

# STANDARD PRECAUTIONS AND ADDITIONAL PRECAUTIONS: AUDIT ON THE KNOWLEDGE, ATTITUDES, AND PRACTICES OF HEALTHCARE PROFESSIONALS

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## Abstract

**Introduction** Preventing the transmission of microorganisms in healthcare settings is a major challenge that relies on shared individual foundations and collective will. The concerning epidemiology of multi-resistant bacteria (MRB) in certain departments (such as intensive care units, hemodialysis units, etc.), the emergence of potentially epidemic infectious phenomena, and the immunological status of patients (patients under immunosuppressive therapy or chemotherapy) necessitate the implementation of standard precautions (SP) and sometimes additional precautions (AP) aimed at protecting both healthcare workers and patients. To date, SP and AP are not fully assimilated by healthcare personnel, and their essential implementation remains imperfect. **Objective:** To assess the knowledge, attitudes, and practices of healthcare professionals regarding standard precautions and additional precautions. **Materials and methods:** This study is an audit of the knowledge, attitudes, and practices of healthcare personnel working in the medical intensive care unit, emergency department, hematology department, and nephrology department of CHU Béni Messous, using a self-administered anonymous questionnaire. The audit was conducted from February 14th to March 10th, 2023. Data entry and analysis were performed using EPI INFO software. **Results:** A total of 150 questionnaires were distributed among the 4 departments included in the audit. The sex ratio is 0.5, and the average length of service is  $9.66 \pm 7.66$  years. 56% of the surveyed personnel hold the rank of Public Health Nurse, 33% are nursing assistants, and 11% are nursing students. 82.2% of the surveyed personnel knew that standard precautions aim to protect both healthcare workers and patients. 71.1% of healthcare workers believe that standard precautions should apply to all patients, while 25.6% think they should only be applied to patients carrying multi-resistant bacteria. Different categories recognize hand hygiene (HH) as the most effective measure to limit the transmission of infectious agents in 64% of cases, and glove use in 27% of cases, but they report that they perform hand rubbing with alcohol-based solutions before placing a Huber needle in only 17.8% of cases and before a venous sampling in 24.4% of cases. Regarding the management of healthcare waste, the surveyed personnel report working with the sharp object puncture-resistant container nearby in 40% of cases, but they never check the fill level before the procedure in 20% of cases. Additional precautions are not always applied to patients in aplasia; personalized individual equipment (thermometer, blood pressure cuff, stethoscope, etc.) is not provided in 58.1% of cases, and hand rubbing with alcohol-based solutions at the entrance of the room is not performed in 24.4% of cases. Half of the personnel are unfamiliar with the protocol for managing Accidental Exposure to Blood (AEB). **Conclusion:** This analysis highlighted an inadequacy in the level of general knowledge of standard and additional precautions. The level of qualification of personnel is an important factor in the management and control of infectious risk.

**Index Terms:** Audit, Standard Precautions, Additional Precautions. Multi-Resistant Bacteria, Accidental Exposure to Blood.

## I. INTRODUCTION

Healthcare-associated infections (HAIs) are the most common complications of hospitalization, increasing the average length of stay by 2 to 7 days. They are responsible for serious adverse events, especially in patients with weakened immune systems such as premature infants, dialysis patients, severe burn victims, AIDS patients, leukemia patients, organ or bone marrow transplant recipients, and patients undergoing anticancer chemotherapy.

Preventing the transmission of microorganisms in healthcare settings relies on shared individual responsibility and collective willingness. Standard precautions (SPs) are the cornerstone of infectious risk control, and in certain situations, they must be supplemented by additional precautions (APs) tailored to the mode of transmission of infectious agents. The concerning epidemiology of multidrug-resistant organisms (MDROs), particularly in high-risk settings such as intensive care units and hemodialysis units, the emergence of potentially epidemic infectious phenomena, and the immunological status of patients, necessitate the implementation of standard precautions (SPs) and sometimes additional precautions (APs) to protect both healthcare workers and patients. To date, SPs and APs are not fully assimilated by healthcare personnel, and their essential implementation remains imperfect.

The main Objective: Assess the knowledge, attitudes, and practices of healthcare professionals regarding standard precautions (SPs) and additional precautions (APs) and secondary Objectives

Control the transmission of infectious agents in healthcare facilities, particularly cross-transmission. Enable our institution to better target the information and training actions to be implemented.

## II. MATERIALS AND METHODOLOGY:

This is an audit of the knowledge, attitudes, and practices of healthcare personnel working in the medical resuscitation, medical emergency, hematology, and nephrology departments of CHU Béni Messous, using a self-administered anonymous questionnaire.

The audit took place from February 14th to March 10th, 2023. Data entry and analysis were performed using EPI INFO software.

## III. RESULTS

In total, 150 questionnaires were distributed across 4 departments: medical emergencies, nephrology in 29% and 27% of cases respectively, hematology and intensive care unit in 22% of cases each. The surveyed staff consisted of Public Health Nurses in 56% of cases, nursing assistants in 33% of cases, and nursing students in 11% of cases. The sex ratio is 0.5 (meaning two women for every man), with an average seniority of  $9.66 \pm 7.66$  years. Types of care performed on the morning of the audit:

intramuscular injection = 64.4%, direct intravenous injection = 93.2%, subcutaneous injection = 23%, disconnecting a central venous catheter needle = 66.7%, dressing with sharp object = 29.5%, blood sampling = 80%, urinary catheterization = 48.9%.

### 1. Attitude of audited personnel towards the application of standard precautions

**Table 1: On what occasions do you perform hand hygiene?**

| What hand hygiene do you perform: | Mild soap |      | Hydroalcoholic solution |      | Antiseptic soap |      | nothing   |      |
|-----------------------------------|-----------|------|-------------------------|------|-----------------|------|-----------|------|
|                                   | Effective | %    | Effective               | %    | Effective       | %    | Effective | %    |
| after glove removal               | 56        | 62.2 | 20                      | 22.2 | 28              | 31.1 | 2         | 2.2  |
| before venipuncture               | 48        | 53.3 | 22                      | 24.4 | 28              | 31.1 | 8         | 8.9  |
| before placing a Huber needle     | 36        | 40   | 16                      | 17.8 | 30              | 33.1 | 8         | 8.9  |
| before emptying a urine collector | 48        | 53.3 | 18                      | 20   | 22              | 24.4 | 14        | 15.6 |
| after emptying a urine collector  | 48        | 53.3 | 16                      | 17.8 | 48              | 31.1 | 10        | 11.1 |

Only 17.8% perform hand rubbing with an hydroalcoholic solution before placing a Huber needle and 24.4% before venipuncture. 11.1% of the audited personnel report that they do not perform any hand disinfection after emptying a urine collector.

**Table 2: Wearing gloves**

| Type of care                                  | Always    |      | often     |      | sometimes |      | never     |      |
|---|-----------|------|-----------|------|-----------|------|-----------|------|
|   | Effective | %    | Effective | %    | Effective | %    | Effective | %    |
| Subcutaneous, Intramuscular                   | 26        | 28.9 | 18        | 20   | 28        | 31   | 18        | 20   |
| Blood culture                                 | 78        | 88.6 | 2         | 2.3  | 2         | 2.3  | 6         | 6.8  |
| Placing a venous access                       | 70        | 77.8 | 18        | 20   | 0         | 0    | 2         | 2.2  |
| Removing a venous access                      | 60        | 68.2 | 14        | 15.9 | 12        | 13.6 | 2         | 2.3  |
| Handling specimen tubes                       | 52        | 57.8 | 14        | 15.6 | 8         | 8.9  | 16        | 17.8 |
| Emptying a urine collector                    | 76        | 84.4 | 4         | 4.4  | 6         | 6.7  | 4         | 4.4  |
| Performing a procedure at risk of needlestick | 76        | 84.4 | 10        | 11.1 | 0         | 0    | 4         | 4.4  |
| If your hands are injured                     | 62        | 68.9 | 8         | 8.9  | 16        | 17.8 | 4         | 4.4  |
| Performing nursing care                       | 68        | 77.3 | 6         | 6.8  | 8         | 9.1  | 6         | 6.8  |

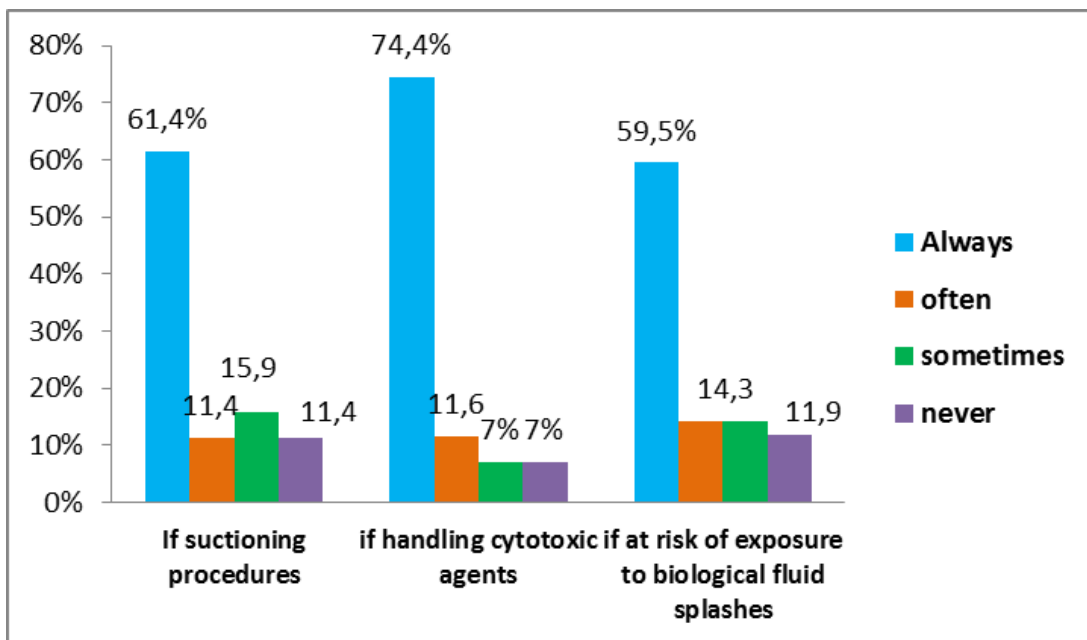
Healthcare workers report wearing gloves for procedures at risk of needlestick and/or when emptying a urine collector in 84.4% of cases, but they do not wear gloves when handling specimen tubes in 17.8% of cases.

**Table 3: Wearing a protective gown**

| Do you wear protective gowns for:    | Always    |      | often     |      | sometimes |      | never     |      |
|--------------------------------------|-----------|------|-----------|------|-----------|------|-----------|------|
|                                      | Effective | %    | Effective | %    | Effective | %    | Effective | %    |
| Suctioning procedures                | 26        | 29.5 | 10        | 11.4 | 20        | 22.7 | 32        | 36.4 |
| Dressing with irrigation             | 24        | 27.3 | 14        | 15.9 | 30        | 34.1 | 20        | 22.7 |
| When handling cytotoxic agents       | 61        | 70.5 | 6         | 6.8  | 8         | 9.1  | 12        | 13.6 |
| When handling contaminated materials | 34        | 38.6 | 16        | 18.2 | 12        | 13.6 | 26        | 29.5 |

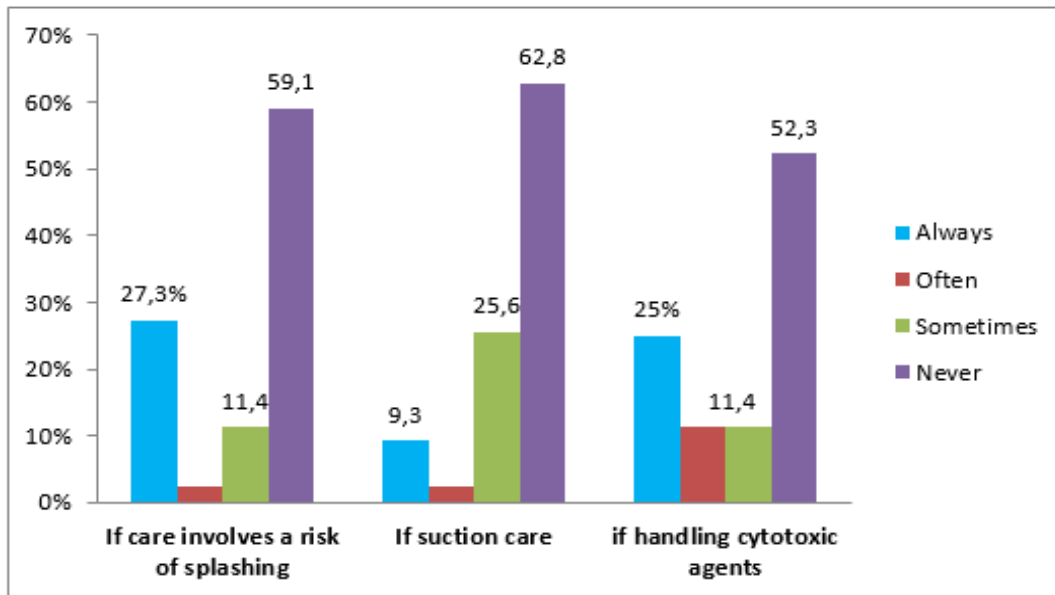
Wearing protective gowns when there is a risk of exposure to biological fluids is not carried out for suctioning procedures in 36.4% and for dressing changes with irrigation in 22.7% of cases according to the declarations of the audited personnel. However, when handling cytotoxic agents, two-thirds of the personnel wear protective gowns.

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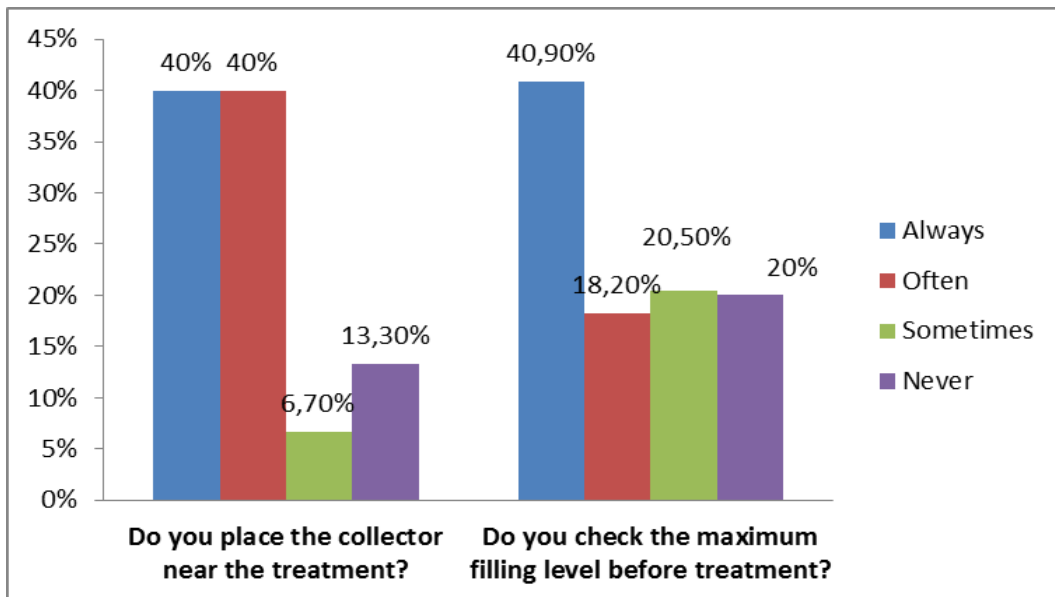
**Figure 1: Wearing a mask during procedures according to the declarations of the audited personnel**

The staff reports wearing masks for suction care in 61.4% of cases, during handling of cytotoxic products in 74.4% of cases, and when there is a risk of splashing or aerosolization of blood, or any other human-origin product (tracheobronchial aspiration, endoscopy, intubation, etc.) in 59.5% of cases.



**Figure 2: Wearing goggles during care, according to the statements of the audited staff**

The audited staff report wearing protective glasses always when there is a risk of splashing in 9.3% of cases, when handling cytotoxic products in 25% of cases, and when performing care involving a risk of biological fluid splashing in 27.3% of cases.



**Figure 3: Sharp Object Collector (SOC)**

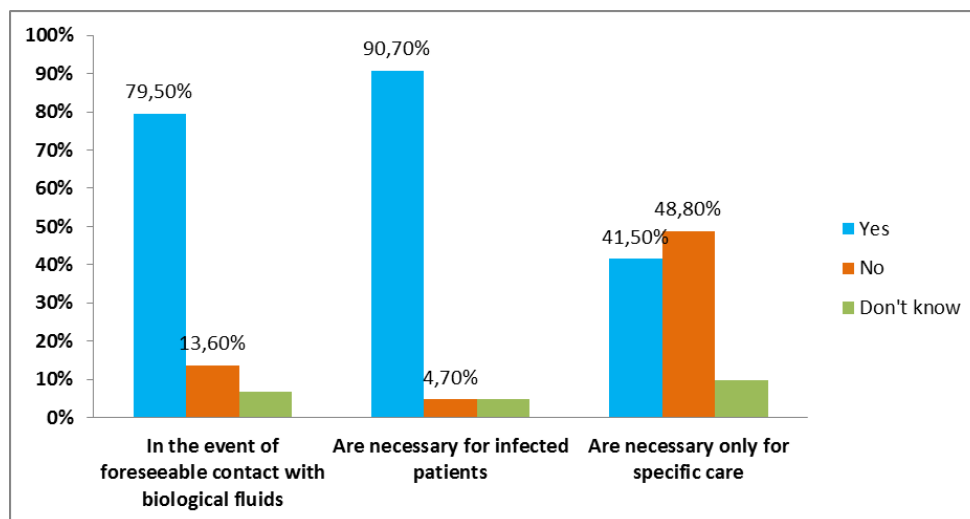
The audited staff report always working with the sharp object collector (SOC) nearby in 40% of cases, but they never check the filling level before treatment in 20% of cases.

## Competence of the audited staff regarding the application of additional precautions

**Table 3: Your attitude towards patients in profound aplasia**

|   | Always      | Often       | Sometimes   | Never       |
|---|-------------|-------------|-------------|-------------|
|   | %           | %           | %           | %           |
| <b>Signaling</b>  | <b>60.5</b> | <b>18.6</b> | <b>11.6</b> | <b>9.3</b>  |
| Single room   | 33.3        | 26.7        | 20          | 20          |
| Grouping of patients with the same pathology  | 11.6        | 18.6        | 30.2        | 39.5        |
| <b>Mandatory hairnet</b>  | <b>32.6</b> | <b>16.3</b> | <b>20.9</b> | <b>30.2</b> |
| <b>Uniform or gown required each time you enter the isolation area</b>              | <b>43.2</b> | <b>6.8</b>  | <b>22.7</b> | <b>27.3</b> |
| <b>Over shoes</b>   | <b>50</b>   | <b>11.4</b> | <b>15.9</b> | <b>22.7</b> |
| <b>Individual equipment (thermometer, blood pressure cuff, stethoscope...)</b>      | <b>18.6</b> | <b>14</b>   | <b>9.3</b>  | <b>58.1</b> |
| <b>Hand rubbing with hydro-alcoholic solution (HAS) at the entrance of the room</b> | <b>31.1</b> | <b>22.2</b> | <b>22.2</b> | <b>24.4</b> |
| <b>Limited visits</b>   | <b>40.9</b> | <b>15.9</b> | <b>22.7</b> | <b>20.5</b> |

Additional precautions are not always implemented with regard to patients in deep aplasia according to statements from the audited staff: patients are isolated in only 1/3 of cases, rooms are never marked in 9.3% of cases, personalized individual equipment (thermometer, blood pressure cuff, stethoscope...) is not provided in 58.1% of cases, and hand rubbing with hydro-alcoholic solution at the entrance of the room is never carried out in 24.4% of cases.



**Figure 4: Knowledge of surveyed staff regarding situations at risk requiring the implementation of Standard Precautions**

Management in case of accidents with exposure to blood or biological products. Nearly half of the surveyed staff reported having experienced an accidents with exposure to

blood or biological products (45.5%). Only 15.6% of caregivers reported their accidents with exposure to blood or biological products to occupational health services. Reasons for not reporting AES: 25.5% believe they know the patient's virological status, 17.9% due to lack of time, and 2.6% due to ignorance of the procedure. Only half of the surveyed staff know that they should wash the skin wound with soap, and 68.2% know that they should disinfect with Dakin solution or diluted bleach in case of accidents. Contacting occupational health services is known to almost all of the surveyed staff (93.3% of cases).

### **Procedure to follow in the event of an accident with exposure to blood or biological products.**

Nearly half of the surveyed staff report having experienced an accident with exposure to blood or biological products (45.5%), with 50% being nurses and 60.9% being nursing assistants. Only 15.6% of healthcare workers reported their accident with exposure to blood or biological products to occupational health.

Reasons for not reporting accident with exposure to blood or biological products: 25.5% believe they know the patient's virological status, 17.9% due to lack of time, and 2.6% due to unfamiliarity with the procedure.

Only half of the surveyed staff know that a skin wound should be washed with soap, and 68.2% know that it should be disinfected with Dakin's solution or diluted bleach in case of accident with exposure to blood or biological products.

Almost all surveyed staff are aware of the need to contact occupational health (93.3% of cases).

## **IV. DISCUSSION**

The audit was conducted in 4 high-risk departments: medical emergencies, nephrology in 29% and 27% of cases respectively, hematology and intensive care unit in 22% of cases each. The sex ratio is 0.5, and nearly two-thirds of the surveyed staff have less than 10 years of seniority. Following this analysis, we have identified an inadequacy in the implementation of standard precautions and additional precautions during care procedures. Hand hygiene, recognized by 64% of the surveyed staff as the most effective measure to limit the transmission of infectious agents, is not always performed before and after each procedure or care. It is evident that the lack of liquid soap or hand sanitizer, means of drying hands, and sometimes the unavailability of protective gloves in our facility remain the main reasons for the lack of adherence to standard precautions.

Providing hand sanitizer and dispensers of the same solution near the point of care (e.g., beside the patient's bed) has improved handwashing compliance in many facilities. 17.8% of the personnel report handling specimen tubes without wearing gloves. Personal protective equipment is not always worn by staff for high-risk procedures. Regarding the management of healthcare waste, the surveyed staff indicates that in 40% of cases, they always place the sharp object puncture-resistant container (SOPRC) nearby, but never



check the fill level before the procedure in 20% of cases. Additionally, they mention covering contaminated needles in 20% of cases and continuing to manually remove a contaminated needle in 42.2% of cases. This practice increases the risk of accidents, especially when it involves manual recapping<sup>18, 19, 20, 21</sup>. This explains the high number of accidents involving exposure to blood and biological fluids, as nearly half of the surveyed personnel report experiencing such accidents (45.5%). These figures are similar to those reported by Beghdadli B et al.<sup>22</sup>

The group most affected by blood exposure accidents is that of public health nurses, accounting for 50% of cases, followed by nursing assistants, who are involved in 60.9% of situations. In France, accidents mainly affect nursing staff<sup>23, 24, 25</sup>.

Many of these accidents could have been avoided if standard precautions were followed<sup>22, 24, 26</sup>. Only 15.6% of caregivers reported their accidents to occupational health services. Additional precautions are not always applied to patients in aplasia; personalized individual equipment (thermometer, blood pressure cuff, stethoscope, etc.) is not provided in 58.1% of cases, and hand rubbing with alcohol-based solution at the entrance of the room is not performed in 24.4% of cases.

Caregivers recognize that the application of standard precautions is necessary for infected patients in 90.7% of cases and in case of foreseeable contact with biological fluids in 79.5% of cases.

The level of qualification of personnel is an important factor in the management and control of infectious risk, which is closely linked to initial and ongoing training. However, nursing assistants have received training on standard precautions and additional precautions in only 8.3% since they started working, compared to 83.3% for public health nurses. Similarly, for initial training, only 28.6% of nursing assistants received it compared to 60% of public health nurses.

Some authors have been able to improve compliance with standard precautions through awareness-raising and staff training initiatives<sup>27, 28, 29, 30</sup>, which have also led to a reduction in the incidence of blood exposure accidents<sup>31</sup>.

## V. CONCLUSION

Multi-resistant bacteria and "emerging" bacteria are part of our daily reality and will continue to be so for several years to come. Adherence to standard and additional precautions is increasingly becoming an undeniable necessity! Managing risks does not mean "eliminating all risks" but rather defining the best strategy to manage them and to cope with their consequences. Awareness-raising and training initiatives will be prioritized for all professional categories, taking into account this data and in accordance with universal standards. A subsequent evaluation will be conducted to assess the effectiveness of the implemented measures.



## References

- 1) Judlin P. Les infections nosocomiales en obstétrique. Hygiènes 1998; hors série: 4-7.
- 2) National Nosocomial Infections Surveillance (NNIS) System Report. Data report from January 1992-June 2001, issued Auguste 2001. Am J Infect Control 2001; 29: 404-21.
- 3) Haley RW, Culver DH, White JW, Meade MW, Emori TG, Munn VP. The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. Am J Epidemiol 1984; 121: 182-205.
- 4) Sax H, Posfay-Barbe K, Harbarth S, et al. Control of a cluster of community-associated, methicillin-resistant *Staphylococcus aureus* in neonatology. J Hosp Infect 2006; 63(1): 93-100.
- 5) Gehanno JF, Kohen-Couderc L, Lemeland JF, Leroy J. Nosocomial meningococemia in a physician. Infect Control Hosp Epidemiol 1999; 20(8): 564-565.
- 6) Scales DC, Green K, Chan AK, et al. Illness in intensive care staff after brief exposure to severe acute respiratory syndrome. Emerg Infect Dis 2003; 9(10): 1205-1210.
- 7) Seto WH, Tsang D, Yung RW, et al. Effectiveness of precautions against droplets and contact in prevention of nosocomial transmission of severe acute respiratory syndrome (SARS). Lancet 2003; 361(9368): 1519-1520.
- 8) Directives nationales de l'hygiène de l'environnement des établissements de soins publics et privés Guide technique MSPRH Direction générale de la prévention et de la promotion de la santé. Edition 2015
- 9) Centers for Disease Control and Prevention. Prevention of HIV transmission. MM WR 1987; 36 suppl 2S: S3-S18.
- 10) US Department of Labor. Occupational Safety and Health Administration 29 CFR Part 1910. 1030 occupational exposure to bloodborne pathogens; needlestick and other sharps injuries; final rule. Federal Register 2001; 66(12): 5317-5325. As amended from and includes Federal Register 1991 29 CFR Part 1910. 1030 occupational exposure to blood-borne pathogens; final rule. 2001, 56(235):64174-64182.
- 11) Bridges CB, Kuehnert MJ, Hall CB. Transmission of influenza: implications for control in health care settings. Clin Infect Dis 2003; 37(8): 1094-1101.
- 12) Musher DM. How contagious are common respiratory tract infections? N Engl J Med 2003; 348(13): 1256-1266.
- 13) Bassetti S, Bischoff WE, Walter M, et al. Dispersal of *Staphylococcus aureus* into the air associated with a rhinovirus infection. Infect Control Hosp Epidemiol 2005; 26(2): 196-203.
- 14) Siegel JD, Rhinehart E, Jackson M, Chiarello L, Healthcare Infection Control Practices Advisory Committee (HICPAC). 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings. Am J Infect Control 2007; 35(10 Suppl 2): S65-164.
- 15) Bischoff WE, Reynolds TM, Sessler CN, Edmond MB, Wenzel RP. Handwashing compliance by health care workers: The impact of introducing an accessible alcohol-based hand antiseptic. Arch Intern Med 2000; 160(7):101-21.
- 16) Creedon SA. Healthcare workers' hand decontamination practices: compliance with recommended guidelines. J Adv Nurs 2005; 51:208-16.

- 17) Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvau V, Touveneau S, Perneger TV. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. *Infection Control Programme*. *Lancet* 2000; 356:1307-12.
- 18) Henry K, Campbell S, Collier P, Williams CO. Compliance with universal precautions and needles handling and disposal practices among emergency staff at two community hospitals. *Am J Infection Control* 1994;22: 129-37.
- 19) Henry K, Campbell S, Maki M. A comparison of observed and self-reported compliance with universal precautions among emergency department personnel at a Minnesota public teaching hospital: implications for assessing infection control programs. *Ann Emerg Med* 1992; 21:940-6.
- 20) Miller KE, Krol RA, Losh DP. Universal precaution in the family physician's office. *J Fam Pract* 1992;35: 163-8.
- 21) Sadoh WE, Fawole AO, Sadoh AE, Oladimeji AO, Sotilove OS. Practice of universal precautions among health-care workers. *J Nat Med Asso* 2006; 98:722-6.
- 22) Beghdadli B, Ghomari O, Fanello S, Kandouci AB. Les accidents d'exposition au sang: le personnel à risque dans un CHU. XXIVes Journées Méditerranéennes Internationales de Médecine du Travail. Sidi Frej-Alger- Algérie, 18- 20 mai 2007. Alger; Livre des abstracts: p 30.
- 23) Abiteboul D, Antona D, Fourrier A, Brucker G, Deschamps JM, Leprince A, Pernet M, Bouvet E. Exposition accidentelle au sang du personnel soignant. Résultats d'un an de surveillance du risque pour les infirmières dans 17 hôpitaux. *Path Biol* 1992; 40:983-9.
- 24) Raisin, Geres. Surveillance des accidents avec exposition au sang dans les établissements sanitaires français. Résultats année 2004. *Raisin* 2005: 1-79. <http://www.invs.sante.fr/raisin/>
- 25) Tarantola A, Golliot F, Astagneau P, Fleury L, Brucker G, Bouvet E, and the CCLIN Paris-Nord Blood Body Fluids (BBF) Exposure Surveillance Taskforce. Occupational blood and body fluids exposures in health care workers: Four-year surveillance from the Northern France network. *Am J Infection Control* 2003; 31:357-63.
- 26) Lot F, Abiteboul D. Contaminations professionnelles par le VIH, le VHC et le VHB chez le personnel de santé en France. Données au 31 décembre 2005. Septembre 2006: 16 p. [www.invs.santé.fr](http://www.invs.santé.fr)
- 27) El-Safie IF, Mokabel FM, Helmy FE. The relationship between the knowledge of nursing staff and their compliance to universal precautions for prevention of hepatitis B viral infection. *J Egypt Public Health Asso* 1995; 70:523-40.
- 28) Lam BCC, Lee J, Lau YL. Hand hygiene practices in a Neonatal Intensive Care Unit: A Multimodal Intervention and Impact on Nosocomial Infection. *Pediatrics* 2004; 114:565-71.
- 29) Ramsey PW, McConnell P, Palmer BH, Lee Glenn L. Nurses' Compliance with Universal Precautions before and after Implementation of OSHA Regulations. *Clin Nurse Specialist* 1996; 10:234-9.
- 30) Trick WE, Vernon MO, Welbel SF, Demais P, Hayden MK, Robert A. Weinstein and Chicago Antimicrobial Resistant Project. *Infection Control Hosp Epidemiol* 2007; 28:42-9
- 31) Tarantola A, Golliot F, Astagneau P, Fleury L, Brucker G, Bouvet E, and the CCLIN Paris-Nord Blood Body Fluids (BBF) Exposure Surveillance Taskforce. Occupational blood and body fluids exposures in health care workers: Four-year surveillance from the Northern France network. *Am J Infection Control* 2003; 31:357-63.