Methylobacteriaceae (19% and 55%). Also, 16S sequencing revealed the presence of potential opportunistic pathogens in the biofilms, including reads attributed to *Pseudomonas* and *Acinetobacter*. CPKP CAV1016 inoculated into 28-day p-trap biofilms colonized and persisted in all 6 sinks for 12 days after inoculation. **Conclusions:** Despite all 6 sinks sharing an incoming water line, soap, and carbon and energy source, there was a significant variation in the bacterial community composition observed between the sinks. CPKP can colonize and persist in the p-trap biofilms; however, additional work is needed to achieve a reproducible model system. Once this is achieved, the sink gallery will be used to investigate interventions to mitigate colonization or persistence of CPKP in p-trap biofilms.

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Poster Presentation

Estimating the Impact of County Boundaries on State-wide Patient-Sharing Network Models

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Background: In the field of public health, network models are useful for understanding the spread of both information and infectious diseases. Collecting network data requires determining network boundaries (ie, the entities selected for data collection). These decisions, if not made carefully, have potential outsized downstream effects on study findings. In practice, collaboration and coordination between healthcare organizations are often dictated by historical or geopolitical boundaries (eg, state or county boundaries), which may distort the underlying network under study, and thereby affect the reliability and/or accuracy of the network model. **Objective:** We compared natural communities in a patient-sharing network with those induced by geopolitical boundaries. **Methods:** Using data from the Healthcare Cost and Utilization Project (HCUP), we constructed a patient-sharing network among hospitals in California, splitting the data into a training set and a holdout set. We performed edge-betweenness clustering on the training set, and with the holdout set, we compared the resulting partition with the partition by counties using modularity. We also clustered contiguous counties that might function more cohesively together than individually. We performed spatially

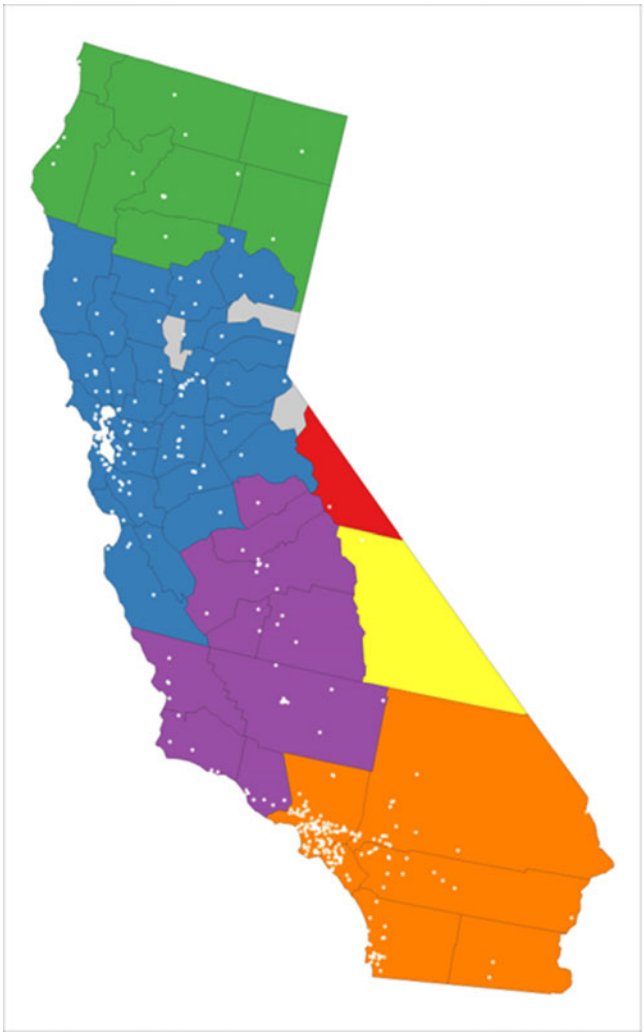

Fig. 1.

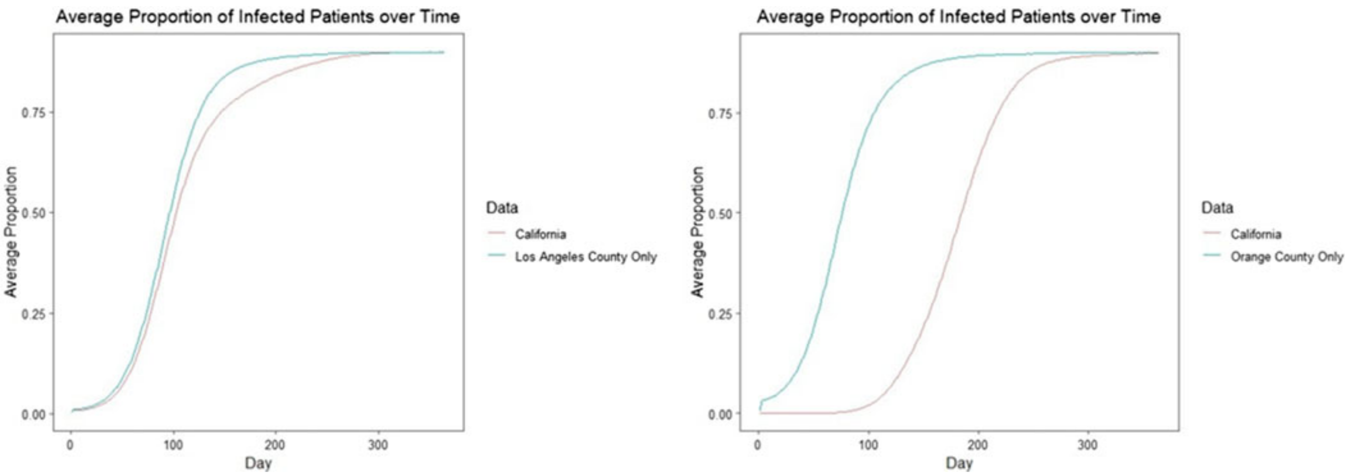

Fig. 2.

constrained hierarchical clustering on the network constructed from total patient flow between pairs of counties. The results were again compared via modularity on the hold-out set to the county partition. Lastly, we built an individual-based model (IBM) using HCUP and American Hospital Association data to perform epidemic simulations. For each of several counties, we implemented this model to estimate the proportion of patients infected over time. We then reran the individual-based model using the entire state while dividing the results into corresponding counties. **Results:** In total, 680,485 patients transferred between 374 hospitals in 55 counties from 2003 to 2011. The out-of-sample modularity for the edge-betweenness clustering partition was 464% higher than that of the county partition. Aggregating the counties into half as many contiguous clusters was 319% higher, and aggregating them into 6 clusters was 489% higher (Fig. 1). The epicurves from the individual-based model ranged from small to significant deviations between state versus county boundaries (Fig. 2) . **Conclusions:** Collecting network data using externally imposed boundaries may lead to inaccurate network models. For example, counties serve as a poor proxy for their underlying communities, resulting in poor overall disease spread simulation results when county boundaries are allowed to drive network construction. These issues should be considered when building coordination partnerships such as the Accountable Communities for Health.

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Etiology, Incidence, and Risk Factors for Meningitis after Ventriculoperitoneal Shunt Procedures: A Multicenter Study

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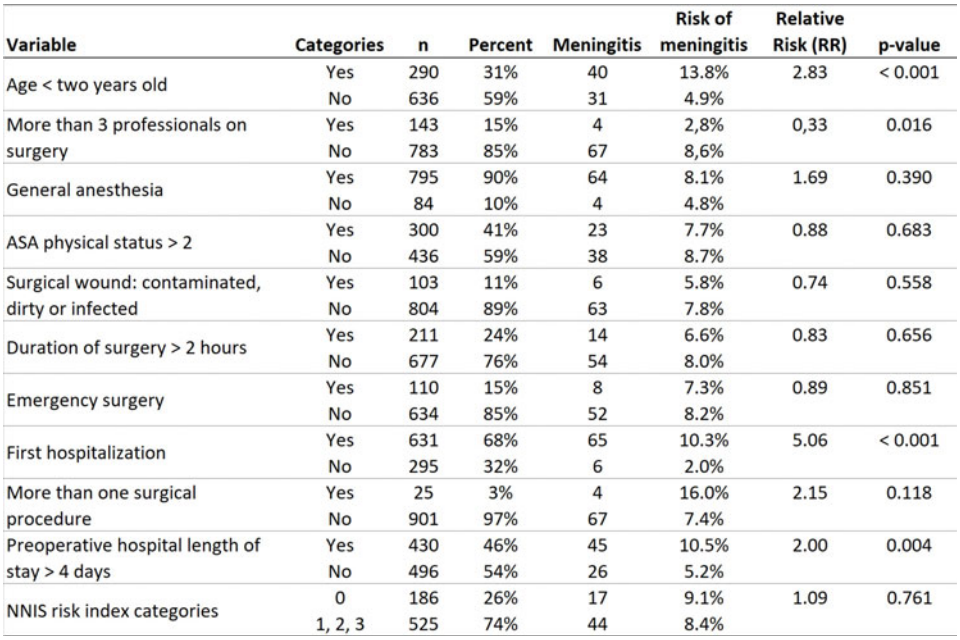
Background: The ventriculoperitoneal shunt is the main procedure used for to treat communicating hydrocephalus. Surgical site infection associated with the shunt device is the most common complication and a cause of morbidity and mortality of related to the treatment. We sought to answer 3 questions: (1) What is the risk of meningitis after ventricular shunt operations? (2) What are the risk factors for meningitis? (3) What are the main microorganisms causing meningitis? **Methods:** We conducted a retrospective cohort study of patients undergoing ventricular shunt operations between July 2015 and June 2018 from 12 hospitals at Belo Horizonte, Brazil. Data were gathered by standardized methods defined by the CDC NHSN. Our sample size was 926, and we evaluated 26 preoperative and operative variables by univariate and multivariate analysis. Our outcome variables of interest were meningitis and hospital death. **Results:** In total, 71 cases of meningitis were diagnosed (risk, 7.7%; 95% CI, 6.1%–9.6%). The mortality rate among patients without infection was 10%, whereas hospital mortality of infected patients was 13% ($P = .544$). The 3 main risk factors for meningitis after ventricular shunt were identified by logistic regression model: age <2 years (OR, 3.20; $P < .001$), preoperative hospital stay >4 days (OR, 2.02; $P = .007$) and >1 surgical procedure, in addition to ventricular shunt (OR, 3.23; $P = .043$). Almost 1 of 3 of all patients was <2 years old (290, 31%). Also, 430 patients had >4 preoperative days (46%). Patients aged ≥2 years who underwent surgery 4 days after hospital admission had an increased risk of meningitis, from 4% to 6% ($P = .140$). If a patient <2 years old underwent surgery 4 or more days after hospital admission, the risk of meningitis increased from 9% to 18% ($P = .026$; Fig. 1). We built a risk index using the number of main risk factors based on a logistic regression model (0, 1, 2 or 3; Fig. 2).



Variable	Categories	n	Percent	Meningitis	Risk of meningitis	Relative Risk (RR)	p-value
Age < two years old	Yes	290	31%	40	13.8%	2.83	< 0.001
	No	636	59%	31	4.9%		
More than 3 professionals on surgery	Yes	143	15%	4	2,8%	0,33	0.016
	No	783	85%	67	8,6%		
General anesthesia	Yes	795	90%	64	8.1%	1.69	0.390
	No	84	10%	4	4.8%		
ASA physical status > 2	Yes	300	41%	23	7.7%	0.88	0.683
	No	436	59%	38	8.7%		
Surgical wound: contaminated, dirty or infected	Yes	103	11%	6	5.8%	0.74	0.558
	No	804	89%	63	7.8%		
Duration of surgery > 2 hours	Yes	211	24%	14	6.6%	0.83	0.656
	No	677	76%	54	8.0%		
Emergency surgery	Yes	110	15%	8	7.3%	0.89	0.851
	No	634	85%	52	8.2%		
First hospitalization	Yes	631	68%	65	10.3%	5.06	< 0.001
	No	295	32%	6	2.0%		
More than one surgical procedure	Yes	25	3%	4	16.0%	2.15	0.118
	No	901	97%	67	7.4%		
Preoperative hospital length of stay > 4 days	Yes	430	46%	45	10.5%	2.00	0.004
	No	496	54%	26	5.2%		
NNIS risk index categories	0	186	26%	17	9.1%	1.09	0.761
	1, 2, 3	525	74%	44	8.4%		

Fig. 1.