Letter to the Editor

Impact of antimicrobial stewardship interventions on reducing antifungal use in hospitals in Jordan

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To the Editor—Antimicrobial resistance (AMR) poses a significant threat to health and human development worldwide. The overuse and misuse of antimicrobials has increased the risk of emergence and spread of AMR globally.1 Recent developments in antifungal resistance have highlighted the importance of implementing effective antifungal stewardship in hospitals and the need to do so.2 Whereas significant work has been done to describe and evaluate antibiotic stewardship interventions in hospitals, experience with antifungal stewardship interventions is limited. In February 2018, King Abdullah University Hospital (KAUH), a 533-bed tertiary teaching hospital in Jordan, implemented an overarching antimicrobial restriction policy and feedback.4

A key intervention was the strict antifungal approval policy, which required that a prescriber seek approval from an infectious diseases consultant before using conventional amphotericin B, caspofungin, anidulafungin, or voriconazole. The usual uses of antifungals in our hospital were mainly for prophylactic, empiric, or definitive therapies, with no or little role for pre-emptive therapy. We followed the Infectious Diseases Society of America (IDSA) guidelines for therapy.1,5 Education and awareness about appropriate use of antifungals comprised a major part of this ASP; these measures included grand rounds and regular lectures directed mainly toward healthcare providers in the hospital. They also included direct, easily accessible links integrated into the electronic medical system for information about different antifungals including dosing and dosing adjustment.

The impact of the ASP on the restricted antifungal consumption was evaluated using a segmented regression of interrupted time series.6,9 Caspofungin and anidulafungin use were grouped under the echinocandins category. In addition, the potential overall increase in awareness of the issue of antimicrobial use and resistance due to the introduced ASP interventions on the use of fluconazole was assessed. The final model was simplified by removing insignificant terms using a backward stepwise approach based on the Bayesian full information criteria (BIC). Any outliers discovered during residual diagnostics were adjusted for in the model as additive outliers.3 Analyses were performed using SCA Statistical System version 8.1 software (Scientific Computing Associates, River Forest, IL).

The average total restricted antifungal use was 0.78 DDDs per 100 OBD, and the total antifungal use (including fluconazole) was 1.81 DDDs per 100 OBD. The average conventional amphotericin B use was 0.09 DDDs per 100 OBD; echinocandin use was 0.45 DDDs per 100 OBD; voriconazole use was 0.25 DDDs per 100 OBD; and fluconazole use was 1.04 DDDs per 100 OBD. The results of our analysis of the impact of the ASP on antifungal use are presented in Table 1 (a and b). Statistically significant decreases in the level of fluconazole (regression coefficient, −0.3793; *P* = 0.0091) and total antifungal use (regression coefficient, −0.5735; *P* = 0.0108) were observed after the introduction of the ASP (Table 1b). A statistically significant...
The assessment demonstrated the impact of the ASP in a hospital with low use of antifungal agents, on average 1.8 DDDs per 100 OBD, compared with other studies.7 This trend was halted in the post-intervention period (P = .1462 and P = .5695, respectively) (Table 1a). A significant increase in the level of conventional amphotericin B (regression coefficient, 0.0870; P = .001) was observed after the introduction of the ASP. We detected no change in voriconazole use (Table 1).

The study included patients with candidiasis at a Thai tertiary care hospital. Antifungal stewardship measures.10 The use of conventional amphotericin B throughout the study was low (5% of total antifungals used). In conclusion, a multifaceted ASP contributed to a reduction in the use of antifungals in hospitalized patients. This study provides evidence supporting the efficacy of ASPs to optimize the use of antifungal agents in hospitals, and our findings emphasize the need to promote antifungal stewardship alongside antibiotic stewardship.

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References


### Table 1. Changes in Antifungal Use After the Intervention Using Segmented Regression Analysis, January 2014–December 2019

<table>
<thead>
<tr>
<th>Termsa</th>
<th>Intercept</th>
<th>P Value</th>
<th>Trend</th>
<th>P Value</th>
<th>Level Change After Intervention</th>
<th>P Value</th>
<th>Trend Change After Intervention</th>
<th>P Value</th>
<th>ARMA Adjustment (coefficient; P Value)</th>
<th>R²</th>
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<tr>
<td>(a) Full model</td>
<td>Conventional amphotericin B</td>
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<td>.0033</td>
<td>−0.0021</td>
<td>0.503</td>
<td>0.0090</td>
<td>.0518</td>
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<td></td>
<td>Echinocandins</td>
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<td>.4470</td>
<td>0.0131</td>
<td>.0000</td>
<td>−0.1109</td>
<td>.4353</td>
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<td></td>
<td>Fluconazole</td>
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<td>.0083</td>
<td>0.0193</td>
<td>.0000</td>
<td>−0.3793</td>
<td>.0091</td>
<td>−0.0241</td>
<td>.0131</td>
<td>AR1 (0.264; .00912)</td>
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<td></td>
<td>Voriconazole</td>
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<td>.3382</td>
<td>0.0037</td>
<td>.0000</td>
<td>−0.1482</td>
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<td>−0.0041</td>
<td>.4689</td>
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<td>Restricted antifungals</td>
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<td>−0.4489</td>
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<tr>
<td>(b) Most parsimonious model</td>
<td>Conventional amphotericin B</td>
<td>0.0396</td>
<td>.0092</td>
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Note. ARMA, autoregressive moving average. N/A, not applicable; AR1, first-order autocorrelation coefficient; DDD, defined daily dose; OBD, occupied bed days.

*Antibiotic use expressed as DDD/100 OBD.
To err is human, to forget is device-related: A cautionary note for endoscopists

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To the Editor—More than 5 million endoscopies are performed annually in the United States, and 1 in 1.8 million procedures is associated with a healthcare-related infection.1–3 However, the true rate of infection transmission during endoscopy is largely unrecognized because of the late onset of clinical symptoms after the procedure, underreporting, and other surveillance challenges.1–4

Risk factors for gastrointestinal (GI) infections after endoscopy include bacterial biofilm formation, inadequate decontamination, immunocompromised patients, presence of infective foci in the operating field, and equipment malfunction. Procedural endoscopies, such as variceal ligation, are associated with significantly higher infection transmission than diagnostic GI procedures.5–8

The disinfection of endoscopes involves a complicated, multistep process, and any retained object in one of its narrow channels, such as a sheath, could increase the microbial burden and the chance of an endoscopy-related infection, as illustrated by the following example.1,3,9 During a routine colonoscopy, the operator noticed resistance while advancing a vascular clipping wire through the channel. A sheath of a balloon-tipped catheter (M0058470 Boston Scientific CRE Wire-guided Esophageal/pyloric balloon dilation) was then extruded into the colonic lumen. The sheath and endoscope were withdrawn, and the procedure was completed with a different endoscope.

A standardized protocol for exposure investigation after a breach of disinfection procedure was followed.9 The last time that type of balloon-tipped catheter was used occurred 20 days prior, resulting in 20 patients having potentially been exposed. However, a tracking system linking the serial number of any endoscope in the endoscopy compromising the disinfection process in one (June 14, 2019), and in the other, leading to detachment of the exit marker (February 18, 2017). No similar cases were found in PubMed.

The root cause analysis revealed that 4 factors contributed to this incident. First, the assisting technologist was newly trained and inexperienced. Second, the rapid turnover of patients, insufficient number of endoscopes, and different models of catheters stocked heightened risk of reprocessing breakdown. Third, there was no count and verification for the number of removable components (similar to an operating-room sponge count). Last, there were 2 important design flaws. The first flaw pertains to the design of balloon sheaths and cleaning brushes. Sheaths should not be able to advance the balloon unless the sheath were removed prior to use the balloon. In contrast, the sheath of the Cook Medical balloon has a tag indicating its removal prior to insertion of the balloon, and it is also large enough that the provider would notice it prior to use the balloon. Additionally, this brand lacks a large warning flag that also precludes channel sheath entry (Fig. 1). The second flaw pertains to the cleaning brushes that are not large enough to extrude a lodged sheath because they pass through the lumen of the embedded sheath. This permits the sheath to remain, undetected, in the endoscope during the preparatory steps of reprocessing.

The Boston Scientific sheath covering the balloon is flared at each end. However, there is no tag on the sheath stating to remove it prior to use the balloon. In contrast, the sheath of the Cook Medical balloon has a tag indicating its removal prior to insertion of the balloon, and it is also large enough that the provider would not be able to advance the balloon unless the sheath were removed (Fig. 1). Additionally, because sheaths are not conventionally counted after the procedure, there is a risk of them being left unnoticed within the lumen of the endoscope channel.

The following measures would help prevent the recurrence of this process breakdown. First, manufacturers should consider modifying the design of balloon sheaths and cleaning brushes. Sheaths should...