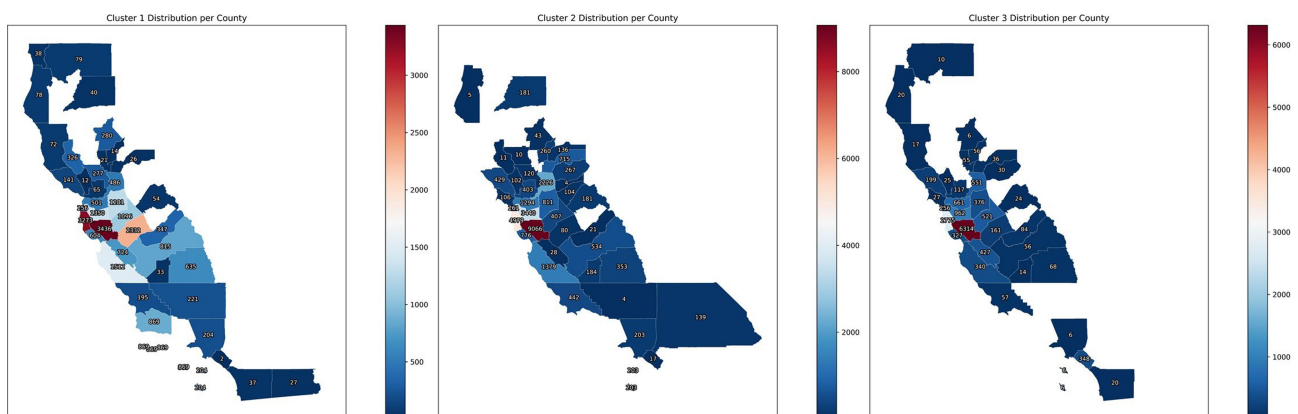Elbow Method For Optimal k

K-Means Clustering with 3 Clusters

October 2023. We identified blood cultures ordered ≥4 days of admission. To evaluate the association between social determinants of health and HOB, we employed an unsupervised machine learning approach (K-Means clustering) to discern patterns in HOB rates based on the Social Vulnerability Index (SVI). The SVI indicates the relative vulnerability of every U.S. Census tract. It ranks the tracts on 16 measures of vulnerability across 4 themes: socioeconomic factors, household characteristics, racial and ethnic minority status, and housing/transportation aspects. The number of clusters was determined using the Elbow Method (Figure 1). **Results:** Out of 209,947 blood cultures from 23,938 unique patients with a California address, we identified 81,653 blood cultures collected after 4 days (40%). The K-Means clustering algorithm identified 3 distinct clusters within the Californian census tracts, suggesting heterogeneity in the relationship between SVI and HOB (Figure 2). Cluster 1 had a higher SVI (median 0.73, range 0.46 – 0.99), with logistic regression indicating a positive SVI-HOB association (OR 4.84, 95% CI 4.02 – 4.81, p <.001). Cluster 2, had a median SVI of 0.29 (range 0.0009 – 0.78), also showed a positive association between SVI and HOB (OR 1.67, 95% CI 1.4 – 1.89, p <.001), aligning with trends of higher infection risks in more vulnerable groups. In contrast, Cluster 3 had a median SVI of 0.22 (range 0.002 – 0.84). In this cluster, the SVI showed a negative association with HOB (OR 0.24, 95% CI 0.18 – 0.31, p <.001). Cluster 3 was the cluster with the least number of subjects (15,000, versus 21,761 for Cluster 1 and 29,762 for Cluster 2). Most subjects in Cluster 3 resided in Santa Clara County, whereas those in Clusters 1 and 2 were spread across Santa Clara, San Mateo, Alameda, Merced, and Sacramento Counties (Figure 3). **Conclusions:** Advanced techniques can be used to explore the complex interplay between social determinants of health and healthcare-associated infections and could guide the development of community-specific strategies to improve outcomes.

Presentation Type:
Poster Presentation - Poster Presentation
Subject Category: Quality Improvement
Does Patient Perception of Cleanliness Still Matter? The Relationship between HCAHPS and HAC During the COVID-19 Pandemic

Caitlin Crews-Stowe, University of Tennessee at Chattanooga

Background: Environmental contamination of surfaces is known to be one of the most common causes of healthcare associated infections (HAIs), with cleaning and disinfection of surfaces shown to reduce the incidence of HAIs and contribute to overall hospital cleanliness. Prior research showed that there was a relationship between a hospital's performance on the Hospital Consumer Assessment of Healthcare Providers and Systems survey question on patient perception of cleanliness and their

Cluster 1 Distribution per County

Cluster 2 Distribution per County

Cluster 3 Distribution per County

Relationship between MRSA HAC and HCAHPS question

Response to HCAHPS Question 8: "During this hospital stay, how often were your room and bathroom kept clean?"	n	Mean	SD	Skewness Statistic	Spearman rho correlation	p-value
Always	1725	67.47	6.19	-0.316	-0.141	<0.001*
Usually	1725	20.66	2.88	-0.037	0.066	0.006*
Never	1725	11.87	4.18	0.830	0.175	<0.001*

*p <0.05

Relationship between CDI HAC and HCAHPS question

Response to HCAHPS Question 8: "During this hospital stay, how often were your room and bathroom kept clean?"	n	Mean	SD	Skewness Statistic	Spearman rho correlation	p-value
Always	2707	69.05	6.72	-0.203	-0.023	0.237
Usually	2707	19.85	3.38	-0.203	0.061	0.001*
Never	2707	11.11	4.39	.803	-0.012	0.527

*p <0.05

HAC score. However, this research was done prior to the COVID-19 pandemic. This study looked to examine if the pandemic changed the relationship between patient perception of cleanliness and HAC score performance. **Method:** A retrospective correlational study was performed to examine if the relationship between patient perception of cleanliness and the incidence of Clostridioides difficile (CDI) and Methicillin-Resistant Staphylococcus aureus (MRSA) HAIs, as defined by the facility's HAC score, were affected by the COVID-19 pandemic. Multiple Center for Medicare and Medicaid Services (CMS) datasets were utilized for the study. There were approximately 2700 acute care facilities that reported data on the HCAHPS perception of cleanliness question and either a MRSA or CDI HAC score for the period of January 1, 2021, to December 31st, 2021. Basic descriptive statistics and Spearman's rho correlation analyses were performed to examine the potential associations between the two scores. **Result:** For MRSA, the study found that as the percentage of patients who reported that their room was "always" clean increased, the hospital's HAC score decreased (r= -0.141, p = < 0.001). Additionally, as the percentage of patients who reported their room was "never" clean increased, the hospital's HAC score increased (r= 0.175, p = <0.001) For C. difficile, the analysis also revealed that as the percentage of patients who reported their room was "always" clean increased, there was not a significant change in the hospital's HAC score (r= -0.023, p = 0.237). There was also not a significant change in the HAC score when the percentage of patients who reported their room as "never" clean increased (r= -0.012, p = 0.527).

Conclusion: The study found that for MRSA, a hospital's performance on the HCAHPS performance on patient perception of cleanliness is related to their performance on their HAC score. This did not hold true when looking at C. difficile infections, which is in contrast to the prior evidence. Further research is needed to determine if there are specific factors that may have influenced this change.

Disclosure: Caitlin Crews-Stowe: Employee- ActivePure Medical

Presentation Type:
Poster Presentation - Poster Presentation
Subject Category: Quality Improvement
Reducing Blood Culture Contamination in Adult Patients with Cancer Presenting to the Emergency Department
Kim Nguyen, The University of Texas MD Anderson Cancer Center; Amy Spallone, The University of Texas MD Anderson Cancer Center; Adriana Wechsler, University of Texas MD Anderson.org; Karim Samir Abdeldaem, University of Texas MD Anderson.org; Maryam Zaghian, University of Texas MD Anderson.org; Mymimilami Santos, University of Texas MD Anderson.org; Holly Ayers, University of Texas MD Anderson.org; Micah Bhatti, University of Texas MD Anderson.org; Goley Richardson, University of Texas MD Anderson.org and Brian Cameron, University of Texas MD Anderson.org

Background: Infection is one of the most common complications of cancer and cancer treatment. Most patients admitted for fever or infection come through the Emergency Department (ED), which is a primary site for blood culture collection. Contamination of blood cultures complicates the diagnoses, compromises quality of care, leads to unnecessary antibiotic exposure and increases financial burdens. It may also lead to unnecessary removal of central venous access devices or delay of critical therapy or procedures. At our institution, the contamination rate of blood cultures drawn in the ED was over twice that of the remainder of the hospital (2.8 versus 0.8), prompting this quality improvement project. Unlike on hospital floors, nurses, instead of phlebotomists, draw most blood cultures due to the urgency of managing suspected sepsis. Our aim was to decrease the ED contamination rate by 20 percent after the first PDSA cycle, and ultimately bring it on par with the remainder of the hospital. **Methods:** First, we compared ED contamination rates versus other hospital inpatient floors and outpatient centers over a three-month period. We then evaluated the contamination rates of ED nurses versus ED phlebotomists and peripheral versus central line blood draws. Process mapping and fishbone analysis helped identify practices contributing to higher contamination rates. Key drivers of these practices were diagrammed, and potential interventions were ranked on a prioritization matrix. **Results:** We identified use of alcohol rather than chlorhexidine swabs for peripheral disinfection and inconsistent techniques of blood draw by nurses as critical contributors to increased contamination rates in the ED. Our intervention was creating premade blood culture kits promoting the use of chlorhexidine swabs through availability and easy access in the fast-paced ED environment. Ten cubic centimeter (cc) syringes in the kits encouraged withdrawal of adequate blood samples in compliance with the 7-10 cc guideline. Designated nursing team leaders checked off ED nurses at the bedside, implementing education and adherence in using the blood culture collection kits. The average number of blood cultures in the emergency department was 1,400. A reduction in blood culture contamination from 2.46 percent to 1.89 percent was seen after two months. **Conclusions:** A guideline-driven, standardized blood culture collection process followed by ED nurses is vital to reducing blood culture contamination. Chlorhexidine is necessary to maintain the lowest contamination rates. Readily available premade blood culture kits improve compliance with materials and techniques associated with best practices.

Presentation Type:
Poster Presentation - Poster Presentation
Subject Category: Quality Improvement
Case-Control Study Design to Identify Attributable Risk Factors for Rare Yet Trending Healthcare-Associated Infections
Stephanie Stroever, Texas Tech University Health Sciences Center; Krystal Hill, Northwest Texas Healthcare System; Charity Conley, Northwest Texas Healthcare System and Teri Quattlebaum, Northwest Texas Healthcare System

Introduction: There are a number of tools available to healthcare epidemiologists for identification and investigation of healthcare-associated infections. For example, root cause analysis (RCA) is an evidence-based strategy for identifying process failures that resulted in infection. However, RCA is most valuable on a case-by-case basis. It is not an efficient tool for investigating numerous events that trend over time. Healthcare epidemiologists must use different strategies that are both efficient and powerful. A case-control study is a valuable option to investigate rare but recurrent infection events. The objective of this study was to demonstrate the utility of a case-control study design to detect attributable risk factors of cesarean section surgical site infections (SSI). **Methods:** We conducted a case-control study at a Level III childbirth center with data timeframe of January 1, 2021 to May 31, 2023. The project was approved by the institutions' Quality Improvement Review Board prior to implementation. Cases were identified using the National Healthcare Safety Network (NHSN) SSI event criteria and included all levels of SSI. Controls were selected from the NHSN surgical denominator and were matched randomly without replacement by age at a 1:4 ratio. Variables were identified in collaboration with stakeholders based on known risk factors for SSI and abstracted manually. Analyses