KNOWLEDGE AND PRACTICES OF HEALTHCARE WORKERS ON STANDARD PRECAUTIONS IN HEALTHCARE FACILITIES IN THE CITY OF KISANGANI

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ABSTRACT

Introduction: Standard precautions (SP) are essential to prevent infections in healthcare settings. However, their implementation remains insufficient in the Democratic Republic of Congo (DRC). This study assessed the level of knowledge and practices of healthcare providers regarding SP in healthcare facilities.

Materials and Methods: A cross-sectional study was conducted among 120 healthcare professionals from July 22 to August 22, 2024, in twelve healthcare facilities in the city of Kisangani. Categorical variables were presented as proportions, and quantitative variables were expressed as mean ± standard deviation or as median and interquartile range, depending on the symmetry of their distributions.

Results: The mean age of participants was 43.6 ± 11.07 years, with a female predominance (53%). The majority were nurses (58%). About 57.5% had received training on infection prevention and control (IPC). Hand hygiene (75%) and wearing professional attire (75.8%) were the most frequently cited measures, but only 77.5% actually wore their uniform. Waste management was implemented in 85.8% of cases, although 40.8% of facilities lacked a functional incinerator. Furthermore, 56.7% of professionals had already experienced a blood exposure incident (BEI).

Conclusion: The level of knowledge regarding standard precautions was low, and practices were inadequate in most cases. Institutional policies focusing on capacity building, awareness, and the provision of necessary resources are required.

KEYWORDS: Standard Precautions, healthcare professionals, infection prevention, blood exposure incidents, Democratic Republic of Congo

I.   INTRODUCTION

Environmental contamination is a source of germ transmission between patients, healthcare professionals, and other actors within short-term care settings [1].

According to the WHO World Health Report 2022, healthcare facilities are crossroads where patients, health workers, and visitors converge; therefore, they play an amplifying role in the evolution of epidemiological situations [2].

Over the past decade, the WHO Global Report on Infection Prevention and Control has shown that large-scale outbreaks—such as Ebola virus disease, Middle East respiratory syndrome coronavirus (MERS-CoV), and the COVID-19 pandemic—have demonstrated that epidemic-prone pathogens can spread rapidly within healthcare facilities. These events have highlighted existing gaps in infection control programs, regardless of a country's income level or available resources. Furthermore, other less visible health emergencies also underscore the urgent need to address deficiencies in infection control, such as the silent endemic burden of healthcare-associated infections (HAIs) and antimicrobial resistance (AMR), which put patients at risk every day across all health systems [3].

Hygiene precautions (HP), grouped under the term "standard precautions (SP)" or "universal precautions (UP)", are measures designed to protect both healthcare workers and patients from the risk of infection. These measures are based on the principle that blood, body fluids, human-derived products, broken skin, mucous membranes, and contaminated objects can all serve as sources of microorganism transmission during healthcare activities. These precautions must be applied to all patients, regardless of their infection status [4].

The introduction of the SP concept in the mid-1970s represented a major innovation in the prevention of infection risks associated with healthcare [5].

Thus defined, SP rapidly became the foundation of all risk-reduction policies. They can be structured around four main components: hand hygiene, use of personal protective equipment (PPE) (gloves, masks,

gowns, goggles), prevention of blood exposure accidents (BEA), and management of contaminated equipment and environments (MCEE) [6].

Several studies have demonstrated the positive impact of systematically implementing SP or practices included in these precautions—particularly hand hygiene. In France, the "Study Group on Healthcare Workers' Exposure Risk to Infectious Agents (GERES)" reported a 25% reduction in BEA over ten years among 1,506 nurses in medical and intensive care units, thanks to better adherence to SP [7]. It should be noted that preventable accidents through the application of SP still account for more than one-third of BEA cases reported in national surveillance in France [5]. Similarly, another study showed that wearing gloves reduced the volume of blood inoculated during a needlestick injury [8].

A systematic literature review analyzed factors positively or negatively influencing staff compliance with handwashing as a fundamental measure to prevent healthcare-associated infections. It found that compliance levels were often below 50%, particularly among physicians. The availability of sinks plays a role, but a high number of sinks does not guarantee good compliance—motivation and supervision play a more significant role [9].

Training has a positive impact when it includes an active approach, with analysis of errors and care techniques, and when it is maintained through regular assessments with feedback to the evaluated departments. Awareness of a patient's infectious status improves compliance with hygiene rules in general, which contradicts the notion of standard precautions being universally applied in most healthcare settings [9].

Some aspects require further study, such as evaluating improvements in compliance achieved through alcohol-based hand rubs, integrating handwashing into workload studies, and better defining hand hygiene indications depending on the type of contact and glove use [10].

The most feared infections were viral hepatitis (77.5%) and HIV (89.3%). Only 40.6% of healthcare staff were properly vaccinated against hepatitis B (post-vaccination serology was performed in only 1.8% of vaccinated staff). During the previous 12 months, 58.9% of staff had experienced at least one blood exposure accident (BEA), of which only 5.8% were reported. Only 65.6% of healthcare workers always wore gloves for invasive procedures, 61.5% properly disinfected their hands, and 51.2% practiced needle recapping [11].

Findings from another study showed that only 28.7% of healthcare workers had received training on SP. Furthermore, 87.7% reported washing hands between two patients, and 75.7% recognized the need to

change gloves between patients. However, the use of personal protective measures was rarely reported in many high-risk situations [12].

In another study conducted in healthcare facilities in Isiro, overall knowledge of the three main pathogens transmitted through accidental exposure to blood or other body fluids was low; almost all respondents (91.1%) had experienced at least one BEA in the previous 12 months, and needle recapping and insufficient adherence to SP were found to be associated [13].

Given the frequency and severity of BEA, and the renewed awareness of hand hygiene practices during the COVID-19 pandemic—with the promotion of alcohol-based hand rubs—the objective of this study was to assess the level of knowledge and practices of healthcare providers regarding standard precautions in healthcare settings.

II. MATERIAL AND METHODS
2.1.Material

2.1.1. Study Site

Kisangani (formerly Stanleyville or Stanleystad from 1883 to 1966) is a city in the Democratic Republic of the Congo (DRC), located in Central Africa. It is the capital of the Tshopo Province in the northeastern part of the DRC and ranks as the fifth most populous urban area in the country, with an estimated population of 1,356,640 inhabitants in 2021.

2.1.2. Study Population

The study population consisted of all healthcare professionals and healthcare facilities in the city of Kisangani, covering all ownership sectors (public, faith-based, and private).

2.2. Methods

2.2.1. Type and Period of Study

This was a descriptive cross-sectional study conducted among 120 healthcare providers during the period from July 22 to August 22, 2024.

2.2.2. Sampling

Due to financial, time, and geographical constraints, convenience sampling was used.
Twelve healthcare facilities were randomly selected (four public, four faith-based, and four private) from the exhaustive list of healthcare facilities located on the right bank of the Congo River in Kisangani, based on the inclusion criteria below.

All professional categories were included: physicians, nurses, midwives, laboratory technicians, and cleaning staff.

Below is the list of healthcare facilities selected by health zone:

N°	HEALTH ZONE	HELTHCARE FACILITIES
1	MANGOBO	MATETE
2		BETHSAIDA
3		ANUARITE
4	MAKISO KISANGANI	BOYOMA
5		ALWALEED
6		CELPA
7		ROSARIA
8	TSHOPO	SAINT JOSEPH
9		GLORIA
10	KABONDO	LILEMO
11		FOYER
12		REKAPI

At each healthcare facility, ten (10) healthcare providers were selected, including all professional categories present at the time of the study. The total number of participants inclusded in the study was 120.

2.2.3. Inclusion Criteria

Included in this study were:
- All healthcare facilities located in the city of Kisangani that provide secondary-level care with a capacity not exceeding 50 hospital beds (mainly Reference Health Centers, Hospital Centers, Medical Centers, and Surgical-Medical Centers), selected by simple random sampling;
- All healthcare professionals present at the facility on the day of data collection and available to participate in the study.

2.2.4. Variables of Interest

The main variables considered in this study were:
- Respondent characteristics: sex, age, professional category, qualification, years of service, ownership status of the facility (private, faith-based, public), and department;
- Knowledge: training and information on SP, definition and types of standard precautions, indications for hand hygiene, types and indications for glove use, wearing of masks and gowns, prevention and management of blood exposure accidents (BEA);
- Practices: wearing professional attire, hand hygiene (compliance and frequency), glove use (type and compliance), mask use (indications).

2.2.5. Data Collection Technique

Data were collected through face-to-face interviews using a structured questionnaire.

2.2.6. Data Analysis Techniques

Data were collected using an electronic questionnaire on smartphones via the Kobo Collect application. The data were sent directly to a server, exported to an Excel database, and then imported into STATA version 15 for analysis.

Categorical variables were described using proportions, while quantitative variables with a normal distribution were summarized using mean and standard deviation (SD).

Overall Assessment of Knowledge Level

Knowledge assessment covered the following domains :

- Types of standard precautions,
- Circumstances for using sterile gloves, non-sterile gloves, and household gloves,
- Hand hygiene practices,
- Wearing of apron/gown and surgical mask,
- Knowledge of at least three preventive measures and three management measures for BEA.

Each correct answer was scored "1 point", for a total possible score of 9 points. The knowledge level was classified as GOOD when the total score ranged between 5 and 8, and POOR when the score was below 5.

III. RESULTS

Table 1. Characteristics of the respondents

Variables N=	Categories	Frequency	Percentage
Age (Mean ± SD) (years)	43,6±11,07		
Age group	21 – 30	17	14
	31 – 40	36	30
	41 – 50	31	26
	51 – 60	30	25
	61 – 75	5	5
Sex	Male	56	47
	Female	64	53
Qualification	Doctor	10	8
	Bachelor's degree	49	40
	Graduate (Undergraduate diploma)	28	23
	Diploma (D6 or A2 level)	15	13
	Auxiliary	6	5
	Other	12	10
Professional category	Physician	12	10
	Nurse	69	58
	Laboratory technician	13	11
	Cleaning staff	26	22
Years of service (Mean ± SD) (years)	11,7±9,5		

Table I shows that the mean age of the participants was 43.6 ± 11.07 years, with the dominant age groups being 41–50 and 51–60 years. Both sexes were almost equally represented, and the majority were nurses with a bachelor's degree. The mean years of service was 11.7 ± 9.5 years.

Table 2. Training and knowledge level of the respondents

Table 2 presents the respondents' level of knowledge on standard precautions in healthcare settings.

Variables N=120	Categories	Frequency	Percentage
Training on infection prevention and control (IPC)	Yes	69	57.5
	No	51	42.5
Importance of standard precautions in healthcare settings	Protection of staff	90	75.0
	Protection of patients and others	37	30.8
	Other	6	5.0
Moments of adherence to standard precautions	Before every patient	53	44.2
	For all procedures	31	25.8
	At all times	75	62.5
	All staff	19	15.8
	Other	0	0.0
Types of universal precautions	Hand hygiene	90	75.0
	Professional attire and PPE	91	75.8
	Prevention and management of BEA	26	21.7
	Management of contaminated equipment and environment	23	19.2
Preventive measures for BEA	Wearing gloves	106	88.3
	No needle recapping	34	28.3
	No manual needle disassembly	31	25.8
	Proper management of sharp instruments	44	36.7
	Others (mask)	3	2.5
Actions to take in case of BEA	Cleaning with water or serum	67	55.8
	Disinfection	57	47.5
	Checking serological status	14	11.7

Variables N=120	Categories	Frequency	Percentage
	Reporting the accident	11	9.2
	Post-exposure prophylaxis	5	4.2
	Medical consultation	49	40.8

This table shows that approximately three-fifths of the participants had received training on IPC, and about three-quarters had a good understanding of the importance of standard precautions in healthcare settings. Hand hygiene and professional attire were the most frequently mentioned types of standard precautions. Wearing gloves was the preventive measure for BEA cited by the vast majority, while cleaning the site and disinfection were the management measures for BEA mentioned by about half of the participants.

Table 3. Knowledge of PPE and their indications

Below are the respondents' statements regarding their knowledge of PPE and its use.

Variables N=120	Categories	Frequency	Percentage
Types of PPE	Gloves	110	91.7
	Gown/Jacket	98	81.7
	Boots	82	68.3
	Overalls	19	15.8
	Goggles/Face shield	60	50.0
	Mask	95	79.2
	Hood	8	6.7
	Apron	45	37.5
Circumstances for wearing gown or professional attire	At all times	92	76.7
	Optional	9	7.5
	Patient contact	13	10.8
	Other	6	5.0
Hand hygiene practice according to WHO	Before any patient contact	98	81.7
	Before aseptic procedure	51	42.5
	After contact with patient's environment	75	62.5

Variables N=120	Categories	Frequency	Percentage
Circumstances for wearing sterile gloves	After patient contact	59	49.2
	After risk of blood exposure	35	29.2
	Surgery	83	69.2
	Deliveries	79	65.8
	Contact with sterile organs	34	28.3
Circumstances for wearing non-sterile gloves	Exposure to blood or body fluids	62	51.7
	Gynecological examination	30	25.0
	Contact with broken skin	72	60.0
Circumstances for wearing household gloves	Contact with contaminated materials	40	33.3
	Contact with environment	23	19.2
	Waste management	107	89.2
Circumstances for wearing apron or gown	Wet procedures	113	94.2
	Other	7	5.8
Circumstances for wearing mask	Respiratory infections	60	50.0
	Droplet- and airborne-transmitted diseases	83	69.2
	Other	18	15.0
Overall knowledge level	Good	35	29.17
	Poor	85	70.83

It appears from Table 3 that gloves and gowns were the most frequently mentioned PPE. The most reported circumstance for wearing professional attire was "at all times"; surgery and deliveries were the most cited circumstances for wearing sterile gloves; contact with broken skin for non-sterile gloves; waste management for household gloves; and wet procedures for aprons/gowns. For mask use, droplet- and airborne-transmitted diseases were the main indication. The overall knowledge level on universal precautions was good for about two-thirds of the participants.

Table 4. Practices regarding PPE, waste management, and BEA

The table below presents the respondents' practices regarding PPE, waste management, and blood exposure accidents (BEA).

Variables	Categories	Frequency	Percentage
Wearing professional attire is mandatory	Yes	115	95.8
	No	5	4.2
Wore professional attire	Yes	93	77.5
	No	27	22.5
Waste segregation performed	Yes	103	85.8
	No	17	14.2
Technique for collecting sharp instruments	Receptacle	49	40.8
	Together with other waste	13	10.8
	Other appropriate containers	58	48.3
Functional incinerator present	Yes	71	59.2
	No	49	40.8
Ever experienced a BEA	Yes	68	56.7
	No	52	43.3
Availability of BEA reporting register	Yes	54	45.0
	No	66	55.0
Practices	Adequate	36	30.0
	Inadequate	84	70.0

From this table, it can be seen that almost all participants acknowledged the mandatory nature of wearing professional attire, but about one-quarter were not wearing it. More than four-fifths of healthcare facilities performed waste segregation, and the most used method for collecting sharps was "other appropriate containers". In about three-fifths of cases, healthcare providers had already experienced a BEA; three-fifths of facilities had a functional incinerator, and less than half of facilities had a BEA reporting register available.

IV. DISCUSSION

4.1. Characteristics of the respondents

The demographic characteristics of the respondents (Table 1) show a relatively high mean age (43.6 ± 11.07 years), with the predominant age groups being 41–50 and 51–60 years. These results are consistent with those reported in other studies conducted in Africa, where healthcare providers often have a similar mean age. A study in Nigeria also found a relatively older population among nurses and physicians, which can be explained by the accumulated experience over the years [14]. The sex distribution in this study (53% female and 47% male) reflects trends observed in Sierra Leone, where women often dominate health professions [15]. The majority of healthcare providers in this study were nurses (58%), which is comparable to observations in Nigeria, where nurses constitute a large portion of the health workforce [16].

4.2. Training and knowledge level of standard precautions

Regarding training and knowledge of standard precautions (Table 2), about 57.5% of participants reported having received training on infection prevention and control (IPC), a rate that seems relatively low for such a crucial practice. This is concerning, as training is essential to ensure the correct implementation of standard precautions and the protection of both healthcare providers and patients. This rate is lower than that observed in some African countries, where IPC training initiatives have been implemented to improve patient safety. In Ghana, a study reported that over 70% of healthcare providers had received IPC training [17]. It is also notable that the importance of standard precautions in healthcare settings was widely recognized by respondents, with 75% emphasizing staff protection. However, the low proportion of providers citing protection of patients and others (30.8%) is concerning, as it indicates a lack of awareness of the full scope of standard precautions.

4.3. Knowledge of personal protective equipment (PPE)

Table 3 shows that gloves (91.7%) and gowns (81.7%) are the most frequently mentioned personal protective equipment (PPE), which aligns with global infection prevention priorities. However, other equipment, such as goggles and face shields (50%) and aprons (37.5%), are less frequently mentioned, suggesting a lack of awareness regarding the full range of protective measures. In a study conducted in Côte d'Ivoire, it was observed that while PPE use is common, it does not always comprehensively cover all exposure situations [18]. This finding highlights a persistent challenge regarding risk management in healthcare settings, particularly in resource-limited countries such as the DRC.

4.4. Practices in waste management and blood exposure accidents (BEA)

The study also highlighted encouraging practices regarding waste management, with 85.8% of facilities participating in waste segregation (Table 4). However, about 40% of facilities did not have functional incinerators, which is concerning for the management of infectious waste. This result is similar to those reported in other African studies, where waste management remains a major challenge due to weak infrastructure and insufficient resources [19].

Regarding blood exposure accidents (BEA), approximately 56.7% of healthcare providers reported having experienced a BEA, a high rate that reflects increased risks in healthcare settings, especially in contexts where resources are limited and safety measures are inadequately applied [20]. This high rate of BEA also raises questions about the availability of appropriate prevention and management measures for these accidents, although practices such as wearing gloves and disinfection are often cited as preventive measures.

CONCLUSION

The results of this study allowed for the assessment of the overall knowledge level of respondents regarding standard precautions. The overall knowledge level was low in the majority of cases. Similarly, practices were inadequate in most cases.

This situation calls for strengthening the capacities of healthcare providers, particularly through the implementation of continuous training on standard precautions in healthcare settings.

REFERENCES

1. World Health Organization report. https://doi.org/10.1001/jamanetworkopen.2022.42131
2. Warren, B. G., Barrett, A., Graves, A., King, C., Turner, N. A., & Anderson, D. J. (2022). An Enhanced Strategy for Daily Disinfection in Acute Care Hospital Rooms: A Randomized Clinical Trial. *JAMA Network Open*, 5(11), e2242131.
3. WHO Global Report on Infection Control.
4. Prevention of nosocomial infections. World Health Organization (WHO/DOC/71 pages). 2008, 2nd edition.
5. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. CDC, Atlanta, 2007, p. 67.
6. Basic Infection Control and Prevention Plan for Outpatient Division of Healthcare Quality Promotion Patient Oncology Settings. National Center for Emerging and Zoonotic Infectious Diseases. http://www.cdc.gov/hai/pdfs/guidelines/basic-infection-control-prevention-plan-2011.pdf.

7. Abiteboul D, Lamontagne F, Lolom I, Tarantola A, Descamps JM, Bouvet E. Incidence of blood exposure accidents among nursing staff in metropolitan France, 1999–2000: results of a multicenter survey in 32 hospitals. *BEH* n° 51/2002; 255.

8. Mast ST, Woolwine JD, Gerberding JL. Efficacy of gloves in reducing blood volumes transferred during simulated needle-stick injury. *J Infect Dis*. 1993;168(6):1589–1592.

9. Krikorian R, Lozach-Perlant A, Ferrier-Rembert A, Hoerner P, Sonntag P, Garin D, et al. Standardization of needlestick injury and evaluation of a novel virus-inhibiting protective glove. *J Hosp Infect*. 2007;66:339–345.

10. Mallaret MR, Le Coziffenecker A, Duc DL, Brut A, Veyre M, Chaize P, et al. Compliance with hand hygiene in hospital settings: a literature review. *Médecine et Maladies Infectieuses*. 1998;28(4):285–290.

11. Laraqui O, Laraqui S, Tripodi D, Zahraoui M, Caubet A, Verger C, Laraqui CH. Assessment of knowledge, attitudes, and practices regarding blood exposure accidents in healthcare settings in Morocco. *Médecine et Maladies Infectieuses*. 2008;38(12):658–666.

12. Benboubker M, El Marnissi B, Nhili A, El Rhazi K. Knowledge, attitudes, and practices regarding standard precautions among healthcare workers at Hassan II University Hospital, Fez (Morocco). Information for authors. 1995;1.

13. Mandana Bambenongama N & Losimba Likwela J. Knowledge, attitudes, and practices of healthcare professionals regarding standard precautions in hospital settings. *Santé Publique*. 2013;(5):663–673.

14. Centers for Disease Control and Prevention. Standard Precautions for All Patient Care. https://www.cdc.gov/infection-control/hcp/basics/standard-precautions.html. Accessed June 2025.

15. Centers for Disease Control and Prevention. Isolation Precautions. https://www.cdc.gov/infection-control/guidelines/isolation/index.html. Accessed June 2025.

16. Garner JS. CDC guideline for isolation precautions in hospitals. *Infect Control Hosp Epidemiol*. 1996;17(1):53–80. doi:10.2307/30142380

17. Agbato O, Aderounmu A, Olaniyan A. Survey of nurses' knowledge and practice of universal precautions in Nigerian hospitals. *J Health Educ Res Dev*. 2017;35(2):209–214.

18. Dahourou D, Kabore M, Daht T, Kabore I, Cisse K, Koulibaly A, Ouedraogo S. Knowledge and practices of healthcare providers in Burkina Faso regarding standard precautions for infection prevention in 2023. *Revue Burkinabé de Santé Publique*. 2025;1(Jan–Jun):28–39.

19. Agyemang R, Afriyie D, Obeng E, et al. Training of healthcare workers on infection control measures in Ghana: a study of health facilities in Accra. *Int J Infect Dis*. 2020;94:116–121.

20. Kouadio S, Ouattara D, Yao K. Factors influencing the use of personal protective equipment among healthcare workers in Côte d'Ivoire. *Afr J Med Sci*. 2018;47(1):47–55.