Trends in Invasive Candida Infections in Swiss Hospitals: A 15-Year Surveillance Study (2009-2023) on Species Distribution, Antifungal Resistance, and Usage Patterns

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Background

Invasive fungal infections, particularly candidemia, represent an escalating threat to global public health, causing significant morbidity and mortality, especially among immunocompromised patients[1–3]. In Switzerland, systematic nationwide surveillance of antifungal resistance remains limited[4], potentially leading to critical knowledge gaps in clinical practice[5]. Additionally, the stagnation observed in antifungal drug development further exacerbates this situation, highlighting the need for systematic antifungal stewardship and enhanced surveillance in acute care hospitals[3–5].

Objectives

- Characterize the epidemiological trends of invasive Candida infections in Switzerland over a 15-year period (2009–2023).
- Assess species distribution, antifungal resistance patterns, specifically in *Candida albicans*, *Candida glabrata*, and other *Candida spp*.
- Evaluate antifungal consumption trends across various acute care hospital settings.

Methods

- Data Sources: Blood culture isolates and systemic antifungal use data (2009–2023) were collected from acute care hospitals in the ANRESIS network. Resistance data were based on reported isolates; antifungal consumption was measured in defined daily doses (DDD) per 100 bed-days.
- Statistical Analysis: Generalized Additive Models (GAM) applied to assess resistance trends and antifungal consumption patterns over time.

Results

Species Distribution: Initial Shift Followed by Stable Species Levels

- *Candida albicans* consistently predominant (50–65%) throughout the 15-year period.
- Initial increase in *Candida glabrata* and other non-albicans species was observed, with their proportion stabilizing at approximately 45% of isolates from 2014 onward.

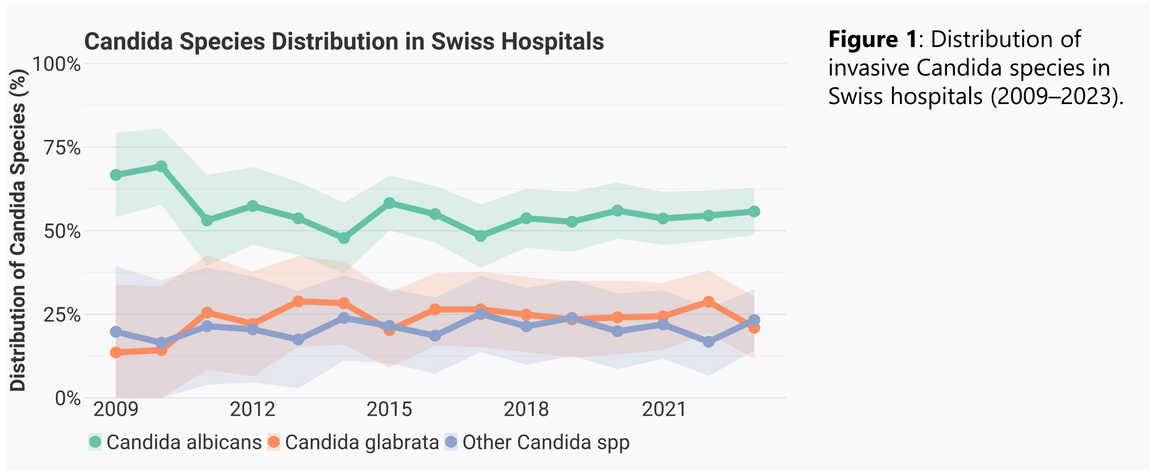

Figure 1: Distribution of invasive Candida species in Swiss hospitals (2009–2023).

Resistance: Increasing Echinocandin, Stable Azole Resistance

Resistance profiles were analyzed using agents with the most reliable breakpoints.

- Polyenes (Amphotericin B): Resistance remains consistently low across species.
- Echinocandins (Anidulafungin): Resistance shows an increase in *C. albicans*, remains highest in non-albicans species, and is stable in *C. glabrata*.
- Azoles (Fluconazole): Resistance is high in non-albicans species and remains low and stable in *C. albicans*.

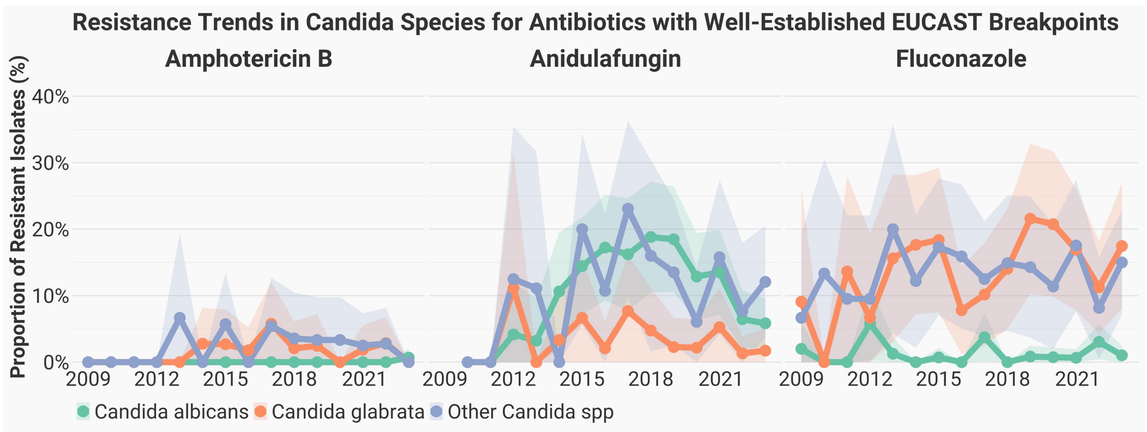

Figure 2: Resistance trends in invasive *Candida* isolates from Swiss hospitals (2009–2023). Shows resistance to fluconazole, amphotericin B, and anidulafungin in *C. albicans*, *C. glabrata*, and other species.

Consumption: Shift in Antifungal Consumption Patterns

- Echinocandins: Marked increase in use in recent years, likely due to their favorable safety profile with fewer reported adverse events.
- Newer azoles: Steady increase in use observed throughout the study period.
- Older azoles: Use declined after 2012, yet they remained the most widely used antifungal class overall.
- Amphotericin B: Gradual decrease in use over the observed period.

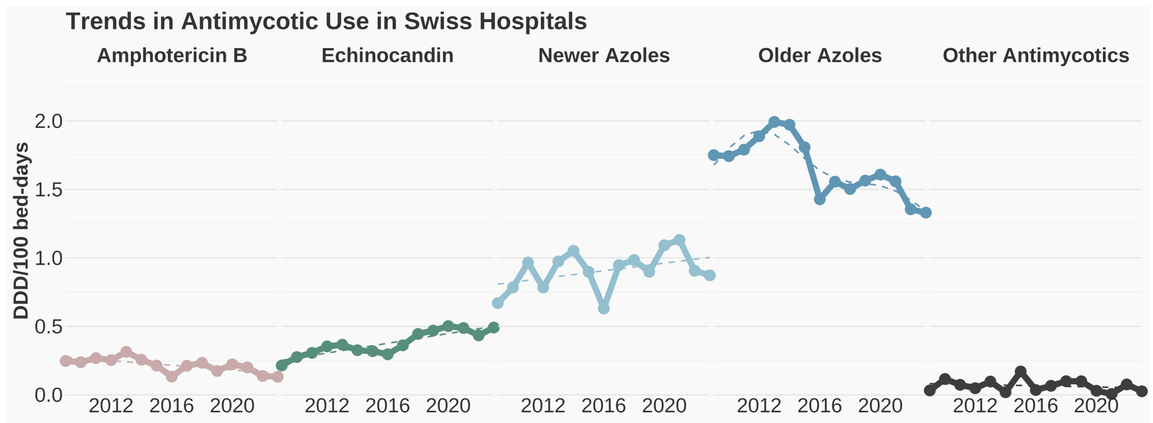

Figure 3: Annual antifungal use in Swiss inpatient settings (2009–2023), by drug class: Amphotericin B, older azoles (Fluconazole, Itraconazole), newer azoles (Voriconazole, Isavuconazole, Posaconazole), echinocandins (Caspofungin, Micafungin, Anidulafungin), and other antimycotics. Expressed in DDD per 100 bed-days.

Conclusion

- Recent species distribution appears stable; however, the earlier shift toward non-albicans Candida and increasing resistance to key antifungal agents remain concerning.
- While echinocandins show fewer adverse effects, their growing use—along with newer azoles—may be driving emerging resistance, highlighting the need for appropriate antifungal use.
- These findings highlight the importance of national antifungal surveillance and enhanced stewardship programmes to reduce resistance and improve patient outcomes.

References
[1] Denning DW et al. Lancet Infect Dis, 2024. (PMID: 38224705)[2] Casalini G et al. Lancet Microbe, 2024. (PMID: 38608682)
[3] Fisher MC et al. Nat Rev Microbiol, 2022. (PMID: 35352028) [4] Adam KM et al. Open Forum Infect Dis, 2021. (PMID: 34660836)[5] EUCAST Antifungal Breakpoints, v11.0, 2024. (www.eucast.org)

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