Risk Factors for Failure for Intra-Abdominal Infections

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Background

➤ Complicated intra-abdominal infections (cIAIs) are common infectious diseases with over 300,000 cases reported each year
➤ cIAIs are are managed by a combination of surgical interventions and antimicrobial therapy
➤ Approximately 20-25% of these patients will fail therapy with a 10% mortality rate
➤ Previous studies have identified severity of illness, baseline comorbidity, failure of initial therapy, age, delayed initial intervention, and other factors as independent risk factors for clinical failure in IAI patients undergoing surgical intervention
➤ Limited data exists for the 20% of cIAI patients who do not receive surgical intervention
➤ The purpose of this study is to identify risk factors for clinical failure in patients with IAI, regardless of surgical intervention

Methods

Study Design and Objectives
This was a single center, case-control study assessing the proportion of patients diagnosed with a cIAI experiencing clinical failure (cases) compared to those who did not experience clinical failure (controls). The study was approved by the University of Mississippi Medical Center Investigational Review Board. The primary study objective was to:

➤ Characterize the incidence of and risk factors associated with clinical failure

Secondary Objectives:
➤ Evaluate the impact of an isolated pathogen on the incidence of clinical failure.
➤ Compare appropriate vs inappropriate empiric therapy on clinical failure rates.

Subjects
The study population included patients admitted to the University of Mississippi Medical Center from July 2012 – September 2015.

Inclusion criteria	Exclusion Criteria
➤ Age ≥ 18 years ➤ Received systemic antibiotics for ≥ 48 hours ➤ ICD-9 code for intra-abdominal infection	➤ Spontaneous bacterial peritonitis, pancreatitis, stage abdominal repair, peritoneal dialysis, solid organ transplant within the last year, pregnancy ➤ Concomitant dissimilar bacterial infection at a second site ➤ IAI, surgery, or trauma within the last 90 days

Data Collection
Data collected included demographics, infection-related information, treatment-related information, and incidence of infectious diseases consults. Clinical failure was defined as a composite outcome of mortality, repeat procedure, incidence of a fever after 96 hours of antibiotics, or a change in antibiotics after 96 hours for reasons other than culture-guided or de-escalation.

Analysis
Descriptive measures were used to evaluate baseline demographics and microbiological data. To compare risk factors associated with the primary outcomes, bivariate comparative tests were used. Categorical data was compared using Chi-square test, for association between study group, and continuous data was compared with Mann Whitney U. Multivariable logistic regression was used for risk factors with a p-value <0.2, and variables were retained if p-value was < 0.1. All tests were two-sided; a P value of <0.05 was considered significant. Statistical analysis was completed with SPSS version 23.0.
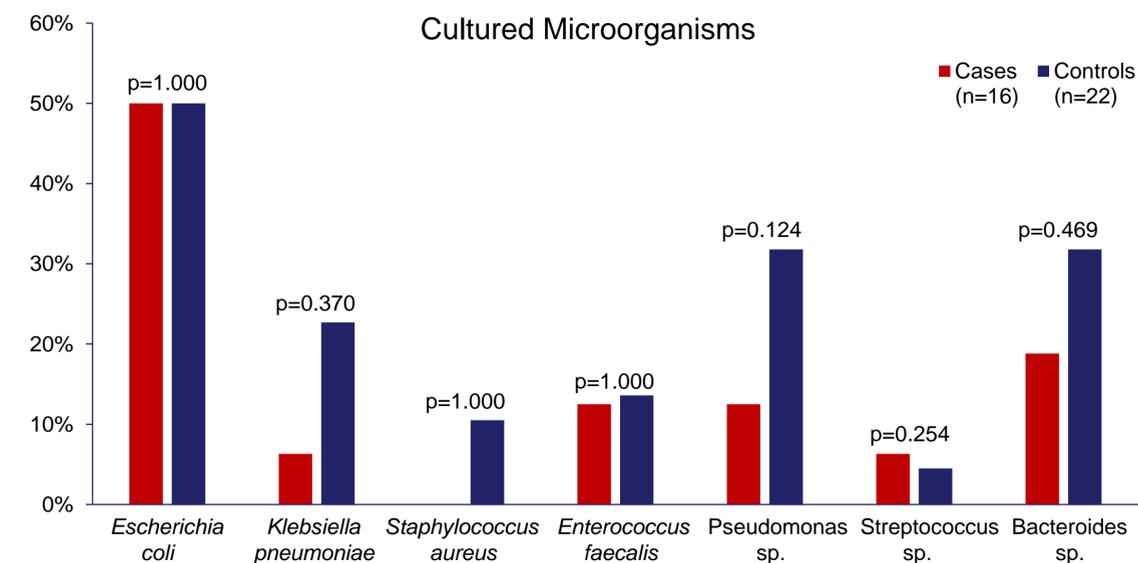
Baseline Demographic Results

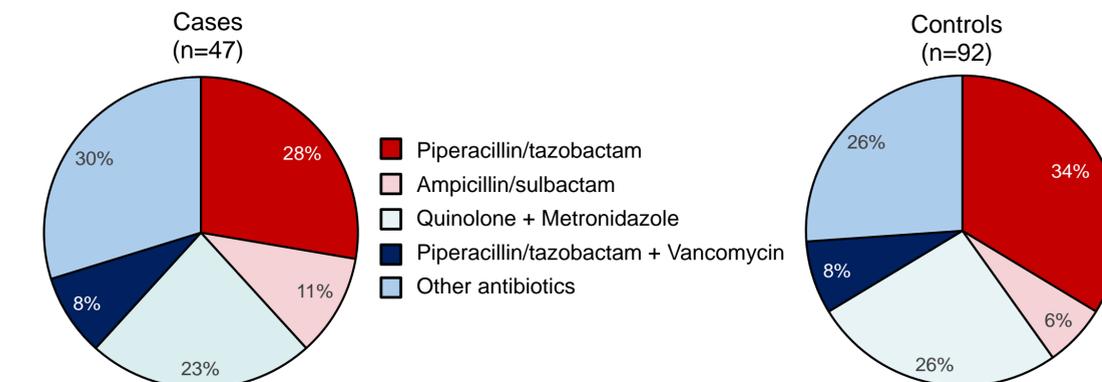| Parameter N (%) or median (IQR)	Total Population (n=139)	Cases (n=47)	Controls (n=92)	P-value
Age (years)	54.0 (37.0 – 62.0)	46.0 (30.0 – 62.0)	55.0 (44.3 – 62.0)	0.033
Female	54 (38.8)	18 (38.3)	36 (39.1)	0.924
Weight (kg)	83.9 (68.0 – 100.8)	89.4 (68.04 – 107.2)	81.6 (68.0 – 97.1)	0.250
Height (inches)	68 (65.3 – 71.0)	69 (66.8 – 71.3)	68 (64.8 – 71.0)	0.124
BMI (kg/m^2)	27.5 (23.6 – 32.5)	27.8 (23.7 – 34.6)	27.3 (23.1 – 32.3)	0.684
Serum Creatinine (mg/dL)	0.95 (0.73 – 1.2)	0.99 (0.71 – 1.39)	0.90 (0.74 – 1.11)	0.239
Charlson Comorbidity Index	0 (0 – 1)	0 (0 – 1)	0 (0 – 2)	0.380
Healthcare Associated Infection	20 (14.4)	8 (17.0)	12 (13.0)	0.527

Suspected Infection Source[a]
  Appendix
  Colon
  Peritonitis
	
	44 (31.7)
	63 (45.3)
	81 (58.3)
		
		15 (31.9)
		23 (48.9)
		31 (66.0)
			
			29 (31.5)
			40 (43.5)
			50 (61.7)
				
				0.962
				0.541
				0.189

Source Control Procedure	115 (82.7)	42 (89.4)	73 (79.3)	0.139
Time to Source Control Procedure (hours)	13.0 (3.0 – 49.0)	20.5 (2.8 – 69.3)	13.0 (3.0 – 37.5)	0.292

[a] 70 patients had multiple suspected sites of infection

Microbiological Results

Cultured Microorganisms

➤ 22 patients had polymicrobial cultures
➤ Cultures were from intra-abdominal sites except for 2 cultures from blood
➤ No methicillin-resistant *S. aureus* was isolated
➤ *Candida albicans* was isolated in 1 patient in the control group

Treatment Results

Cases (n=47) / Controls (n=92)

- Piperacillin/tazobactam
- Ampicillin/sulbactam
- Quinolone + Metronidazole
- Piperacillin/tazobactam + Vancomycin
- Other antibiotics

Parameter N (%) or median (IQR)	Total Population (n=139)	Cases (n=47)	Controls (n=92)	P-value
Monotherapy	69 (49.6)	21 (44.7)	48 (52.2)	0.403
Combination Therapy	70 (51.8)	26 (55.3)	44 (47.8)	0.403
Adequate Empiric Therapy	117 (84.2)	38 (80.9)	79 (85.9)	0.443
Adequate Definitive Therapy	28 (20.1)	14 (29.8)	14 (15.2)	0.043
Duration of Antibiotics (days)	7 (6-10)	13 (8-17)	6 (5-8)	< 0.001
ID Consult Obtained	10 (7.2)	7 (14.9)	3 (3.3)	0.031
Length of Stay (days)	8 (6-12)	14 (9-19)	7 (5-8)	< 0.001

Characteristics Associated with Clinical Failure

Parameter N (%) or median (IQR)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age (years)	0.976 (0.955 – 0.998)	0.967 (0.944 – 0.991)
Heights (inches)	1.084 (0.988 – 1.190)	Removed from model
Serum Creatinine (mg/dL)	1.665 (1.033 – 2.683)	2.168 (1.091 – 4.308)
Suspected Infection Site - Peritonitis	1.627 (0.785 – 3.376)	Removed from model
Source Control Procedure	2.186 (0.761 – 6.284)	Removed from model

Death occurred in 5 (3.6%) patients.

Conclusions

➤ Clinical failure occurred in 34% of patients.
➤ Antibiotic selection did not have a statistically significant association with clinical failure.
➤ Younger age and elevated serum creatinine are predictive of clinical failure.