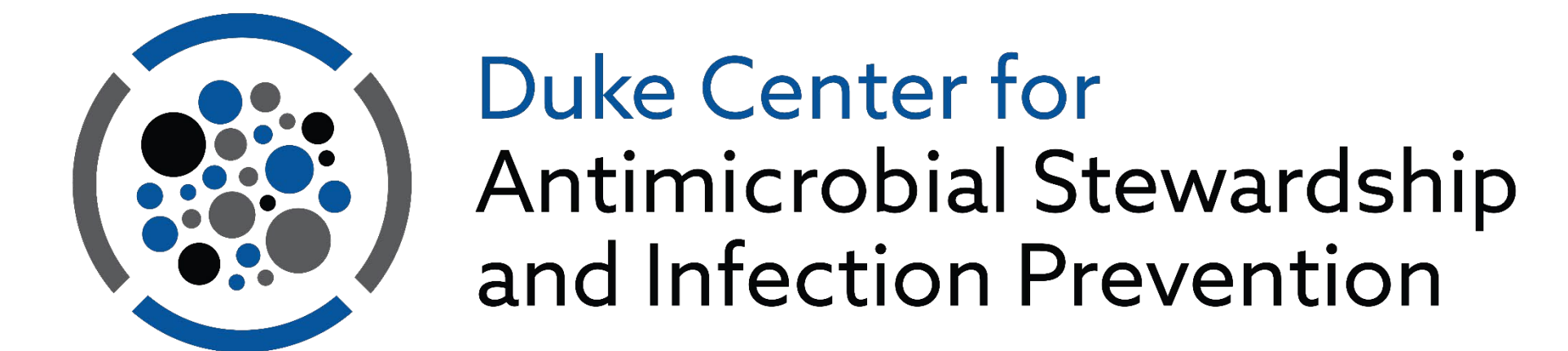


Invasive Ocular Candidiasis: Who is at Risk?



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Abstract

Background: The Infectious Disease Society of America recommends that all patients with candidemia undergo a dilated retinal exam to exclude invasive ocular candidiasis. However, it remains unclear if there are patients with candidemia who do not warrant routine surveillance because the risk of ocular infection is low.

Methods: We conducted a retrospective cohort study of all patients with candidemia diagnosed at three academic medical centers (Duke, University of North Carolina and University of Virginia) from 2012 to 2017. We collected risk factors for invasive ocular candidiasis based on previous literature and compared them between patients with and without invasive ocular candidiasis. We then built a multivariate logistic regression model to assess which risk factors were significant for developing invasive ocular candidiasis.

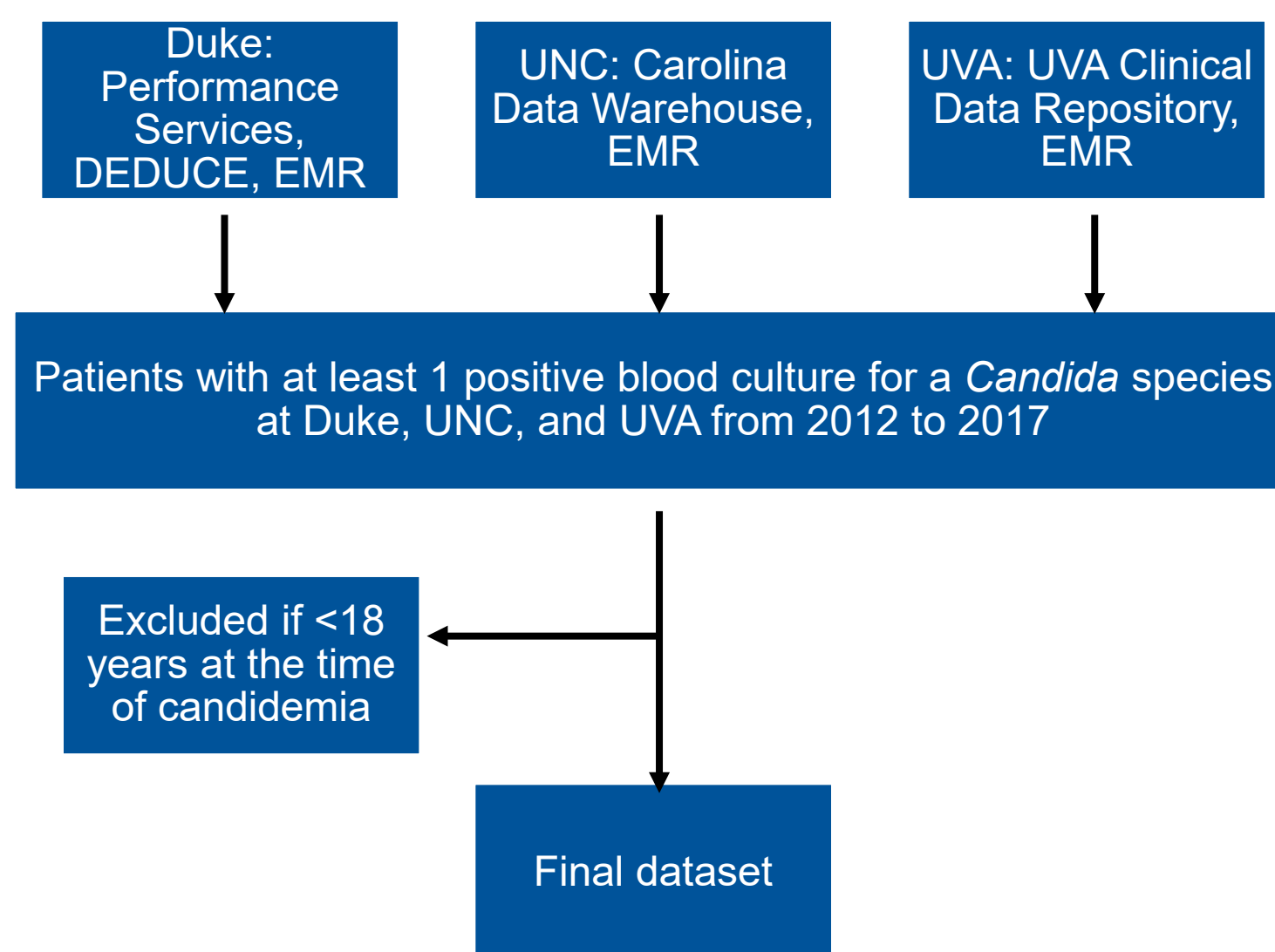
Results: Overall, 942 patients were diagnosed with candidemia over the study period. The mean age was 55.9 years, 56% were men, 34% were non-White. Among these patients, 120 (13%) were also diagnosed with invasive ocular candidiasis. In our logistic regression analysis, central venous catheter presence (OR 9.65), intravenous drug use (OR 4.91), immunosuppression (OR 3.35), total parenteral nutrition (OR 2.01), non-White race (OR 1.90), male gender (OR 1.74), and older age (OR 1.02) were risk factors for developing invasive ocular candidiasis. In addition, we found that persons with candidemia due to *C. albicans* were more likely to have invasive ocular candidiasis (OR 1.74).

Conclusions: This cohort represents the largest study of patients with candidemia who developed invasive ocular candidiasis to date. Based on our findings, clinicians should develop targeted and cost-effective strategies for endophthalmitis screening.

Background

- Approximately 16% of persons with candidemia have ocular manifestations of which a substantial subset will develop invasive ocular candidiasis (chorioretinitis with or without vitritis).
- Due to the devastating consequences of invasive ocular candidiasis and the underappreciated incidence of this as a sequelae of candidemia, the IDSA recommends that all patients with candidemia be screened for invasive ocular candidiasis.
- However, with the improvement of antifungals and the lower prevalence of endophthalmitis, some researchers have called for a refinement of which patients with candidemia truly need an ophthalmologic exam.

Methods



- Compared variables in patients with and without invasive ocular candidiasis: 2-sided unpaired t-tests, Wilcoxon rank sum tests, Fisher's exact tests, or chi-square tests
- Multivariate logistic regression model: Included all covariates in model

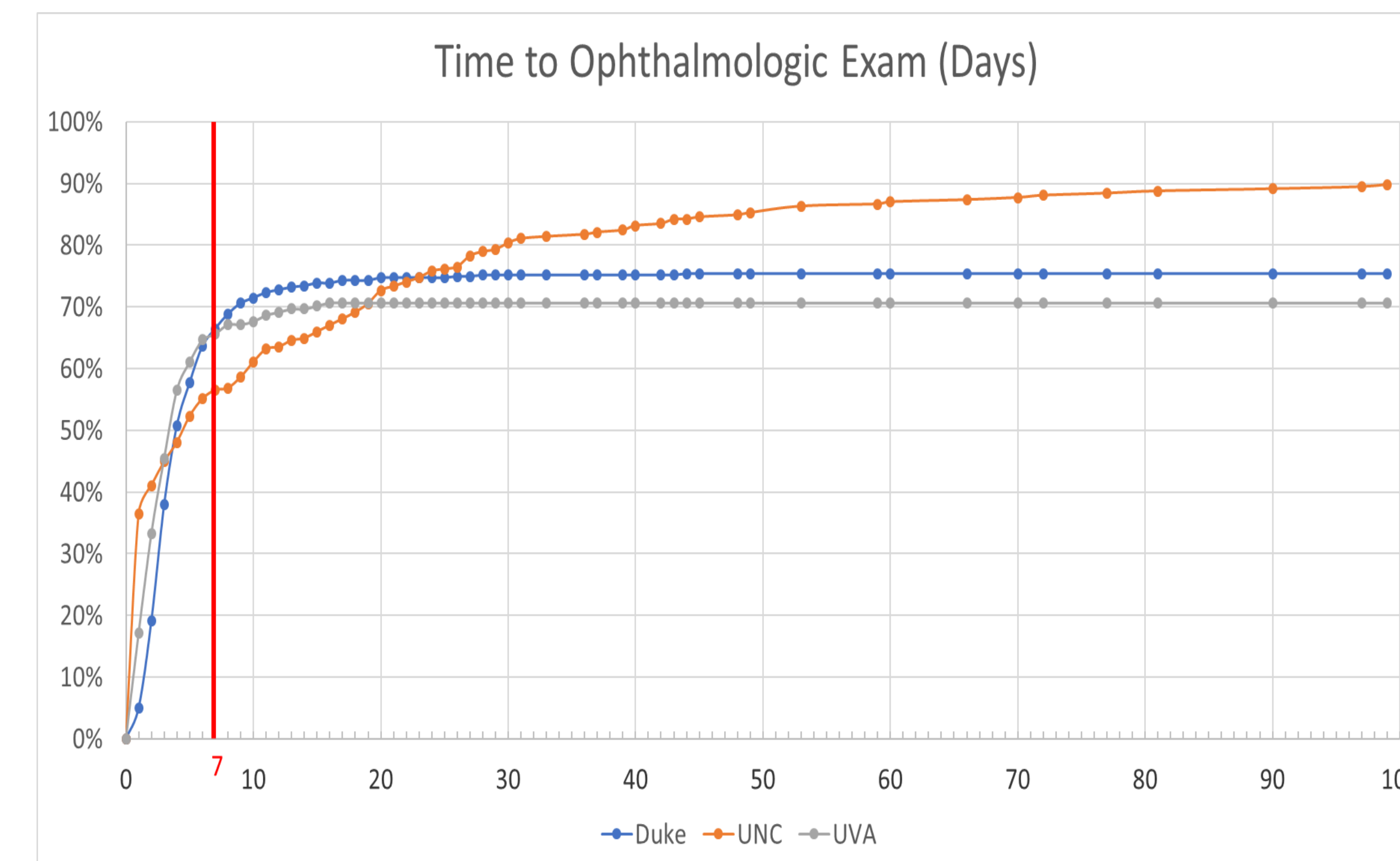
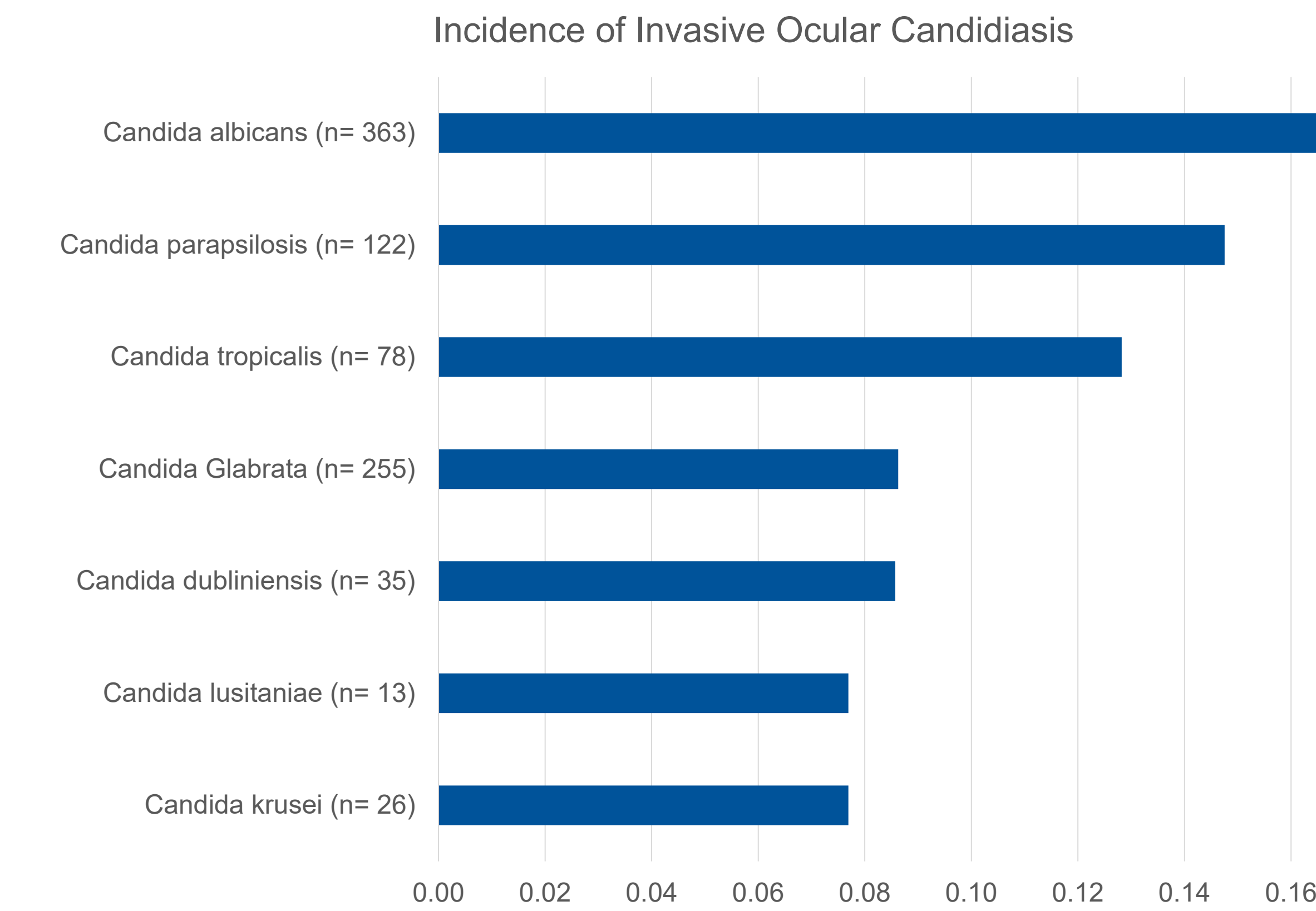
Results:

Characteristic	Total N=942 n (%)	Invasive Ocular Candidiasis N= 120 n (%)	No Invasive Ocular Candidiasis* N= 651 n (%)	P-value
Age in years (mean, std)	55.9 (17.3)	58.1 (16.3)	54.9 (17.7)	0.06 [‡]
Male Gender	493 (52.3%)	76 (63.3%)	330 (50.7%)	0.01 [†]
Race				0.04 [‡]
Black or African American	259 (27.5%)	42 (35.0%)	160 (24.6%)	
Other	66 (7.0%)	10 (8.3%)	45 (6.9%)	
White, Caucasian (ref)	617 (65.5%)	68 (56.7%)	446 (68.5%)	
ICU Patient	263 (27.9%)	25 (20.8%)	221 (34.0%)	<0.01 [†]
Patient Able to Respond to Questions	577 (61.3%)	87 (72.5%)	490 (59.6%)	<0.01 [†]
Central Venous Catheter present	672 (71.3%)	114 (95.0%)	440 (67.6%)	<0.01 [†]
Major Surgery within 30 days of Candidemia	362 (38.4%)	54 (45.0%)	247 (51.5%)	0.15 [†]
≥7 days of broad-spectrum antibiotics at the time of Candidemia	499 (53.0%)	66 (55.0%)	335 (51.5%)	0.48 [†]
Total Parenteral Nutrition	163 (17.3%)	41 (34.2%)	100 (15.4%)	<0.01 [†]
Intravenous Drug User	73 (7.8%)	23 (19.2%)	39 (6.0%)	<0.01 [†]

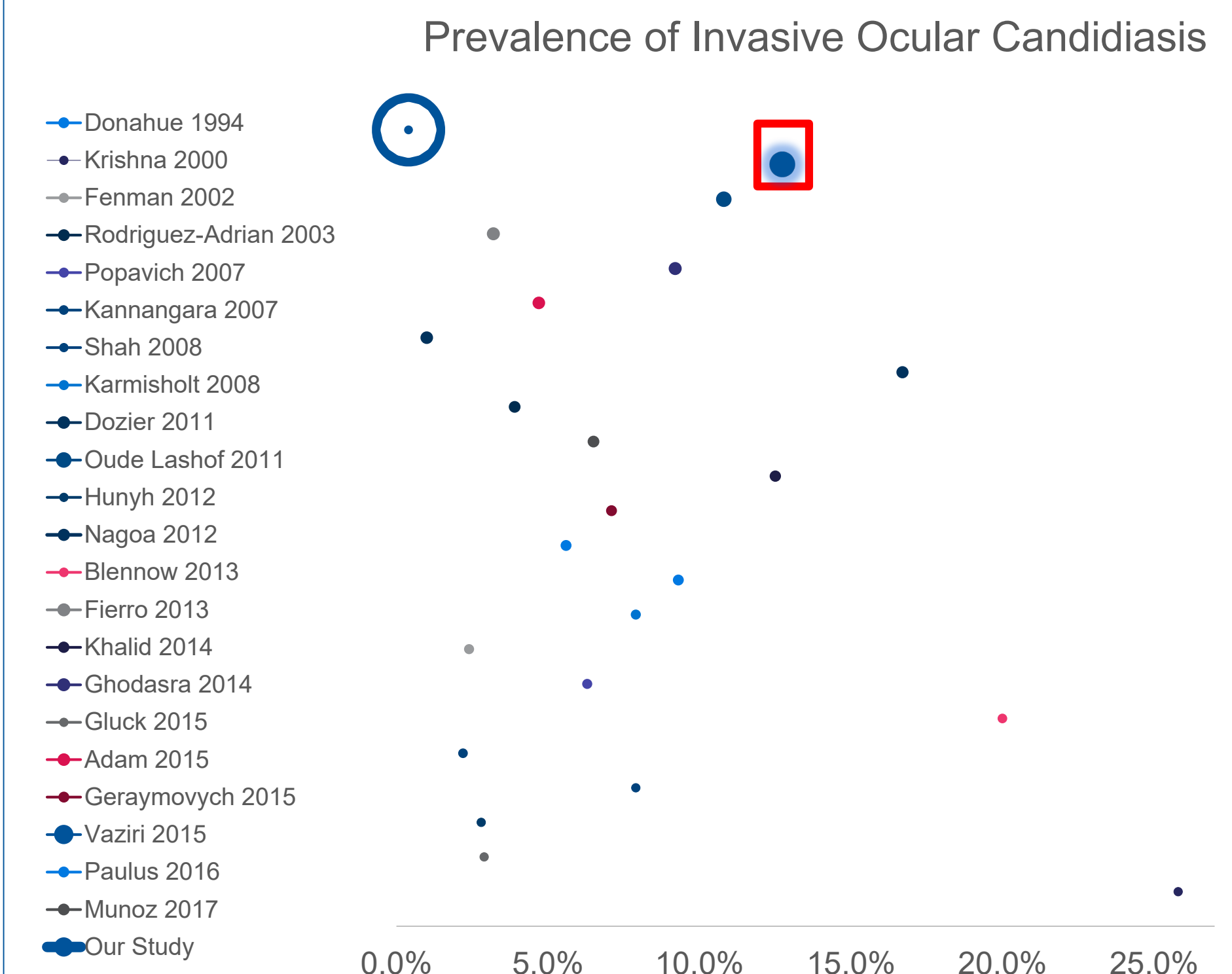
Covariate	OR (95% CI)	aOR (95% CI)	p value
Central venous catheter present	9.11 (3.94, 21.05)	9.65 (4.01, 23.19)	<0.01
Intravenous drug user	3.72 (2.13, 6.50)	4.91 (2.50, 9.63)	<0.01
Immunosuppressed (transplant or treatment)	2.85 (1.84, 4.43)	3.35 (1.87, 6.00)	<0.01
Total parenteral nutrition	2.86 (1.85, 4.41)	2.01 (1.22, 3.30)	0.01
Non-Caucasian/White	1.66 (1.12, 2.47)	1.90 (1.20, 2.99)	0.01
Male gender	1.68 (1.12, 2.51)	1.74 (1.10, 2.73)	0.02
Candida albicans	1.66 (1.12, 2.45)	1.74 (1.12, 2.69)	<0.01
Age	1.01 (1.00, 1.02)	1.02 (1.01, 1.03)	<0.01
Surgery within the last 30 days	1.37 (0.93, 2.01)	1.19 (0.77, 1.82)	0.44
Duration of candidemia (days)	1.01 (0.96, 1.07)	1.00 (0.94, 1.07)	0.98
Diabetes mellitus	0.96 (0.65, 1.42)	0.97 (0.63, 1.50)	0.88
Broad-spectrum antibiotics ≥7 days at time of candidemia	1.10 (0.75, 1.61)	0.96 (0.63, 1.48)	0.86

**171 Patients without an eye exam excluded

*Unpaired T-test, † Fisher's Exact Test, ‡ Chi-square Test, § Wilcoxon Rank Sum Test



Conclusions



- Largest cohort to date of patients with invasive ocular candidiasis examining risk factors
- Novel finding of race as a potential risk factor
- Lack of association between major surgery, duration of candidemia, broad-spectrum antibiotics and diabetes diagnosis and the diagnosis of invasive ocular candidiasis
- Support for gender and age as risk factors
- Future studies: risk calculator for patients with candidemia to determine who does and does not need an ophthalmologic exam

Purpose: determine prevalence of invasive ocular candidiasis and risk factors of invasive ocular candidiasis at three large, tertiary care centers.

