or Latino* | 700 (1.8) | 1 (0.1) |
| **Vancomycin therapy duration (days), median (25th, 75th percentiles)** | 2 (1, 4) | 3 (2, 5) |
| **Length of stay (days), median (25th, 75th percentiles)** | 4 (2, 9) | 4 (2, 7) |
| **Order Indications (%)** | - |  |
| Surgical prophylaxis | 16,098 (42.1) | 160 (15.5) |
| *Hospital Acquired Pneumonia* | 4,489 (11.7) | 231 (22.3) |
| *Cellulitis* | 2,958 (7.7) | 292 (28.2) |
| *Bacteremia* | 2,182 (5.7) | 86 (8.3) |
| *Abscess* | 1,502 (3.9) | 40 (3.9) |
| *Neutropenic Fever* | 922 (2.4) | 3 (0.3) |
| *Osteomyelitis* | 649 (1.7) | 55 (4.3) |
| **Dispositions** |  |  |
| *Home* | 27,640 (72.3) | 671 (64.9) |
| *Skilled Nursing Facility* | 3,682 (9.6) | 149 (14.4) |
| *Inpatient Rehabilitation* | 2,847 (7.4) | 23 (2.2) |
| *Others* | 4063 (10.6) | 191 (18.5) |

**Table S2. Summary Demographics for Patients Undergoing Manual Adjudications**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Characteristics** | **NMH** | | **HFH** | |
| **Electronically identified NE (n=100)** | **Electronically identified non-NE (n=100)** | **Electronically identified NE (n=23)** | **Electronically identified non-NE (n=115)** |
| **Age (years), mean (±SD)** | 59.7 (15.5) | 57.6 (17.7) | 57.4 (14.1) | 59.5 (16.1) |
| **Female (%)** | 54 (27.0) | 24 (12.0) | 8 (34.8) | 59 (51.3) |
| **Weight (kg), mean (±SD)** | 82.8 (32.8) | 80.5 (30.2) | 87.6 (20.2) | 87.8 (34.5) |
| **Race** |  |  |  |  |
| *White or Caucasian* | 55 (27.5) | 20 (10.0) | 11 (47.8) | 33 (28.7) |
| *Black or African American* | 28 (14) | 7 (3.5) | 9 (39.1) | 66 (57.4) |
| **Vancomycin therapy duration (days), median (25th, 75th percentiles)** | 5 (4, 8) | 3 (2, 8) | 6 (5, 8) | 3 (2, 5) |
| **Length of stay (days), median (25th, 75th percentiles)** | 17.5 (9.75, 35) | 7 (4, 18) | 7 (5, 10) | 4 (3, 7) |
| **Order Indications (%)** |  |  |  |  |
| *Bacteremia* | 42 (21.0) | 29 (14.5) | 1 (4.3) | 9 (7.8) |
| *Hospital Acquired Pneumonia* | 9 (4.5) | 16 (8.0) | 8 (34.8) | 37 (32.2) |
| *Cellulitis* | 4 (2.0) | 4 (2.0) | 7 (30.4) | 24 (20.9) |
| *Osteomyelitis* | 2 (1.0) | 1 (0.5) | 4 (17.4) | 6 (5.2) |
| **Dispositions** |  |  |  |  |
| *Home* | 16 (8.0) | 46 (23.0) | 11 (47.8) | 85 (73.9) |
| *Skilled Nursing Facility* | 13 (6.5) | 12 (6.0) | 3 (13.0) | 17 (14.8) |
| *Inpatient Rehabilitation* | 49 (24.5) | 8 (4.0) | 0 (0) | 0 (0) |
| *Others* | 22 (11.0) | 34 (17.0) | 9 (39.1) | 13 (11.3) |

*Summary demographics table includes (but not limited to) potential clinical variables that contributed to differences between NE and non-NE vancomycin courses*

**Figure S2. Schematic of Data Acquisition from Two Medical Centers**



*NE, never events*

*\*BCMA, barcoded medication administration*

**Data Extraction Process**

*Northwestern Memorial Hospital*.

All data elements were obtained from a data warehouse at NMH, including vancomycin administration data (via Bar Code Medication Administration), patient encounter and location, organism susceptibility, organism profile, and encounter-specific surgical procedures. Based on aforementioned criteria, a dataset of potential subjects was compiled for study period. Following data reconciliation, dataset was imported into R (R Core Team, Vienna, Austria) and transformed as objects for storage and manipulation with local R functions [1]. NE algorithm (Fig. 2) was applied to the dataset to categorize subjects who potentially experienced NE during index hospital stays and non-NE subjects. Microbiological data extracted at NMH included susceptibility testing method and susceptibility interpretation. All subjects classified as non-NE subjects were randomly assigned unique IDs, and 100 randomly generated unique numbers bounded by the range of unique IDs facilitated the selection of non-NE patients for manual chart review.

*Henry Ford Hospital.*

Vancomycin administrations were extracted at HFH, and relevant clinical variables were reconciled with Microsoft SQL®. Theradoc© (Charlotte, NC) provided all relevant microbiological data. Using NE definition and data processing techniques with Microsoft Excel, all data elements were linked to vancomycin administration records, representing the overall clinical care of unique patients. After applying the NE algorithm (Fig. 2) to this data set, a preliminary list was generated and provided a first look of categorized subjects who potentially experienced NE or did not (non-NE instances) during study period. To further evaluate the performance of the NE algorithm locally, allocation of NE and non-NE instances was validated with manual EHR review.

**Pre-processing of EHR Data and Data Elements**

After vancomycin administration records were queried, inpatient encounter and location, microbiological data, surgical procedures and relevant diagnoses codes were subsequently extracted and reconciled to vancomycin records via unique patient encounter IDs [2]. Data elements in the pre-processed vancomycin administration records consisted of encounter ID, start and end infusion times (per dose), dosage form, dosage, diluent volume (if applicable), indication (per order), ordering provider, and provider ID. Available clinical elements reconciled included admission date, discharge date, hospital unit, length of stay, race, weight, sex, attending physician, primary team information, disposition post discharge, re-admission within 30 days (binary variable), culture collection time, culture type ordered, organism profile, organism result time, and antibiotic panel. Data elements defined as protected health information under HIPAA regulations were removed or deidentified per protocol in the final dataset. Patient records were also excluded if: 1) less than 18 or greater than 89 of age; 2) pregnant patients; and 3) prisoner status.

**Never Event Definitions in the Electronic Algorithm**

Two types of vancomycin NE were defined in the electronically applied algorithm: Type 1 NE) vancomycin usage for a vancomycin non-susceptible organism (after finalization of microbiological data), and Type 2 NE) vancomycin therapy exceeding 48 hours after de-escalation was possible (based on identification and susceptibility of causative organism) and without any contraindication (e.g., allergy).

Reference:

1. *R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.*

2. Kho, A.N., et al., *Design and implementation of a privacy preserving electronic health record linkage tool in Chicago.* J Am Med Inform Assoc, 2015. **22**(5): p. 1072-80.