TOWARD EFFECTIVE MANAGEMENT OF NOSOCOMIAL INFECTIONS IN NIGERIAN HOSPITALS- A REVIEW

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Abstract: Infection control (IC), an integral part of safe, high quality patient care, is essential for the well-being of the patients, staff and visitors in all the healthcare establishment. The increasing awareness of hospital infections has motivated hospitals to improve their clinical hygiene practices. The practical details of IC are valid across all settings where healthcare is being provided globally. These rudiments need to be employed despite the consequences of constraints in wherewithal and support. They are intended to shield the patients, staff and visitors from exposure to infections and probably too, multiple antibiotic-resistant microorganisms and against the morbidity and mortality associated with these agents should an infection occur. Every effort should be made to ensure compliance with IC recommendations and/or regulations. As a first step, IC programme needs to establish the appropriate managerial structure within each level of the healthcare organization and to have defined roles and responsibilities for key personnel. This organizational structure is an essential element to the accomplishment of any public health agenda in order to ensure personal accountability and prevent system failure. [Academia Arena, 2010;2(5):1-7] (ISSN 1553-992X).

Key words: Infection control, nosocomial infections, hospital-acquired infection, healthcare workers, infectious diseases.

Introduction

The hospital is not only a place where sick people recover from their illnesses, but also where the illnesses at times get complicated and healthy people get infected (Horan and Emoric, 1997). Whenever clinical procedures are performed, clients are at risk of infection during and after the procedure. Healthcare workers (HCWs) are constantly exposed to potentially infectious materials (Falk, 1996). Healthcare services are sometimes provided to client in a limited space resulting in overcrowding. In addition, David and Famurewa (2006) posited that the pressure of providing services to a large number of clients usually results in non-compliance with infection control practices (ICPs).

Infection control (IC) is the series of activities or procedures put in place especially in hospitals that discourage or prevent the establishment of pathogenic organisms within the body or to prevent them from gaining access into the host (Famurewa and Sonntag, 1987; Talaat *et al*., 2006). IC is also a quality standard which is essential for the well-being and safety of patients, staff and visitors in hospital environment. It affects most departments of the hospital that are involved in issues of quality, risk management, clinical governance and health and safety (Hauri *et al*., 2003). An IC programme with a firm structure should be in existence in all institutions that provide healthcare services (Reed *et al.*, 2005). In order to establish and 1993; PHC4, 2005). HAIs are a global problem and are among the leading causes of death and cause significant morbidity among patients who receive healthcare (Mast *et al.,* 1993; Yokoe *et al*., 2008). These lead to conditions that require the use of expensive healthcare resources and often lead to increased use of medication and supplies, more laboratory studies, and increased manage an environment that secures the lowest possible rate of hospital-acquired infections (HAIs), and protect staff and visitors from unnecessary risks, control of nosocomial infections (NIs) is highly essential (Decker and Schaffner, 1996; Melo-Cristino, 2002, Oluduro *et al*., 2003).

Nosocomial or hospital-acquired infections (HAIs), also known as healthcare-associated infections, are infections that appear during and after hospitalization in patients, who were not incubating the infection, on admission. Such infections manifest within 72 hrs or more after admission (Decker and Schaffner, 1996, Horan and Emoric, 1998, WHO, 2004) and are by far the most common complications affecting hospitalized patients (Burke, 2003). It has been estimated that between 5 and 10 percent of patients admitted to acute care hospital in developing nations acquired one or more infections, and the risks are increasing annually (Burke, 2003; Yokoe and Classen, 2008). This is by far more serious in low-resource countries that do not have the resources either to prevent control or financial and technological to manage such situations

HAIs cover a wide spectrum and are associated with urinary tract infection; surgical-site infection, bloodstream infection and pneumonia. They have been identified as the major infections accounting for close to 80% of all NIs (Mast *et al.,* duration or prolonged hospitalization (Wenzel, 1995; Hauri *et al*., 2003, Moro *et al*., 2006). HAIs may also impair the quality of life of the patient even after treatment (Lynch and White, 1993; White and Lynch, 1997; Yokoe and Classen, 2008). Table 1 shows sources and transmission of most HAIs. It has been reported that

HAIs is cost effective and achievable even when resources are limited (Lynch, 1992; Mehtar, 1992).

It is imperative to work towards reducing the risk of infection among patients and staff and the major preventive effort should be geared towards improved and qualitative hospital and healthcare facilities. Infection control practices (ICPs) are therefore indispensable in healthcare sectors to ensure the safety of healthcare workers, patients, clients, visitors and the community at large (Bijl and Voss, 2001; Dawnson, 2003).

Table 1: The source and transmission of HAIs

Source	Transmission
Microbial flora of colonized infected patients	Direct contact via staff hands and devices
Inanimate hospital environment	Direct contact via staff hands
Hospital equipment	Inadequate disinfected endoscope, stethoscope, sphygmomanometer, weighing scale, surgical instruments.
Infected patient or staff members	Respiratory droplets or nuclei, blood borne

Source: Spelman (2002)**;** Moro *et al*., (2006).

Transmission of infections

Factors responsible for recent upsurge in HAIs

Factors that contribute to rise in HAIs have been recognized to include the following; scientific discoveries and increased use of modern medical methods (Wendel and Edmond, 1999), patient populations (that are getting older or are infected with chronic diseases), and increasing proportions of patients with immunocompromised conditions or diseases (principally HIV patients). Further, the misuse and abuse of antibiotics have contributed largely to increased incidence of antimicrobial-resistant pathogens (Hart and Kariuki, 1998; Therapeutic Guidelines, 2006). Factors associated with the transmission of resistant strains of pathogenic microorganisms include poor attention to hygiene, overcrowding, lack of an effective IC program and shortage of trained IC providers (CDC, 2007). There is a misconception that ICPs are costly and are therefore beyond the reach of most hospitals particularly in resource-poor nations. In actual sense, this claim is far from the truth. IC is based on common sense and on safe practice and can be put into practice with minimal cost (Methler, 1992; Lynch, 1997).

Infection control in healthcare facilities

It is imperative to uphold the activities that ensure adequate IC practices where healthcare is provided (Bijl and Voss, 2001; Jevis, 2001). This may include but not limited to the following;

- Provision of facilities and equipment that make it possible for the HCWs to maintain good IC practices. Standards (policies and guidelines) for procedures or systems used within the healthcare setting and implementation of educational programmes for all personnel in the use of such standards should be available and should not be neglected.
- Establishment of surveillance systems that identify problem areas early enough (McLaw *et al.*, 2000).
- Putting in place a policy for the prudent use of antibiotics and work to ensure adherence to the policy (Weinstein, 2001). This is the most desirable as it has truly established that unnecessary exposure of bacterial to antimicrobial agents results in selective pressure with altimate formation of resistant forms
- Production of guidelines for cleaning, disinfection and decontamination and work to ensure adherence to those guidelines. (HELICS 1999,)

Hand hygiene

The hand is the most common vehicle for microbial transmissions. Hand hygiene is thus the single most effective method used in preventing the spread of infections and infectious agents. Hand washing reduces the number of potentially infections microorganisms on the hand and decreases the incidence of infection transmission in the healthcare facility (Javis, 1994).

Hygienic hand washing or hand disinfection involves the use of antiseptic and/or detergents to wash hand for as little as about 10-15secs or to use alcohol-based agents to disinfect the hands. This is necessary before and after attending to a patient, before performing invasive procedures such as setting intravenous lines, lumber puncture, catheterization, before gloving, after contact with blood, body secretions or following situations in which microbes contaminate hands before caring for (susceptible) patients (AVSC, 2000; Wendel and Edmond, 2000, Esan *et al.*, 2005) and as well as personal or self protection.

Cleaning, Disinfection, Sterilization and Protective materials

The hazard in a healthcare setting includes exposure to blood, saliva, or other body fluids or aerosols that may carry infectious materials such as Hepatitis C, HIV or other blood-borne or body fluid pathogens (White and Lynch, 1997). Personal protective equipment (PPE) include specialized clothing or equipment worn by a worker for protection against a hazard. It prevents contact with potentially pathogenic microorganisms, by creating a physical barrier between the potentially infectious materials and the healthcare worker (Mast *et al*., 1993).

Workers must wear PPE to guard against blood-borne pathogens if there is a reasonable anticipated exposure to blood or other potentially infectious materials. Components of PPE include bonnets, gowns, shoe covers, medical gloves, face shield masks, goggles, surgical masks and respirators (Caillaud and Orr, 1981; Mast *et al*., 1993; Famurewa *et al*., 1994). How and when the PPE is used depends on the regulations or the IC protocol guiding it (Burke and Mandan, 1997). If PPE cannot be disinfected it should be disposed to prevent cross-contamination (Famurewa *et al*., 1996). Infected or disposable items should be immediately thoroughly treated before final disposal.

Vaccination of healthcare workers

Vaccine is a preparation from dead or live microorganisms that is introduced into the body through inoculation. The vaccine causes the development of antibodies, which produce immunity to the disease caused by such microorganisms. Vaccines include preparation of weakened or killed pathogen, such as a bacterium or virus, or of a portion of the pathogen's structure that upon administration stimulates antibody production against the pathogen but is incapable of causing severe infection. Prophylactic vaccines (e.g. to prevent or ameliorate the effects of a future infection by any natural or "wild" pathogen) rather than therapeutic (e.g. vaccines against infection) should be administer to HCWs (Sneller *et al*., 2000).

Certain diseases have available vaccines that give some protection to workers in a healthcare setting. The specific work function, or personal preference, healthcare workers or first responders may receive vaccinations for hepatitis B, influenza, measles, tetanus diphtheria pertussis meningitides and vericella et.c. In general, vaccines however do not guarantee complete protection from diseases, and there is potential for adverse effects from receiving the vaccine (CDC, 2007).

Surveillance for emerging infections

Traditionally, surveillance involves significant manual data assessment and entry in order to assess preventative actions such as isolation of patients with an infectious disease (Perry, 1995; Pottinger *et al*., 1997).

Well over 25% of HAIs are avoidable; hence surveillance and preventive measures are increasingly a priority for hospital staff. Surveillance is the act of infection investigation (McLaw *et al.*, 2000) and involves determination of an infection with the aid of patient's chart and detection if the patient had the signs and symptom of the suspected infection (NNIS, 2004).

The use of antibiotics is a common treatment when an outbreak occurs. However, if the infectious agent has built a resistance to a particular antibiotic, then that antibiotic would be ineffective (Hart and Kariuki, 1998; Moro *et al*., 2001; Weinstein 2001). Data on antibiotic resistance, which results from consistent exposure to an antibiotic, should be provided. The knowledge of misuse and abuse of antibiotics is also needed in the survey of nosocomial infection (CDC, 2001).

Training of healthcare workers in infection control and healthcare epidemiology

Practitioners can come from several different educational streams. Specialized training in IC and healthcare epidemiology is offered by the professional organizations to nurses, medical laboratory scientists (particularly in clinical microbiology), and some physicians (typically, infectious disease specialists). Physicians who desire to become IC practitioners are often trained in the context of an infectious disease fellowship (Javis, 2001). Such measure to prevent HAIs are summerised in Table 2.

Table 2: Summary of preventive measures of hospital acquired infection (HAI)

Practitioners behaviour	
	Compliance with hand hygiene rules
	Training on basis microbiology and mode of diseases transmission
	Use of aseptic techniques
	Compliance with guideline on antimicrobial use
	Use of protective clothing and equipment
	Proper handling
Patient care	
	Short hospital stay
	Early removal of invasive devices
	Isolation of infectious patients
	Decontamination, cleaning and disinfection of work area

	Proper patient placement
Hospital infrastructures and policies	
	Adequate staff numbers
	Staff vaccination (e.g hepatitis B, Vericella-Zooster, tuberculosis and influenza)
	Proper disposal of sharpes
	Adequate sterilization and disinfection of surgical instrument
	Active surveillance for HAIs
	Proper infection control programme
	Constitution of infection control task force
	Establishment of molecular laboratory
	Education of HCWs on legal and ethnical implications of HAIs
	Proper disposal of healthcare waste
	Education and implication of antibiotic policies

Haley *et al*. (1985); Pearson (1996); TLG (2000); David and Famurewa (2006).

Transmission of infections

Diagnostic and therapeutic procedures during hospitalization may be a source of transmission of potentially infectious agents. For an infection to be established some vital conditions must be met. The elements of disease establishment comprises of the pathogens, susceptible host, route of entry, portal of exit, reservoirs and mode of transmission (Ekiti State Infection Control, 2006). Many organisms gain entry into the host through breaches or invasion of the first line of body defences. Breaches in epithelia integrity (e.g surgical wound, intravascular cannulas and drain tubes), loss of washing action of body fluid and interference with first line of action of respiratory defences (e.g anaesthesia and endotracheal intubation) are common precursors of entry of pathogens in the establishment of HAI (Spelmen, 2002).

Some microorganisms are generally present on human skin, respiratory, intestinal and genital tracts. Under normal condition these organisms do not cause infections unless factors in their environment are altered (Singleton and Sainsbury, 1991). Other microorganisms however, are not normally found on or in the human body and are associated with diseases. All microorganisms including normal flora can cause disease if certain opportunities are provided. These conditions include the introduction of normal flora to an area where they are not normally found, introduction of pathogens into the body and introduction of either pathogens or normal flora to the body of an immunocompromised patient. The infective agents can be transmitted through direct contacts.

The hospital manager or medical director is ultimately responsible for safety and quality within the hospital (WHO, 2003). He or she must ensure that appropriate arrangements are in place for effective IC practices and that there is an *Infection Control Team* (ICT) and an *Infection Control Committee* (ICC). If the healthcare setting is too small to support such an organisation, experts in IC should be available for consultation at regular intervals and when needed in an acute situation.

Establishment of Infection control team (ICT)

The ICT should have a range of expertise covering knowledge of IC, medical microbiology, infectious diseases and nursing procedures. The team should have a close liaison with the microbiology laboratory and ideally, a microbiologist should be a member of the team. In addition at least one physician, the IC officer (ICO), and at least one nurse, the IC nurse (ICN) must be part of the team. One ICN for 250 acute beds on a full-time basis has been recommended (Dawson, 2003). However, the number of acute care beds is decreasing, while out-patient management, day surgery and home care are expanding in the developing nations, and problems of HAIs and antibiotic resistance are steadily increasing globally. Thus, the optimal number of ICNs cannot be calculated simply based on the number of acute care beds but rather it depends on the case mix and workload. The number of intensive care officers in a team is probably best related to the number of ICNs.

The team is responsible for day-to-day decisions on IC as well as long term planning of IC policy. It should meet several times a week or preferably daily. The team should be adequately funded to provide secretarial assistance, information technology capabilities, facilities and training materials, and to allow members to attend educational courses and professional meetingsfor continous capacity building to enhance competence and professionalism. The composition and organization of the ICT should take into account the local, social and religious culture in the country and/or environment concerned and the hierarchical structure of the hospital.

Infection control team is to advise staff on all aspects of IC and maintain a safe environment for patients and staff. It is to organize educational programmes on the prevention of hospital infections for all hospital personnel. Its roles also include provision of a basic manual of policies and procedures and ensure that in-house guidelines based on these are in existence. It is to establish systems of surveillance of hospital infection in order to identify at-risk patients and problem areas that need intervention and or particular

attention. The methods to be used for surveillance may include case finding by ward rounds and chart reviews, reviews of laboratory reports, and targeted prevalence or incidence surveys. These are not merely for academic purposes.

ICT advises on the management of patients requiring special isolation and control measures, investigate and control outbreaks of infection(s) in collaboration with medical and nursing staff and ensure that an antibiotic (use) policy is in place. It is as well to liaise with the hospital (residence) doctors and administration (managerial and nursing), community health doctors and nurses, and IC staff in adjacent hospitals. ICT provides relevant information on infection problems to hospital management and the ICC.

Other duties of ICT include the following; kitchen inspections, pest control and waste disposal and advice on general architectural features (e.g. operating and isolation rooms). It ensures availability of clean water and proper facilities for hand washing and drinking, arrangement for the separation of clean and dirty materials and procedures (e.g., storage of sterile supplies in a room separate from the one used for reprocessing of dirty equipment or storage of waste). ICT also provides written policies for critical elements of IC (Ekiti State Infection Control, 2006).

Appointment of Infection Control Officer

The infection control officers (ICO) should preferably be a senior member of the hospital staff with experience and training in IC, such as a medical microbiologist, epidemiologist or infectious diseases physician. In the absence of one of these, a surgeon, paediatrician or other appropriate physician with special interest in the field could be appointed. Whichever person is appointed must be guaranteed the extra time needed to fulfil the responsibility of an ICO. The chair of the ICC should be responsible to the Chief Medical Director (CMD) for IC in the healthcare setting.

Duties and responsibilities of Infection Control Nurse

The ICN should be able to function as a clinical nurse specialist. The duties of the ICN are primarily associated with IC practices with special responsibility for nursing problems and education.

In a large hospital the ICN can train ‘link' nurses. These individuals have special responsibility for maintaining good IC practices and a ‘link’ between the ICN and the wards and helps identify problems, put into operation solutions and maintain communications and education within their clinical departments Basic qualifications of the ICN include a registered nurse (or equivalent qualified person) with clinical and administrative expertise. Good interpersonal and educational proficiencies are important and recognized training in IC is fundamental.

Duties and responsibilities of Infection control committee

Both clinical and supporting (e.g., pharmacy, maintenance) departments are to work together in order to achieve minimal infection in the hospitals. To achieve this, (ICC). In comprehensive health centres and general hospitals, the ICC may report directly to the senior hospital management committee; but in State Specialist Hospitals, Federal Health Centres and University Teaching Hospitals it may be a subunit of a risk management or clinical governance committees. It should consist of representatives from various hospital departments. All the clinical departments should be represented (on the committee), including members of other key departments, such as occupational health, catering, cleaning, facilities/buildings and management. The committee should act as a link between departments responsible for patient care and supporting departments. Its aim should be to improve hospital IC practice and recommend appropriate policies, which should be subjected to frequent review (Talaat *et al*., 2006).

The committee should be responsible to the hospital manager or medical director and should have a physician, preferably the ICO or hospital epidemiologist as the chairman. The hospital manager and the chief nursing officer, or their representatives, should attend meetings. The size of the committee will vary depending on the size and/or requirements of the hospital. The departments should nominate their representatives and if not the departmental head, the representative should be in a position to take decisions.

The committee should hold regular meetings and the minutes of the meeting should be well documented and should be forwarded to the Medical Director and the Hospital Management Board as well as to the departments directly involved in the subjects discussed during the meeting. It should produce an annual report and annual business plan for IC.

Effective hospital management

The roles of the hospital management in IC include ensuring that facilities are available to the hospital staff to maintain good IC practices and to ensure an ICT is available and its activities supported adequately. It should also give periodic training to HCWs to enable them know their responsibility in IC and supply instruction brochure of critical IC policies. It is also to organized seminars in house and educational programmes for staff and to make public clear line of responsibility of ICT to the senior management of the hospital.

Conclusion

In Nigeria IC should take a new shape and undergo series of reforms. Many strategies have been put in place and are being implemented. In some cases there is no clear defined guideline. This will precipitate poor state of things. This is paramount because it is fundamental to the provision of quality healthcare, most especially in the local level, because of their potential to reduce the disease burden on patients, healthcare workers and the community. If IC policy is enforced in our hospitals, it will curtail the increasing rate of outbreaks and reemergence of infectious diseases. The enormous rate of multiple-antibiotic resistance of pathogens to common and readily available antibiotics will be reduced. Hospital bill, length of hospital stay, loss of working hours and the possibility of litigation will be reduced to the barest minimum.

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