to chlorine. This solution is interesting because it is nontoxic and easy to perform, requiring a small volume of hot water. The rapid recolonization of the new drain suggests that replacing contaminated drains is not a sustainable solution and would need to be paired with a thermal disinfection program to maintain low culturable cells.

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Presentation Type:
Oral Presentation
Subject Category: Other
Identification of Risk Factors for Invasive Extraintestinal Pathogenic *Escherichia coli* (ExPEC) Disease

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Background: A pathogenic group of invasive extraintestinal pathogenic (ExPEC) *Escherichia coli* possess the ability to infect normally sterile body sites and cause severe invasive ExPEC disease (IED). ExPEC is a leading cause of bacteremia and sepsis worldwide and is associated with older age and multidrug-resistant infections. Janssen Vaccines & Prevention is developing a novel multivalent glycoconjugate vaccine to prevent IED. We aimed to use an unbiased approach, with no prespecified potential risk factors, using machine-learning models, to screen for and identify IED risk factors for further validation. **Methods:** We used a patient-level prediction study design to model the probability of a patient developing IED within 14 days to 1 year from a given date based on their prior 2 years of health records. We used the Optum EHR database (~98 million subjects) in the common data model (CDM) format, with health features encoded in the following categories: conditions, procedures, drugs, healthcare visits, recent laboratory measurements, and age and gender. A gradient boosting model (XGBoost) was used with Shapley additive explanation (SHAP) values to identify which features were most important to the model's decisions and to characterize precisely the relationship between features and outcomes (binary or continuous). **Results:** Study participants were aged ≥60 years at index with no previously recorded IED. Of ~6,500,000 cases included, ~8,000 had IED during the prediction window. We found that having ≥1 urinary tract infection (UTI) in the retrospective period increased the model's probability of predicting IED for that patient, with more frequent or more recent UTIs increasing IED prediction chance (Figure 1). Higher age linearly increased the model's likelihood of predicting that a patient would develop IED. The model also identified ≥1 inpatient or ER visit and laboratory values indicative of renal or immune dysfunction to be correlated with increased IED risk. This methodology is a generalizable approach to screening for potential risk factors for an outcome using EHR databases; it requires little to no prespecification of the health factors or precise relationship between the factors and outcome. **Conclusions:** Using a new, impartial methodology (with no
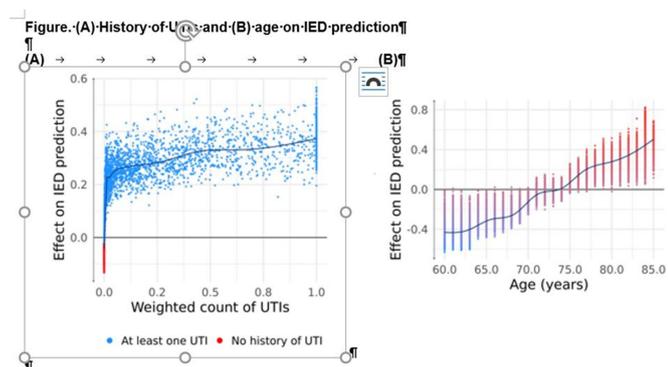
prespecification), older age and a history of UTIs were key predictive features for IED, factors previously identified through traditional analysis, confirming the validity of the methodology. Novel features, including recent hospitalization, were shown to increase IED risk relative to existing criteria. Our findings may be used to inform the clinical development of preventive strategies.

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Management of *Pseudomonas aeruginosa* Bloodstream Infection and Impact on Health Outcomes

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Background: Gram-negative bacteria cause a variety of hospital-associated infections (HAIs). Of concern is *Pseudomonas aeruginosa*, which is a leading cause of HAIs. Early and adequate therapy of *P. aeruginosa* blood stream infection (BSI) is associated with decreased mortality. Additionally, infectious disease consultation has also shown to improve health outcomes, streamline care, and decrease costs. Therefore, the goal of this study was to describe treatment of *P. aeruginosa* BSI and impact of infectious disease consultations on health outcomes. **Methods:** In this retrospective cohort study, we analyzed national VA medical, encounter, pharmacy, microbiology, and laboratory data from January 1, 2012 to December 31, 2018. The cohort included all hospitalized adult veterans (aged ≥18 years) who had a positive blood culture for *P. aeruginosa*. Only the first *P. aeruginosa* blood culture per patient was included, and duplicate cultures within 30 days were removed. Treatment was identified within −2 to +5 days of the culture date. Multidrug-resistant (MDR) cultures were identified based on resistance to at least 1 agent in at least 3 or more antimicrobial categories tested. Multivariable logistic regression models were fit to assess infectious disease consultations and adequate treatment on in-hospital mortality and 30-day mortality. **Results:** In total, 3,256 patients had a BSI with *P. aeruginosa*, of which 386 (11.5%) were MDR. Most of these patients were male (97.5%), >65 years of age (70.9%), and non-Hispanic white (63.8%). Also, 784 patients (23.3%) died during hospitalization and 870 (25.8%) died within 30 days of their culture. In multivariable regression models, infectious disease consultations were associated with decreased odds of in-hospital mortality (odds ratio [OR], 0.64; 95% confidence interval [CI], 0.53–0.77) and 30-day mortality (OR, 0.56, 95% CI, 0.48–0.67) even after adjusting for age, race, care setting, Charlson score, and prior healthcare exposures. Furthermore, inadequate definitive treatment was associated with increased odds of in-hospital mortality (OR, 2.77; 95% CI, 1.35–5.69) and 30-day mortality (OR, 2.37; 95% CI, 1.18–4.79), even after adjusting for age, Charlson score, care setting, and prior healthcare exposures. In addition, carbapenem treatment was associated with increased odds of in-hospital mortality (OR, 1.38; 95% CI, 1.12–1.70) and 30-day mortality (OR, 1.49; 95% CI, 1.22–1.81), whereas fluoroquinolone treatment was associated with lower odds of in-hospital mortality (OR, 0.49; 95% CI, 0.41–0.59) and 30-day mortality (OR, 0.60; 95% CI, 0.50–0.71). Finally, extended-spectrum cephalosporin was also associated with lower odds of in-hospital mortality (OR, 0.82; 95% CI, 0.68–0.98). **Conclusions:** Use of infectious disease consultations and any adequate definitive treatment for those with *P. aeruginosa* BSI lowered odds of in-hospital and 30-day mortality. Early consultation with infectious disease physicians regarding adequate treatment has direct positive impact on clinical outcomes for patients with *P. aeruginosa* BSI.

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Figure. (A) History of UTIs and (B) age on IED prediction

Figure 1.