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**Workflow from Clean to Dirty, HACCP and Inclusiveness Principles in Effective Implementation of Hospital Infection Control**

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Control of hospital infection is one of the most important issues in modern medical practice. Hospital infection is not only a potential burden on patients but also an economical burden (1). It prolongs a patient's stay in the hospital, and thus incur additional expenses for extra treatment and manpower. In some cases, other patients are deprived of the opportunity of admission. Though its importance is recognized and several manuals and guidelines have been published on the topic, hospital infection control often remains ineffective, as reflected by the frequent anecdotes in the media about unfortunate cases of hospital infection.

To implement infection control practices more effectively, this paper proposes the following: (i) a "from clean to dirty" principle, (ii) the incorporation of the notion of HACCP (Hazard Analysis and Critical Control Point), and (iii) inclusiveness.

1. I propose the use of a principle of workflow from clean to dirty in all infection control practices. "Clean" means an area free of sources of infection and "dirty" designates an area with a high possibility of becoming a source of infection. Whenever this principle cannot be followed, decontamination (ex., hand washing) is needed. Two important issues are involved.

(i) Proper design of medical units/wards and proper provisions. Patients' rooms with different risks, toilet rooms, disposal rooms, entrances, doctors' and nurses' rooms, etc. have to be located so that the above principle can be maintained (Fig. 1). Equipment should be located in the correct place.

(ii) Movement of medical staff, patients, and materials is a major source of the propagation of pathogens. It is important to check if there is an inverse flux, workflow from dirty to clean. Particular attention is required when nurses, who have the closest contact with patients, move from one ward to another.

2. HACCP consists of 1) conducting a hazard analysis, 2) determining the critical control points (CCPs), 3) establishing critical limit(s), 4) establishing a system to monitor control of the CCP, 5) establishing the corrective action to be taken when monitoring indicates that a particular CCP is not under control, 6) establishing procedures for verification to confirm that the HACCP system is working effectively, and 7) establishing documentation concerning all procedures and records appropriate to these principles and their application (2).

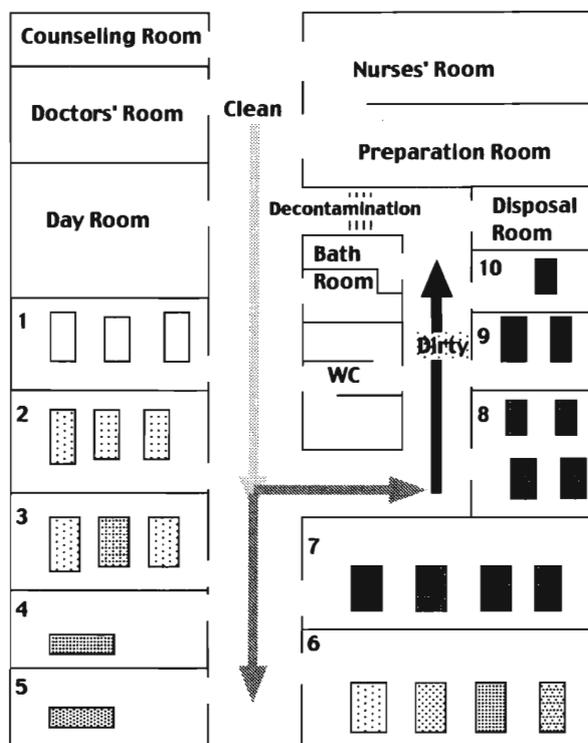


Fig. 1. Design of a ward to meet a principle of workflow from clean to dirty. Rooms 1-10: patients' rooms. Squares in each room indicate beds. Darker beds are those with a higher possibility of becoming a source of infection.

Important points of the HACCP system can be adapted to a hospital infection control system, i.e., 1) hazard analysis based on past experience of hospital infections; 2) identification of clinical settings which resulted in outbreaks, as well as establishment of CCPs; 3) evaluation of present practices based on these analyses; 4) establishment of corrective action; and 5) real-time monitoring of hospital infections, which consists of regular reports about infected patients and about bacterial isolation, all the while taking into account geographical distribution (Fig. 2). Identification of potential sources of infection and sharing the information with the entire medical staff of a particular unit is important for establishing proper infection control measures. Monitoring is not just for the purpose of creating good reports. It is first and foremost for preventing the spread of hospital infections. Hospital records should include essential information, but they should not be so detailed as

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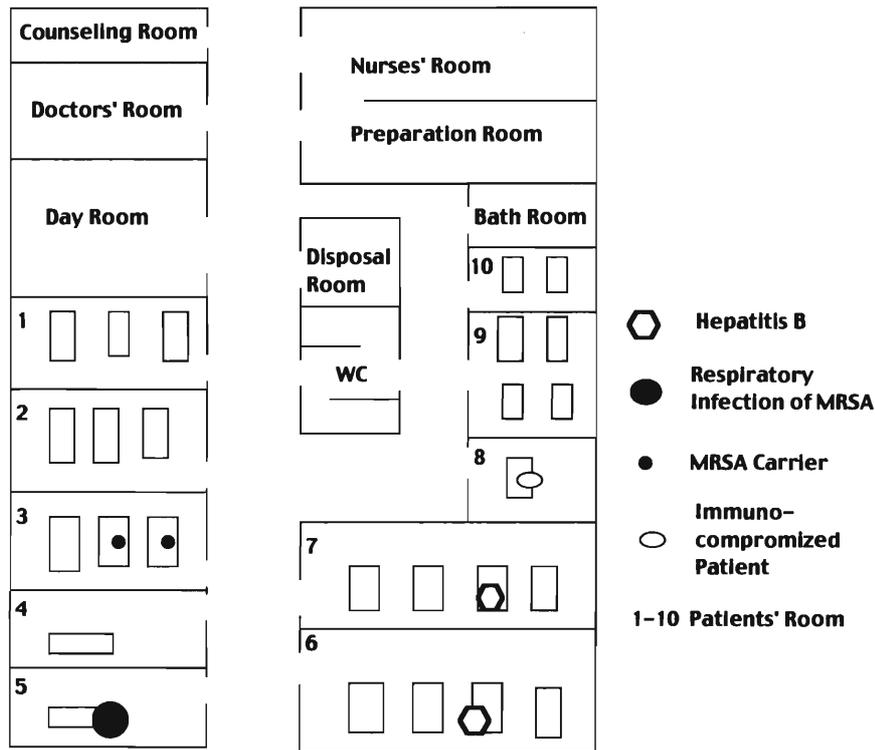


Fig. 2. Infection status depicted on a map of a ward.

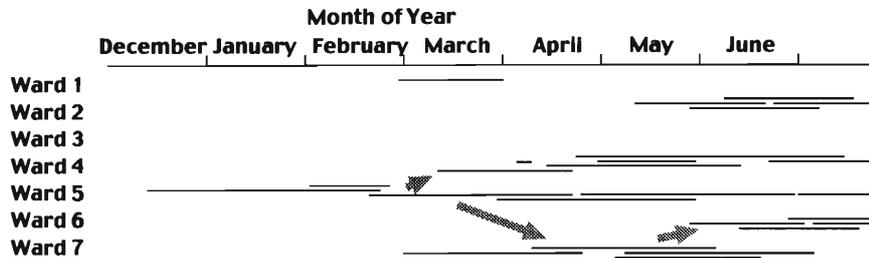


Fig. 3. Hypothetical case of an MRSA outbreak in a hospital. Each line represents a patient with MRSA (methicillin-resistant *Staphylococcus aureus*). In this example, ward 5 (brain surgery unit) is the first source of MRSA.

to burden busy medical staff.

3. Inclusiveness is indispensable for the effective implementation of an infection control program. Each medical unit/ward needs to create a manual specific to that unit. The manual should be prepared by the entire staff and should be regularly scrutinized and revised by the entire staff. Such a manual is intended to save time by being simple, straightforward, specific to each unit, practicable, and supported by the entire staff. Published manuals are to be used only as references.

Recommendations appearing in several manuals should be incorporated into infection control programs. Such recommendations may include a list of duties for which the infection control committee is responsible, as well as roles played by infection control doctors and nurses, and an account of effective

uses of microbiological surveillance data, etc. Though each unit should have its own manual, each hospital should have one general guideline to organize activities in different units into a coherent whole. The monitoring of infections, as shown in Fig. 3, is of great use.

#### REFERENCES

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