Practical Checklist for implementation of Antifungal Stewardship Programs

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Antifungal stewardship programs (SPs) are needed to be implemented in health care facilities to limit overuse or misuse of antifungals [1,2] that was proven to be responsible for an increase in antifungal resistance [3]. Antifungal SPs were indeed demonstrated to have an impact, in particular on antifungal consumption and antifungal expenditure, according to a systematic review [4]. Moreover, this review demonstrated that active interventions including a review of prescriptions had more impact than implementation of treatment guidelines only. Thus, in line with the core elements edited by the Mycoses Study Group Education and Research Consortium [5] and the Centers for Disease Control and Prevention [6], it is of utmost importance to establish a practical checklist that may be used at each health care facility level to implement antifungal SPs.

This checklist includes the following items:
- Leadership support
- Actions to support optimal antifungal use
- Actions to monitor antifungal prescribing, use, and resistance
- Education program

LEADERSHIP SUPPORT *Essential	NEEDED TO BE ESTABLISHED AT FACILITY	
A*. Does your facility leadership provide a formal statement that supports efforts to improve antifungal use (antifungal stewardship)?	❑ **Yes**	❑ **No**
B*. Does your facility leadership ensure that antifungal stewardship activities are integrated in other boards (e.g. Drug and Sterile Medical Devices Committee, anti-infective drugs committee)?	❑ **Yes**	❑ **No**
C. Does your facility leadership promote interaction with regional health authorities such as enrolment in a regional centre for antibiotherapy, in CAQES (Contrat d'amélioration de la qualité et de l'efficience des soins) and/or in SPI (Suivi prospectif des indications)?	❑ Yes	❑ No
D. Does your facility receive any financial support for antifungal stewardship activities (e.g., support for salary, training)?	❑ Yes	❑ No
E. Does your facility leadership provide stewardship program leader(s) dedicated time to manage antifungal SP?	❑ Yes	❑ No
ACCOUNTABILITY *Essential		
A*. Does your facility have leader or co-leaders to manage antifungal SP activities?	❑ **Yes**	❑ **No**
a. Is there an infectious disease physician leader responsible for stewardship activities at your facility?	❑ Yes	❑ No
b. Is there a pharmacist leader responsible for stewardship activities at your facility?	❑ Yes	❑ No
c. Is there a leader responsible for program outcome?	❑ Yes	❑ No
B*. Does antifungal SP leaders have regularly scheduled meetings? **If yes, at what frequency:**	❑ **Yes**	❑ **No**
C. Does your facility have a formal multidisciplinary group that manage antifungal SP (e.g. antifungal group)?	❑ Yes	❑ No
D. Does staff from key support departments have sufficient time to contribute to stewardship activities? If yes, provide the dedicated time:	❑ Yes	❑ No
KEY SUPPORT FOR THE ANTIFUNGAL STEWARDSHIP PROGRAM *Does any of the staff below work with the stewardship leaders to improve antifungal use?*		
A. Pharmacists	❑ Yes	❑ No
B. Clinicians Which specialities ?	❑ Yes	❑ No
C. Infectious disease specialists	❑ Yes	❑ No
D. Mycology (Laboratory)	❑ Yes	❑ No
E. Pharmacology	❑ Yes	❑ No
F. Infection Prevention and Control	❑ Yes	❑ No
G. Information Technology (IT)	❑ Yes	❑ No
H. Nursing staff	❑ Yes	❑ No
I. Quality improvement	❑ Yes	❑ No
J. Education department	❑ Yes	❑ No

ACTIONS TO SUPPORT OPTIMAL ANTIFUNGAL USE		
POLICIES *Essential	**POLICY ESTABLISHED**	
A*. Does your facility have facility-specific treatment recommendations, based on national guidelines and local susceptibilities, to assist with antifungal selection for common clinical conditions?	❑ Yes	❑ No
B. Does your facility have implemented tools to help clinicians with the off-labelled use of antifungals?	❑ Yes	❑ No
C. Does your facility have implemented tools that help prescribers to document in the medical record or during order entry a dose, duration, and indication for all antifungal prescriptions?	❑ Yes	❑ No
SPECIFIC INTERVENTIONS TO IMPROVE ANTIFUNGAL USE *Are the following actions to improve antifungal prescribing conducted in your facility?*		
BROAD INTERVENTIONS *Essential	**ACTION PERFORMED**	
A*. Does your facility have an infectious disease telephone counselling, a bedside case management or a mobile team for antifungals?	❑ Yes	❑ No
B*. Does your facility have access to the results of both fungal culture and non-culture-based tests (e.g. biomarkers, PCR)?	❑ Yes	❑ No
C. Does your facility have access to rapid yeast and mould identification (<24h)?	❑ Yes	❑ No
D. Does a physician or pharmacist review courses of therapy for specified antifungal agents (i.e. prospective audit with feedback) at your facility? If yes, for which antifungals:	❑ Yes	❑ No
E. Is there a formal procedure for all clinicians to review the appropriateness of all antifungals after the initial orders?	❑ Yes	❑ No
F. Do specified antifungal agents need to be approved by a physician or pharmacist prior to dispensing (i.e., pre-authorization) at your facility? If yes, for which antifungals:	❑ Yes	❑ No
G. Does your facility perform antifungal use evaluation (postprescription review) for specific antifungal agents to identify opportunities to improve use? If yes, for which antifungals and at what frequency:	❑ Yes	❑ No
H. Does your facility have access to rapid diagnostic test for any fungal agent, including point of care?	❑ Yes	❑ No
I. Does your facility have access to antifungal therapeutic drug monitoring? If yes, provide the time delay before results are available:	❑ Yes	❑ No
PHARMACY-DRIVEN INTERVENTIONS *Are the following actions implemented in your facility?* *Essential	**ACTION PERFORMED**	
A*. Alerts in situations where therapy might be reevaluated or discontinued?	❑ Yes	❑ No
B. Changes from intravenous to oral antifungal therapy in appropriate situations?	❑ Yes	❑ No
C. Dose optimization (pharmacokinetics/pharmacodynamics) in cases of organ dysfunction or drug interactions, particularly for azoles?	❑ Yes	❑ No
D. A computer-assisted real-time request of all antifungal prescriptions?	❑ Yes	❑ No
DIAGNOSIS AND INFECTIONS SPECIFIC INTERVENTIONS *Does your facility have treatment recommendations to ensure optimal use of antifungals to treat the following common infections?* *Essential	**ACTION PERFORMED**	
A*. Invasive candidiasis	❑ Yes	❑ No
B*. Invasive aspergillosis	❑ Yes	❑ No
C. Mucormycosis	❑ Yes	❑ No
D. Cryptococcosis	❑ Yes	❑ No
E. Candiduria	❑ Yes	❑ No
F. Empirical invasive candidiasis	❑ Yes	❑ No
G. Antifungal prophylaxis (primary and/or secondary)	❑ Yes	❑ No

ACTIONS TO MONITOR ANTIFUNGAL PRESCRIBING, USE, AND RESISTANCE		
PROCESS MEASURES ***Essential**	**MEASURE PERFORMED**	
A*. Does your stewardship program monitor the issue of traceability?	❑ **Yes**	❑ **No**
B. Does your stewardship program monitor adherence to facility-specific treatment recommendations?	❑ Yes	❑ No
C. Does your antifungal SP monitor preauthorization interventions?	❑ Yes	❑ No
D. Does your antifungal stewardship program monitor antifungal use including implementing SPI (Suivi Prospectif des Indications)?	❑ Yes	❑ No
E. Does your facility have a local surveillance system for major invasive fungal diseases?	❑ Yes	❑ No
ANTIFUNGAL USE AND OUTCOME MEASURES ***Essential**	**MEASURE PERFORMED**	
A*. Does your facility have access to an antifungal susceptibility report?	❑ **Yes**	❑ **No**
B*. Does your facility define outcome measures (i.e. antifungal consumption, antifungal resistance, or patient-level outcomes such as treatment efficacy, adverse effects occurrence, or hospital length of stay) to follow antifungal use from year to year?	❑ **Yes**	❑ **No**
C. Does your facility produce a report on the incidence of major invasive fungal diseases?	❑ Yes	❑ No
Does your facility monitor antifungal use (consumption) at the unit and/or facility wide level by one of the following metrics:	**MEASURE PERFORMED**	
D*. At the facility level?	❑ **Yes**	❑ **No**
E*. At the unit level including intensive care unit, haematology, and pneumology?	❑ **Yes**	❑ **No**
F*. By number of grams of antifungals used per 1000 hospitalization days (Defined Daily Dose, DDD)?	❑ **Yes**	❑ **No**
G. By counts of antifungal(s) administered to patients per day (Days of Therapy; DOT)?	❑ Yes	❑ No
H. By direct expenditure for antifungals (purchasing costs)?	❑ Yes	❑ No
REPORTING INFORMATION TO STAFF ON IMPROVING ANTIFUNGAL USE AND RESISTANCE ***Essential**		
A*. Does you stewardship program share facility and/or prescriber-specific reports on antifungal use?	❑ **Yes**	❑ **No**
B*. Has a current antifungal susceptibility profile been distributed to prescribers at your facility?	❑ **Yes**	❑ **No**
C. Do prescribers ever receive direct, personalized communication about how they can improve their antifungal prescribing?	❑ Yes	❑ No
D. Does antifungal SP leaders share priorities with prescribers and/or facility leadership to improve antifungal use?	❑ Yes	❑ No

EDUCATION PROGRAM *Essential		
A*. Does your stewardship program provide education to clinicians and other relevant staff including junior doctors and residents, on improving antifungal prescribing?	❑ **Yes**	❑ **No**
B. Is there any formalization of education provided to clinicians and other relevant staff (e.g. professional development)?	❑ Yes	❑ No
C. Does your facility support the dissemination of educative message to clinicians and other relevant staff regarding antifungal optimal use (e.g. intranet channel)?	❑ Yes	❑ No

This checklist is an adaptable framework that should be used in health care facilities on a periodic basis to assess key elements and actions to ensure optimal antifungal prescribing. This practical check-list is based on the core recommendations edited by the Mycoses Study Group Education and Research Consortium. Essential items needed to be implemented as a priority were defined in this check-list by the panel experts. To implement an antifungal stewardship program, facilities will be assisted by this checklist including essential items, whereas facilities which have already an antifungal stewardship program in place will use this check-list to develop new activities. In any case, one or more knowledgeable staff is needed to determine which action is necessary and/or feasible in their setting.

To conclude, our practical recommendation to start with antifungal stewardhip activities is to:

1. Define achievable objectives according to your facility and your knowledge among the essential items of the check-list
2. Define outcome measures (e.g. antifungal consumption)
3. Share reports with prescribers and facility leadership to make them involved in antifungal stewardship program
4. Define an improvement roadmap for the next period and new objectives connected with the roadmap

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