

Antifungal Susceptibility Testing Practices at Acute Care Hospitals Enrolled in NHSN, United States, 2011–2015

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Background

- More than half of *Candida* bloodstream infections (BSIs) in the United States are now caused by non-*albicans* *Candida* spp, which tend to be more drug resistant.
- Nearly 6%-12% of *C. glabrata* isolates in the U.S. have minimum inhibitory concentrations in the non-susceptible range for echinocandins.
- Timely access to antifungal susceptibility test (AFST) results is essential for effective management of invasive *Candida* infections.
- On-site AFST and reflexive susceptibility testing (done automatically without a clinician order) can reduce time to result and facilitate timely clinical management.
- The 2016 IDSA guidelines for treatment of invasive candidiasis recommend that all *Candida* isolates from invasive infections and *C. glabrata* isolates from any site be automatically tested for presence of antifungal resistance.
- Primary objective: To assess AFST availability and practices reported by acute care hospitals enrolled in the National Healthcare Safety Network (NHSN) during 2011–2015.

Methods

- We analyzed data from NHSN's Patient Safety Component - Annual Hospital Survey collected during 2011 – 2015.
- The survey is required by all hospitals participating in NHSN. We captured data from almost 5,000 U.S. acute care facilities; psychiatric, inpatient rehabilitation, and long-term care facilities were excluded.
- A wide range of information was collected including:
 - Hospital medical school affiliation, bed size
 - Microbiology laboratory practices, specifically:
 - Whether the facility offers any AFST
 - Whether the facility has an on-site laboratory to perform AFST
 - Whether AFST is performed reflexively when *Candida* is isolated from a sterile body site without needing a specific order for AFST from the clinician
 - Which antifungal drugs are tested for reflexively
- Availability of AFST was assessed by hospital characteristics and over time.
- McNemar's test was used to assess changes between 2011 and 2015 in availability of on-site AFST, reflexive AFST, and that reported in both 2011 and 2015.
- Because general acute care facilities represented the largest analyzable group of hospitals and are likely to have the highest burden of invasive *Candida* infections, we assessed characteristics of acute care hospitals in relation to offering AFST.
- Logistic regression was used to model factors associated with a facility offering reflexive AFST.

Results

- Completed surveys were available from a total of 4731 acute care hospitals in the most recent years of NHSN data.
 - 3586 hospitals responded to the survey both in 2011 and 2015.
- In 2015, 95% of hospitals reported capability for antifungal susceptibility testing but only 17% conducted on-site AFST.

Table 1: Type of hospital and availability of antifungal susceptibility testing among respondents to the NHSN Annual Hospital Survey (n=4731)

Facility Type	No. of facilities	Any AFST offered n (%)	Onsite AFST n (%)	Reflexive AFST offered for		
				Fluconazole n (%)	Other azoles n (%)	Echinocandins n (%)
Acute care hospitals	3504	3336 (95.2)	570 (16.3)	1,074 (30.7)	864 (24.7)	785 (22.4)
Pediatric hospitals	86	85 (98.8)	31 (36.0)	47 (54.7)	42 (48.8)	40 (46.5)
Oncology hospitals	17	17 (100.0)	9 (52.9)	11 (64.7)	9 (52.9)	9 (52.9)
Critical access hospitals	827	782 (94.5)	53 (6.4)	193 (23.3)	148 (17.9)	134 (16.2)
Other*	297	281 (94.6)	33(11.1)	97 (32.7)	72 (24.2)	63 (21.2)

Other includes

Figure 1: Comparison of availability of reflexive AFST in 2011 and 2015 among NHSN facilities that completed the Annual Hospital Survey in both years (n=3586)

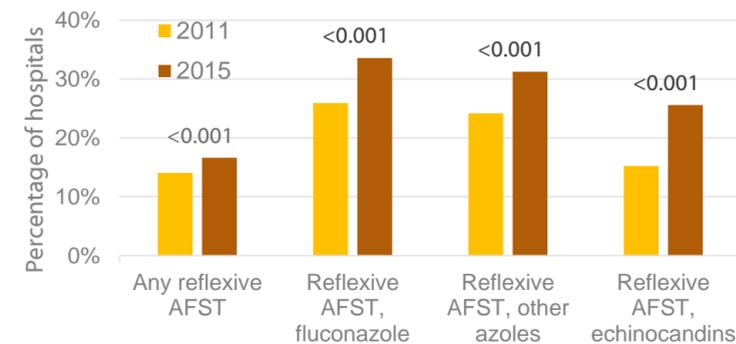


Table 2: Characteristics of NHSN general acute care hospitals and availability of AFST (n=3504)

Variable	No. of facilities	Any AFST offered n (%)	Any reflexive AFST offered n (%)	Reflexive AFST offered for		
				Fluconazole n (%)	Other azoles n (%)	Echinocandins n (%)
Medical School affiliation						
Yes	1166	1130 (96.9)	502 (43.1)	470 (40.3)	386 (33.1)	349 (29.9)
No	2338	2206 (94.4)	647 (27.6)	604 (25.8)	478 (20.4)	436 (18.6)
Number of Beds						
0-100	1285	1215 (94.6)	318 (26.2)	286 (22.3)	219 (17.0)	205 (16.0)
101-200	927	880 (94.9)	295 (31.8)	275 (29.7)	228 (24.6)	204 (22.0)
201-500	1040	991 (95.3)	385 (37.0)	371 (35.7)	302 (29.0)	269 (25.9)
>500	252	252 (99.2)	151 (59.9)	142 (56.3)	115 (45.6)	107 (42.5)
On-site laboratory						
Yes	570	570 (100)	493 (86.5)	467 (81.9)	365 (64.0)	348 (61.1)
No	2934	2766 (94.3)	656 (22.4)	607 (20.7)	499 (17.0)	437 (14.9)

Table 3: Multi-variable analysis of factors associated with offering reflexive AFST among general acute care hospitals in NHSN (n=3504; * denotes statistically significant factors in the logistic regression model).

Variable	Any reflexive AFST offered OR (95% CI)	Fluconazole OR (95% CI)	Other azoles OR (95% CI)	Echinocandins OR (95% CI)
Medical School affiliation yes vs no	1.42 (1.20-1.67)*	1.35 (1.14-1.59)*	1.26 (1.07-1.50)*	1.25 (1.05-1.49)*
No. Beds: 101-200 vs 0-100	1.05 (0.87-1.25)	1.13 (0.93-1.35)	1.26 (1.04-1.52)*	1.20 (0.98-1.47)
No. Beds: 201-500 vs 0-100	0.99 (0.83-1.20)	1.14 (0.94-1.38)	1.29 (1.06-1.57)*	1.21 (0.99-1.48)
No. Beds: >500 vs 0-100	1.15 (0.81-1.63)	1.22 (0.86-1.72)	1.35 (0.98-1.88)*	1.29 (0.92-1.80)
Laboratory onsite vs offsite	17.52 (13.9-22.0)*	14.24 (11.5-17.6)*	7.28 (6.06-8.75)*	7.57 (6.30-9.10)*

Discussion/Conclusion

- Although on-site AFST is not available at most hospitals, a majority of hospitals in NHSN offer AFST at an off-site location.
- A higher proportion of both Pediatric and Oncology hospitals perform both on-site and reflexive AFST than general acute care hospitals in NHSN.
 - Neonates and patients with malignancies are among the highest risk groups for invasive *Candida* infections and potentially drug-resistant infection. Therefore, it is reassuring that these high risk groups have some of the best access to AFST.
- Access to onsite and reflexive AFST improved significantly between 2011 and 2015.
 - However, less than one-third of all facilities offer these services as of 2015 and less than a quarter offered reflexive testing for echinocandin susceptibility.
 - There is an unmet need for on-site and reflexive AFST, especially for echinocandin susceptibility testing as echinocandins are increasingly used for first-line therapy for invasive *Candida* infection at a time when echinocandin resistance is increasing.
 - Access to these services may improve further as laboratories and hospitals adopt the 2016 IDSA guidelines to perform AFST on all *Candida* from sterile sites.
- Among acute care hospitals in NHSN, having a medical school affiliation and having an on-site laboratory that can conduct AFST were associated with offering reflexive AFST.
 - Although a higher proportion of hospitals with > 200 beds were more likely to bigger bed sizes offered these services than hospitals with < 200 beds, smaller bed sizes, size of hospital did not remain significant in the multivariable analysis, except for the model for other azoles.
- Limitations:
 - Data were self-reported by hospitals, not verified by CDC.
 - Did not collect information on if certain *Candida* spp. are referred for reflexive AFST.
- Improved access to timely AFST is essential, particularly in hospitals with high rates of *Candida* BSIs.

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