

# Clinical Impact of Bronchoscopy in Pediatric and Young Adult Oncology Patients with Suspected Respiratory Infections

Daniel Whitehurst, MD<sup>1</sup>; Bill Otto, MD<sup>1,2</sup>, MSCE; Bethany Verkamp, MD<sup>1,3</sup>; Grant Paulsen, MD<sup>1,2</sup>; Lara Danziger-Isakov, MD, MPH<sup>1,2</sup>; Hilary Miller-Handley, MD<sup>1,2</sup>

<sup>1</sup> Department of Pediatrics, University of Cincinnati; <sup>2</sup> Division of Infectious Diseases, Cincinnati Children's Hospital Medical Center; <sup>3</sup> Cancer and Blood Diseases Institute, Cincinnati Children's Hospital Medical Center

## Background

- Respiratory infections are a significant cause of morbidity and mortality in pediatric and young adult patients with malignancy
- Bronchoscopy with bronchoalveolar lavage (BAL) is frequently utilized in hopes of guiding treatment, but the procedure is not without risks
- Information on which patients would most benefit from bronchoscopy with BAL would be beneficial

### Objectives

- Report the diagnostic yield and adverse event rate of bronchoscopy with BAL in pediatric and young adult oncology patients with suspected respiratory infections
- Identify factors associated with positive and negative clinical impact from bronchoscopy with BAL to identify the optimal patient

## Methods

1 All patients with a cancer diagnosis and BAL labs at CCHMC from 2013 to 2022

- 2 Excluded patients:
- With cystic fibrosis
  - Preparing for or post hematopoietic stem cell transplant (HSCT)
  - That had not received chemotherapy in the last six months (unless new cancer diagnosis)
- Excluded bronchoscopies:
- If a prior bronchoscopy in the previous four weeks met inclusion criteria
  - Not performed due to infectious concerns
  - Performed to follow up on previous diagnosis

3 Identified bronchoscopies that led to positive clinical impact, no clinical impact or negative clinical impact

4 Mixed-effects logistic regression to identify factors associated with positive and negative clinical impact

## Adverse Events

Table 2. Procedural Complications	%
Any procedural complication	13.1%
Required persistent (> 6 hours) increase in respiratory support (non-ventilator)	6.2%
Required escalation to mechanical ventilation	5.5%
Required ICU admission	4.8%
Required persistent (> 6 hours) increase in ventilator settings	2.8%
Bleeding	0.7%

## Patient Cohort

Table 1. Demographic and clinical characteristics of patients in cohort (n=145)

Age in years (median, IQR)	12 (5-17)	Patient Location	
Female (n, %)	66 (45.5%)	Floor (n, %)	95 (65.5%)
Cancer diagnosis		ICU (n, %)	47 (32.4%)
ALL (n, %)	52 (35.9%)	Outpatient (n, %)	3 (2.1%)
AML and other leukemias (n, %)	42 (29.0%)	Required respiratory support	59 (40.7%)
Lymphoma (n, %)	20 (13.8%)	Intubated on ventilator (n, %)	33 (22.8%)
Solid Tumor (n, %)	27 (18.6%)	Nasal Cannula (n, %)	24 (16.6%)
CNS Tumor (n, %)	4 (2.8%)	CPAP or BiPAP (n, %)	2 (1.4%)
Any respiratory symptoms present	60 (41.4%)	ANC (median, IQR)	550 (20-1980)
Cough (n, %)	53 (36.6%)	Platelets (median, IQR)	78 (54-172)
Increased work of breathing (n, %)	11 (7.6%)	Antibiotic duration in days (median, IQR)	6.3 (2.5-15.0)
Shortness of breath (n, %)	8 (5.5%)	Antifungal duration in days (median, IQR)	0.5 (0.0-4.1)
Fever (n, %)	64 (44.1%)		

## Diagnostic Yield

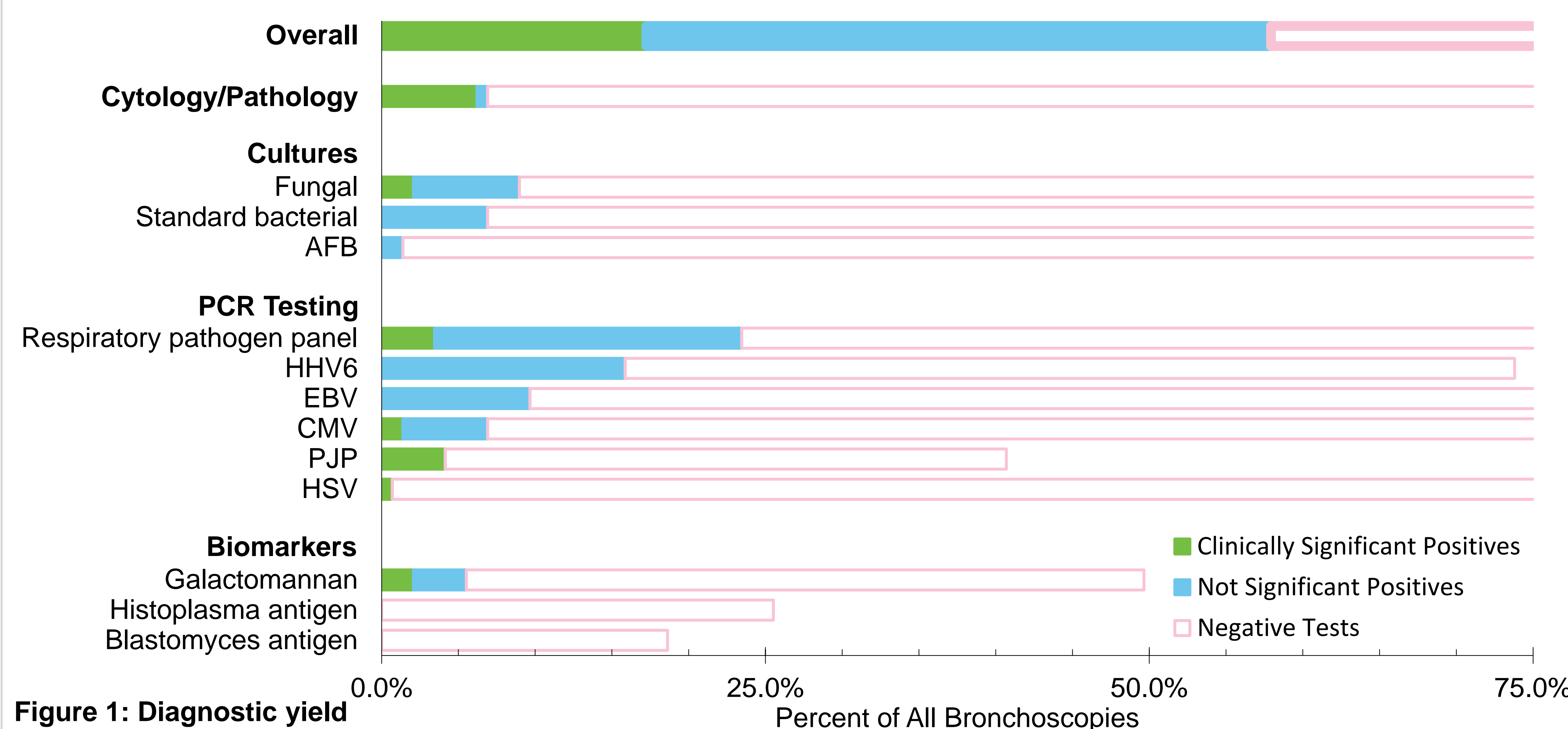


Figure 1: Diagnostic yield

## Clinical Impact

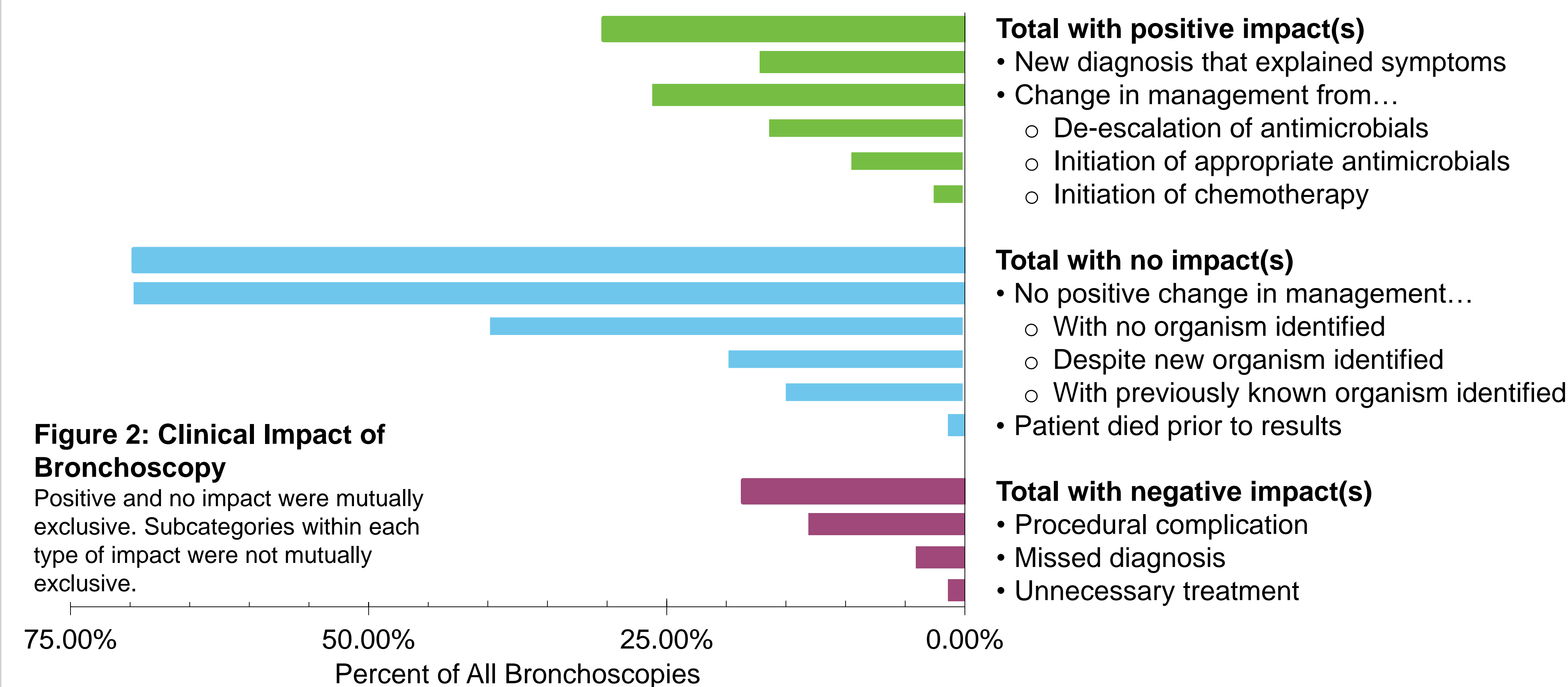
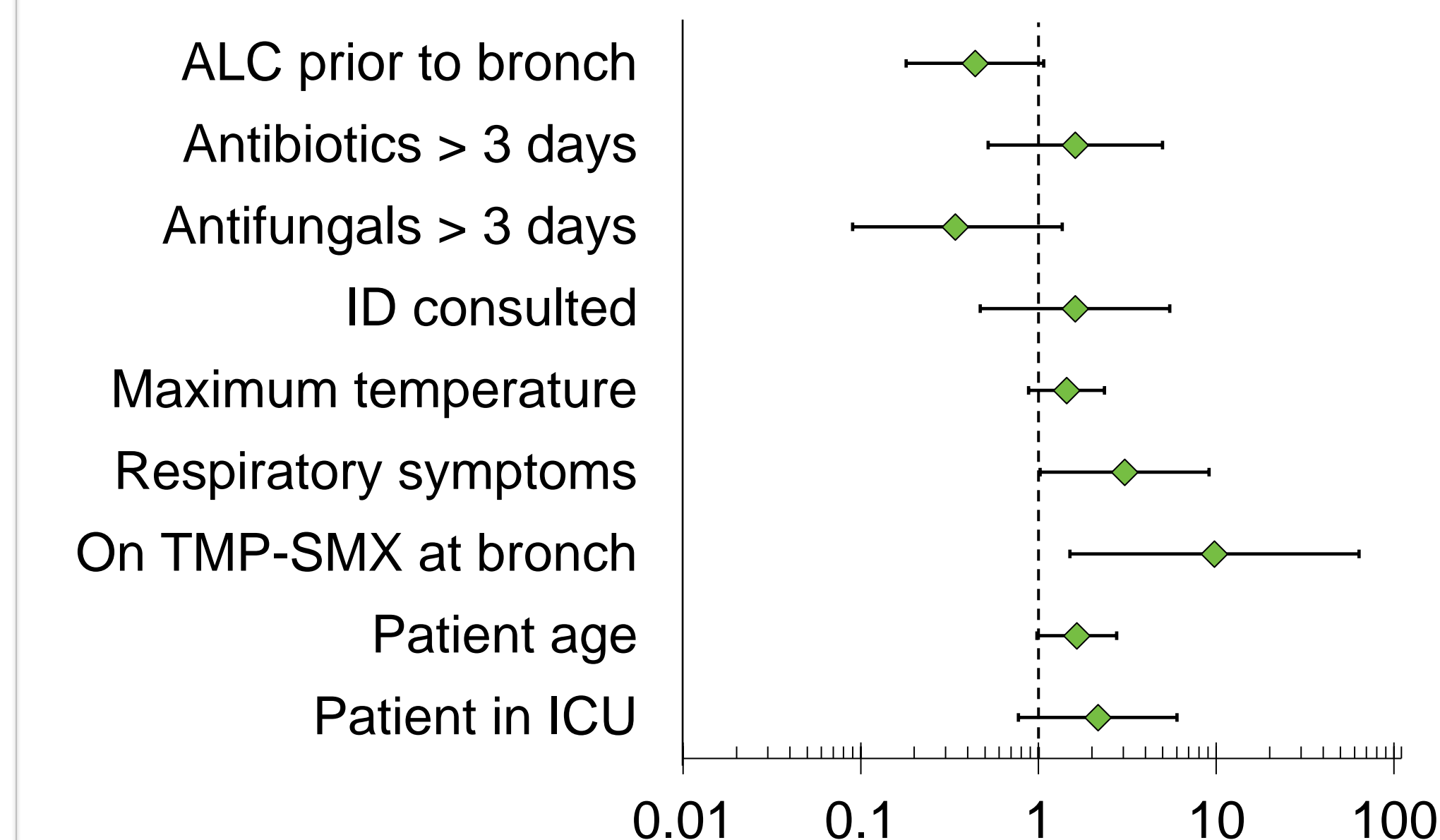


Figure 2: Clinical Impact of Bronchoscopy

Positive and no impact were mutually exclusive. Subcategories within each type of impact were not mutually exclusive.

## Mixed-Effects Model

### Positive Clinical Impact



### Negative Clinical Impact

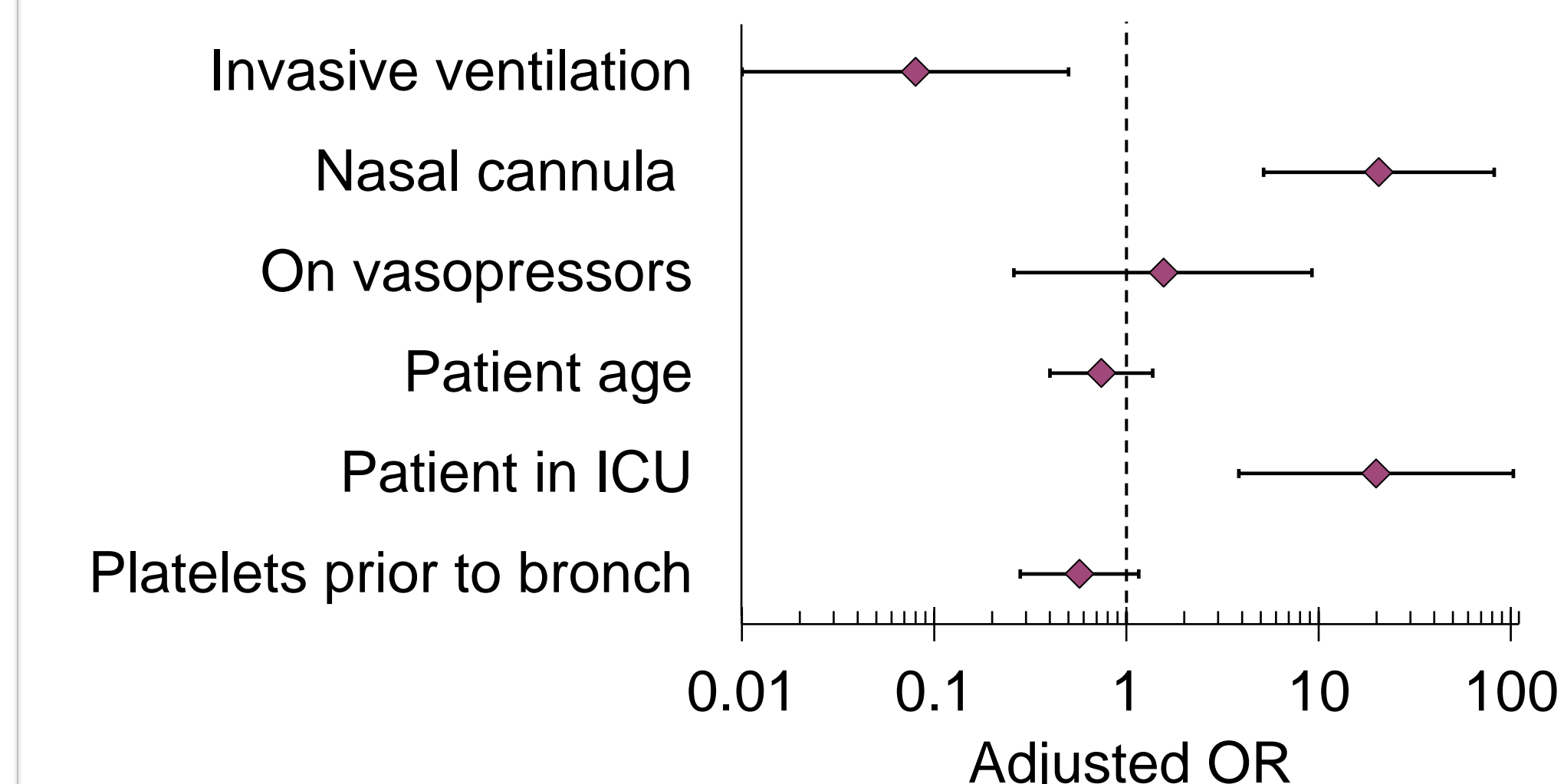


Figure 3: Mixed-effects multivariable logistic regression model that accounted for sex and oncologic diagnosis

## Conclusions

- The diagnostic yield of bronchoscopy with BAL was 58% while 30% had a positive impact and 19% had a negative impact
- Patients with concern for PJP and those with respiratory symptoms benefit most from bronchoscopy with BAL
- Patients requiring non-invasive respiratory support, especially those in the ICU, are at the highest risk for negative outcomes after bronchoscopy
- PCR testing and biomarkers provide the most clinically significant diagnoses in this patients frequent pretreated with antimicrobials
- Further research is needed to better identify the optimal patients for bronchoscopy

## Additional Materials

