Journal of the African Society for Paediatric Infectious Diseases
Volume 1

REVIEW

Organisation and implementation of a hospital infection prevention and control protocol

CN Akujobi[1], IN Aghanya[1*], SN Ushie[1] and TA Akujobi [2]

[1]Department of Medical Microbiology and Parasitology, Nnamdi Azikiwe University, Awka / Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria., Nigeria
[2]Department of Medical Microbiology, National Hospital Abuja, Nigeria, Nigeria

*Corresponding author: aghanyailoduba@gmail.com

How to cite this article:

Akujobi CN, Aghanya IN, Ushie SN, Akujobi TA. Organisation & implementation of a hospital infection prevention and control protocol. Journal of the African Society for Paediatric Infectious Diseases. 2022; Volume1:1-8. DOI: https://doi.org/10.15641/jafspidVol1pp1-8/1696

Article Information
Received: 31 December 2021
Accepted: 14 March 2022

Key words
Hospital infection control; infection prevention and control practices; Africa

Abstract
There has been a global rise in antimicrobial resistance and threats from epidemics and pandemics. These threats and the difficulties experienced while managing them have led to a global plan to improve infection prevention and control (IPC) practices, especially in the developing world, thus making them more effective. International health regulations have considered running an effective IPC programme as a critical strategy for dealing with public health threats of international concern. This review aims to survey IPC implementation practices through the global core components of IPC programmes, including monitoring, and then relate them to the practice in a hospital setting of a developing country. Global best practices on IPC from international health organizations were extracted and summarised. This information was then compared to the real-time situation in a developing country's hospital. An effective hospital IPC program is necessary to curb the devastating consequences of uncontrolled pandemics and antimicrobial resistance (AMR). However, the Nnamdi Azikiwe University Teaching

Hospital in Nnwei, a hospital likened to that of other hospitals in developing countries, has yet to implement the core components of an organized IPC programme fully, and is thus at high risk of an outbreak.

Introduction

Nosocomial (healthcare-associated) infections are a subset of infectious diseases acquired in a healthcare facility. They are not related to the original clinical conditions that brought the patient to the hospital and were not incubating before admission; instead, they must develop at least 48 hours after admission.[1,2]

Despite the advances in modern medicine and surgery, approximately 5-10% of patients admitted to hospital subsequently acquire an infection, thus, leading to increased awareness of the need for rational, scientifically based procedures to minimize this problem.[1,2,3]

Concern about hospital-acquired infections has been increasingly echoed by patients and healthcare practitioners, thus highlighting the importance of infection control procedures.

Globally, it is recommended that every hospital should have an infection control team ICT).[1,2,3,4] The quality of a hospital infection control programme is a reflection of the general standard of care provided by that institution.[1,2,3,4]

International health regulations like the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) have considered running an effective IPC programme as a key strategy for dealing with public health threats of international concern.[5] These international organizations have outlined several minimum requirements as the core components to achieve a successful IPC practice in healthcare facilities.[5] This review aimed to survey the global IPC best practices and then relate them to what is available in a hospital setting in a developing country.

An effective hospital infectious disease protocol

To properly organize an effective infectious disease protocol, the national health organizations, IPC programme, and other relevant bodies should coordinate and support the implementation of the following core components of IPC practices at the facility level.

Every nation's health care system must establish active, stand-alone, national IPC programmes with clearly defined objectives, functions and activities. These programmes can then be adopted and modified to suit individual hospitals' infectious disease situations, with a dedicated, trained team in each acute health care facility.[5] The programme's purpose will be to give general guidelines on preventing healthcare-associated infection (HAI), promoting patient safety and combating antimicrobial resistance (AMR) through IPC best practices.

A dedicated IPC programme should be in place at the national level, including at least one full-time focal person trained in IPC and a dedicated budget for implementing IPC strategies. However, recommendations at the facility level will depend on the type of facility in focus.
For example, a tertiary healthcare facility should have at least one full-time trained IPC focal person with dedicated time per 250 beds, an IPC programme aligned with the national programme and with a dedicated budget, multidisciplinary team and access to the microbiology laboratory.[5,6]

IPC guidelines

The recommended IPC guidelines should be evidence-based, Ministry-approved guidelines adapted to the local context and reviewed at least every five years.[5,6,7] These include evidence-based facility-adapted standard operating procedures (SOPs) and monitoring based on the national IPC guidelines at the primary care facility. The minimum requirement at this level includes hand hygiene, decontamination of medical devices and patient care equipment, environmental cleaning, health care waste management, injection safety, healthcare worker (HCW) protection, aseptic techniques, triage of infectious patients, basic principles of standard and transmission-based precautions. It also requires regular monitoring of the implementation of some basic IPC guidelines / standard operating procedures (SOPs). [5,6]

All primary healthcare facility level requirements apply at the secondary and tertiary healthcare facilities. In addition, SOPs on standard and transmission-based precautions should be included. For example, SOPs for the prevention of airborne pathogen transmission, the aseptic technique for invasive procedures, occupational health-specific SOPs .[5,6,7]

Education on IPC practices

The WHO recommendations for IPC education states that there should be a national law requiring that all health facilities conduct training and retraining of their staff on IPC practices. This training should be in place for all HCWs by using team and task-based techniques that are participatory and include bedside and simulation training to reduce the risk of Healthcare-Associated Infections (HAIs) and AMR. The IPC team should monitor and evaluate training, and the training of HCW should be conducted annually.[5,7,9]

At the primary care level, it is recommended that IPC training for all front-line clinical staff and cleaners upon hiring must be conducted, including training on IPC guidelines / SOPs. The training should also include all IPC link persons in primary care facilities and IPC officers at the district level.[5,7,8]

All IPC training described in the primary care levels and specific IPC training for IPC staff should be done at the secondary and tertiary healthcare facilities. In addition, the IPC staff should receive the IPC training for the tertiary healthcare facilities annually.[7,8,9]

Surveillance for healthcare-associated infections

The WHO recommends that HAI surveillance programmes and networks that include mechanisms for timely data feedback should be designed to reduce HAI and AMR. Timely feedback of surveillance results to HCWs and stakeholders is also necessary.[7,7]

Healthcare-associated infection surveillance is not a minimum requirement at the primary facility level. Still, if available, it should follow national or sub-national plans (for example, detection and reporting of outbreaks affecting the community are usually included in national plans).[5,7,10,11]

Secondary care HAI surveillance is required and should follow national or sub-national plans. The HAI surveillance must be active for tertiary care facilities, including information on AMR. There should also be timely and regular feedback to key stakeholders to lead to appropriate action, particularly to the hospital administration.[5,8]

Implementation of IPC activities using multimodal strategies

It is recommended that multimodal strategies are used to implement priority IPC interventions. For example, the facility should implement the very least interventions like improving hand hygiene, safe injection practices, decontamination of medical devices and instruments, and environmental cleaning at the primary health facility. In addition to interventions mentioned for primary care facilities at the secondary health facility, multimodal strategies should also be employed for implementing interventions to improve the standard and transmission-based precautions and triage.

Tertiary care facility interventions should then include improvement of each of the standard and transmission-based precautions, triage, and those targeted at reducing specific infections (for example, surgical site infections or catheter-associated infections) in high-risk areas / patient groups, in line with local priorities.[6,8,,9,12]

Monitoring, evaluation, auditing and feedback

Effective monitoring of IPC structural and process indicators should be set up at all levels of care.[6] Through this component of IPC practice, the IPC team, can determine if the job has been done correctly and if there need to be further interventions.

This monitoring should be based on IPC priorities identified in the other components of IPC practices mentioned above at the primary care level. In addition, monitoring and evaluation require decisions at the national level and implementation support at the subnational level.

An individual should be responsible for the periodic or continuous monitoring of selected structural process indicators for secondary and tertiary care facilities, informed by the facility's priorities or the country's priorities. Timely and regular feedback must be provided to key stakeholders to take appropriate action, particularly the hospital administration.[5,8]

Workload, staffing and bed occupancy

The panel set up by the WHO to look into IPC recommends that the following elements should be adhered to reduce the risk of HAI and the spread of AMR:

- The bed occupancy should not exceed the standard capacity of the facility
- Healthcare worker staffing levels should be adequately assigned to suit patient workload.

At the primary healthcare facility, the focus should be to reduce overcrowding. There should be a system for patient flow, a triage system (including a referral system), and a system for the management of consultations should be established according to existing guidelines. The staffing levels should also be optimized, considering the various categories identified when using WHO / national tools and developing an appropriate plan.[13,14]

For secondary and tertiary care facilities, standardization of bed occupancy should be done by establishing a system to properly manage space in the facility and establish the standard bed capacity. The hospital administration should ensure that the developed system is enforced, no more than one patient per bed, spacing of at least one metre between the edges of beds, and overall occupancy should not exceed the designed total patient bed capacity of the facility.[5,10] The same minimum requirements as for primary health care is required to reduce overcrowding and optimize staffing at these levels.[5,8,10]

Buildings, environment, materials and equipment for IPC

Patient care should be undertaken in a clean and hygienic environment that facilitates practices related to preventing and controlling HAI and AMR, including all elements around water and sanitation hygiene (WASH) infrastructure and services and the availability of efficient IPC materials and equipment. The WHO panel also recommends that materials and equipment to perform proper hand hygiene should be readily available at each point of care.[5,9]

For primary care facilities

- Clean water should always be available from a source on the premises to perform basic IPC measures.
- A minimum of two functional, improved sanitation facilities should be available on-site, one for patients and the other for staff. In addition, both should be equipped with menstrual hygiene facilities.

- Functional hand hygiene facilities should always be available at points of care / toilets and include soap, water and single-use towels (or, if unavailable, clean reusable towels) or alcohol-based hand rub within 5 metres of the toilets.
- Sufficient and appropriately labelled bins to allow for health care waste segregation should be available and used (less than 5 metres from the generation); waste should be treated and disposed of safely via autoclaving, high-temperature incineration (850° to 1100°C), and buried in a lined, protected pit.
- The facility layout should allow adequate natural ventilation.
- Sufficient and appropriate IPC supplies and equipment (for example, mops, detergent, disinfectant, personal protective equipment) and power / energy should be provided for performing all basic IPC measures according to minimum requirements / SOPs.[15,16]

Secondary and tertiary care facilities

- A safe and sufficient quantity of water should be available for all required IPC measures and specific medical activities, including drinking and piped inside the facility at all times.
- A minimum of two functional, sanitation facilities that safely contain waste for outpatient wards, and one facility per 20 beds for inpatient wards should be available; all should be equipped with menstrual hygiene facilities.
- Efficient hand hygiene facilities should always be available at points of care, toilets and service areas
- Waste segregation and disposal are the same as for primary health facilities.
- The facility should be designed to allow adequate ventilation (natural or mechanical, as needed) to prevent transmission of pathogens.
- Sufficient and appropriate supplies and equipment and reliable power/energy should be available for performing all IPC practices, including standard and transmission-based precautions, according to minimum requirements/SOPs.
- The facility should have a dedicated space for decontamination and reprocessing medical devices according to minimum requirements/SOPs.
- The facility should have adequate single isolation rooms or at least one room for sorting patients with similar infectious disease syndromes if the number of isolation rooms is insufficient.[15,16]

Cost of establishing an infection control programme

The cost of setting up the significant portion of an infection control programme (90%) is minimal; the cost of attaining one hundred per cent is much higher. Therefore, it is prudent, to begin with, programmes designed to achieve the first 90% and gradually build up the final 10% as revenue savings are realized.[1,9,10,17]

The cost involved in setting up an infection control programme includes:

- Predictable costs include staff costs, protective clothing, monitoring equipment, data surveillance equipment, maintenance of equipment, laboratory test for routine monitoring of specialized areas, stationery, office furniture
- Unpredictable costs include costs for individual patient episodes, unforeseen outbreaks

Responsibilities of the infection control team

The infection control team (ICT), which comprises the infection control doctor, infection control nurse, the administrator and the community health physician, make up the core of the ICT. Other healthcare personnel, including pharmacists, laboratory staff are also part of the team.[7,9,16]

The Meeting of the ICT should be monthly, but inspection of the hospital should be done weekly. The ICT reports directly to the infection control committee (ICC).[9,11]

The ICC is responsible for developing policies and procedures related to infection control in the hospital and acting as a source of expertise on matters relating to infection. The committee advises the hospital's chief executive through the infection control doctor.[7]

Infection prevention and control implementation activities in Nnamdi Azikiwe University Teaching Hospital (NAUTH)

Structure

Although there had been some level of infection control practice ongoing in NAUTH from the hospital's inception, the official IPC structure involving an ICC, and an ICT was set up in 2012. From the time the IPC in NAUTH received official recognition by the hospital management in 2012, the team has slowly but steadily improved in the hospital's IPC processes, evidenced by progressive reductions in HAI rates. For example, in 2012, the NAUTH ICT reported an unpublished surgical site infection (SSI) rate of 22%. However, when the same rates were reported in 2020, an SSI rate of less than 13% was observed.

In NAUTH, the ICC comprises members from the management and staff of the hospital, including management, clinical microbiology, nursing, and other medically related fields. A top management staff member, the chairman of the medical advisory committee, leads the ICC for obvious reasons, including policymaking and the seamless approvals of requests and recommendations made by the ICT. This committee was scheduled to meet at least once every quarter.

The ICT, being the subset of the ICC that carries out the actual day to day surveillance and responses to occurrences or outbreaks in the hospital, is led by a consultant clinical microbiologist. Several other doctors from diverse disciplines serve as infection control doctors. In addition, we currently have two infection control nurses who relate with other nurses in the hospital wards to get the IPC job done as swiftly as possible. The hospital recently employed a specialist infectious diseases physician, and we hope to have him join the team as soon as possible.

Implementation of the IPC core components

The hospital is not at its best regarding implementing all the core components of an effective IPC programme, but there is gradual and steady progress. For instance, an IPC programme is available with a dedicated, trained team to prevent HAI and combat AMR. However, the hospital still depends on national guidelines for implementing the IPC programme. Staff receive basic training on IPC practices, but this is not as regular as it should be.

Several surveillance drives for endemic and sometimes epidemic infections have been conducted, including ongoing surveillance coordinated by the hospital in collaboration with the Nigerian Center for Disease Control (NCDC) on causes and prevalence of acute febrile illnesses (including COVID 19). There are also occasional point prevalence surveys on antimicrobial stewardship.

The roles currently carried out by the IPC team in NAUTH include but are not limited to the following:

- To help coordinate the IPC programme activities and develop, revise, and implement the set policies (this involves the review of all the compliance, process and outcome indicators collected during the periods before the policy is established. This process is ongoing but not yet optimal.
- To regularly train hospital staff on the basic understanding of IPC principles and practices (the last hospital-wide training conducted by the team was done in 2020).
- To organize surveillance for HAI and outbreaks (currently ongoing).
- To carry out quarterly point prevalence surveys for antimicrobial use and resistance (currently done yearly due to limited resource availability).
- To coordinate antimicrobial stewardship programmes, including daily rounds in the hospital.
- To audit the quality and effectiveness of the hospital environmental cleaning, including disinfection and sterilization practices.
- To implement local and international best practice guidelines for preventing infection transmission in the hospital.

- On clinician adherence to IPC policies, the committee has continued to engage clinicians on the need to comply with IPC guidelines. A holistic policy document on IPC practices specific for the hospital is pending review and approval by the management. We believe that when this document is finally released, clinicians will give IPC compliance the required seriousness and dedication it deserves.

Challenges

We have experienced some challenges in our centre regarding fully implementing all the set policies / core components for a successful IPC programme. The hospital community's general lack of interest is the top on the list. Unfortunately, this is also witnessed in many other hospitals in the country. Another major challenge is limited funding of IPC activities and reduced zeal by team members resulting from a weak incentive system. Some team members believe that the IPC job is an addition to their regular duties, hence it should come with specific incentives.

Case scenarios

An interesting occurrence was experienced in the hospital's neonatal intensive care unit (NICU) in 2015. An out-born neonate was admitted to the NICU for neonatal sepsis and extensive Staphylococcal scalded skin syndrome (SSS), having a temperature of about 40^0C. The managing team managed the patient with meropenem, but the temperature remained sustained. Based on this occurrence, the clinical microbiologist was invited to review the patient's condition.

It was observed that the managing team missed out on some of the set IPC protocols. Therefore, the patient was reviewed, and the ICT made a presumptive diagnosis of SSS due to methicillin-resistant *Staphylococcus aureus* (MRSA). Specimens were taken for microscopy, culture and sensitivity, and the managing team was advised to adhere strictly to the IPC protocol. After 72 hours, MRSA was isolated and confirmed, the patient was placed on intravenous vancomycin, and there was a rapid resolution of the SSS.

From an IPC perspective, it was advised that the patient be isolated, and barrier nursed. The managing team obliged. Dedicated nurses, equipment, materials, and consumables were also recommended. Afterwards, decontamination was carried out, and the unit was certified MRSA free before being put back to use in the neonatal ICU.

A second scenario still being tackled was observed following a point prevalence survey on antimicrobial use in 2018. We observed that less than 20% of the antibiotic prescriptions in the hospital were based on clear cut reports of organism susceptibilities from the clinical laboratories. Our team sprang into action by revealing the outcome of our survey to the clinicians and the hospital management and conducting training and retraining on the need for good antibiotic stewardship in the hospital. Today, dependence on clinical laboratory susceptibility reports have greatly improved.

Conclusion

An optimal IPC practice is one where the core components of an IPC programme are fully implemented. Unfortunately, IPC in most developing countries' healthcare facilities is yet to achieve optimal status; hence these hospitals are at risk of having outbreak occurrences. Although the IPC practice in NAUTH is not optimal, it has helped ensure a slow but progressive decline in HAI.

Author contributions: All authors developed the concept and wrote the review
Funding: This project was unfunded
Ethics approval and consent: not applicable
Competing interests: The authors declare no competing interests

References

1. WHO. Heath care without avoidable infections: the critical role of infection prevention and control. 2016. Accessed 29 December 2021. Available at https://www.who.int/publications/i/item/health-care-without-avoidable-infections-the-critical-role-of-infection-prevention-and-control
2. Centers for Disease Control and Prevention. Transmission-Based Precautions. 2016. Accessed 6 January 2022. Available at: https://www.cdc.gov/infectioncontrol/basics/transmission-based-precautions.html
3. Saint S, Greene MT, Krein SL *et al*. A program to prevent catheter-associated urinary tract infection in acute care. N Engl J Med. 2016;374:2111-9.
4. CDC. Centers for Disease Control and Prevention Guidelines for evaluating surveillance systems. Morb Mortal Wkly Rep. 1988;37:1-18.
5. WHO. Minimum Requirement for Infection Prevention and Control Programmes. Part 2-Executive Summary of the Minimum Requirements by Core Components. Accessed 22 Feb 2022. URL: Minimum requirements for infection prevention and control programmes
6. WHO. Guidelines on core components of IPC programmes at the national and acute health care facility level. 2016. Accessed 22 February 2022. Available at: https://www.who.int/infection-prevention/publications/core-components/en/.
7. European Centre for Disease Prevention and Control. Core competencies for infection control and hospital hygiene professionals in the EU, 2013. Accessed 23 Feb 2022. https://ecdc.europa.eu/sites/portal/files/media/en/publications/Publications/infection-control-core-competencies.pdf.
8. WHO. Interim practical manual supporting national implementation of the WHO guidelines on core components of infection prevention and control programmes. 2017. Accessed 3 March 2022. Available at: https://www.who.int/infection-prevention/tools/core-components/cc-implementation-guideline.pdf
9. Rennert-May E, Conly J, Leal J *et al.* Economic evaluations and their use in infection prevention and control: a narrative review. *Antimicrob Resist Infect Control.* 2018;**7:**31. https://doi.org/10.1186/s13756-018-0327-z
10. CDC. Centers for Disease Control and Prevention Guidelines for evaluating surveillance systems. Morb Mortal Wkly Rep. 1988;37:1-18.
11. Stempliuk V. Surveillance of healthcare associated infections in low- and middle-income countries: from the need to a reality. Curr Treat Options Infect Dis. 2018. https://doi.org/10.1007/s40506-018-0148-x
12. Allegranzi B, Gayet-Ageron A, Damani N *et al.* Global implementation of WHO's multimodal strategy for improvement of hand hygiene: a quasi-experimental study. Lancet Infect Dis. 2013;13:843-51.
13. WHO. Tools and Kits. 2022. Accessed 3 March 2022. URL: https://www.who.int/tools.
14. WHO. Infection prevention and control: Guidance to action tool. 2021. Accessed 8 January 2022; available at: https://apps.who.int/iris/handle/10665/341107.
15. Abrampah NM, Montgomery M, Baller A *et al*. Improving water, sanitation and hygiene in healthcare facilities, Liberia. Bull World Health Organ. 2017;95:526-30.
16. Zingg W, Holmes A, Dettenkofer M. Hospital organization, management, and structure for prevention of health-care-associated infection: a systematic review and expert consensus. Lancet Infect Dis. 2015;15:215-24

The *Journal of the African Society for Paediatric infectious Diseases Society* (JAfSPID) is a free, open-access, online journal. *JAfSPID* publishes a wide variety of manuscripts including full-length research articles, short research communications, review articles, commentaries, case reports, medical images, conference reports, short commentaries on a published landmark paper or report, letters to the editor and invited editorials on all aspects of infectious diseases in neonates, children, and adolescents. Contributions are reviewed by one editor. In addition, all research manuscripts, review articles, commentaries, case reports, medical images and conference reports are subjected to double-blind peer-review by at least one external, independent referee.