Nosocomial Infection in Al-Hilla City Hospital

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Abstract

Some of the problems are reviewed. Methods suggested for dealing with them are probably not the ideals that should ultimately be attained but minimum standards to serve as immediate objectives for the search about Nosocomial infection. They concern indications for and methods of isolation control of infection from staff, environmental contamination, and a few technical procedures. A new type of dressing towel for wounds is described.

Keywords: Nosocomial Infection, Control of infection, Healthcare-associated infection, Mechanism of infection control.

Introduction

Infection control is the discipline concerned with preventing nosocomial or healthcare-associated infection, a practical (rather than academic) sub-discipline of epidemiology. It is an essential, though often under recognized and under supported, part of the infrastructure of health care. Infection control and hospital epidemiology are akin to public health practice, practiced within the confines of a particular health-care delivery system rather than directed at society as a whole.

Anti-infective agents include antibiotics, antibacterials, antifungals, antiviral and antiprotozoals (1). Infection control addresses factors related to the spread of infections within the healthcare setting (whether patient-to-patient, from patients to staff and from staff to patients, or among-staff), including prevention (via hand hygiene/hand washing, cleaning/disinfection/sterilization, vaccination, surveillance), monitoring/investigation of demonstrated or suspected spread of infection within a particular health-care setting (surveillance and outbreak investigation), and management (interruption of outbreaks). It is on this basis that the common title being adopted within health care is "infection prevention and control (2). Mechanism of infection control Sterilization

Sterilization

Is a process intended to kill all microorganisms and is the highest level of microbial kill that is possible. Sterilizers may be heat only, steam, or liquid chemical.3 Effectiveness of the sterilizer (e.g., a steam autoclave) is determined in three ways.3 First, mechanical indicators and gauges on the machine itself indicate proper operation of the machine. Second heat sensitive indicators or tape on the sterilizing bags change color which indicate proper levels of heat or steam. And, third (most importantly) is biological testing in which a microorganism that is highly heat and chemical resistant (often the bacterial endospore) is selected as the standard challenge. If the process kills this microorganism, the sterilizer is considered to be effective.3 Sterilization, if performed properly, is an effective way of preventing bacteria from spreading. It should be used for the cleaning of the medical instruments or gloves, and basically any type of medical item that comes into contact with the blood stream and sterile tissues.

There are four main ways in which such items can be sterilized:

- Autoclave (by using high-pressure steam).
- Dry heat (in an oven).
- By using chemical sterilants such as glutaraldehydes or formaldehyde solutions.
- By radiation (with the help of physical agents).

The first two are the most used methods of sterilizations mainly because of their accessibility and availability.
Steam sterilization is one of the most effective types of sterilizations, if done correctly which is often hard to achieve. Instruments that are used in healthcare facilities are usually sterilized with this method. The general rule in this case is that in order to perform an effective sterilization, the steam must get into contact with all the surfaces that are meant to be disinfected. On the other hand, dry heat sterilization, which is performed with the help of an oven, is also an accessible type of sterilization, although it can only be used to disinfect instruments that are made of metal or glass.

The very high temperatures needed to perform sterilization in this way are able to melt the instruments that are not made of glass or metal. Steam sterilization is done at a temperature of 121 C (250 F) with a pressure of 209 KPA (15 lbs/in2). In these conditions, rubber items must be sterilized for 20 minutes, and wrapped items 134 C with pressure of 310 KPA for 7 minutes. The time is counted once the temperature that is needed has been reached. Steam sterilization requires four conditions in order to be efficient: adequate contact, sufficiently high temperature, correct time and sufficient moisture. Sterilization using steam can also be done at a temperature of 132 C (270 F), at a double pressure.

Dry heat sterilization is performed at 170 C (340 F) for one hour or two hours at a temperature of 160 C (320 F). Dry heat sterilization can also be performed at 121 C, for at least 16 hours. Chemical sterilization, also referred to as cold sterilization, can be used to sterilize instruments that cannot normally be disinfected through the other two processes described above. The items sterilized with cold sterilization are usually those that can be damaged by regular sterilization. Commonly, glutaraldehydes and formaldehyde are used in this process, but in different ways. When using the first type of disinfectant, the instruments are soaked in a 2-4% solution for at least 10 hours while a solution of 8% formaldehyde will sterilize the items in 24 hours or more.

Chemical sterilization is generally more expensive than steam sterilization and therefore it is used for instruments that cannot be disinfected otherwise. After the instruments have been soaked in the chemical solutions, they are mandatory to be rinsed with sterile water which will remove the residues from the disinfectants. This is the reason why needles and syringes are not sterilized in this way, as the residues left by the chemical solution that has been used to disinfect them cannot be washed off with water and they may interfere with the administered treatment. Although formaldehyde is less expensive than glutaraldehydes, it is also more irritating to the eyes, skin and respiratory tract and is classified as a potential carcinogen.

Other sterilization methods exist, though their efficiency is still controversial. These methods include gas, UV, gas plasma, and chemical sterilization with agents such asperoxyacetic acid or paraformaldehyde.

- Cleaning

Infections can be prevented from occurring in homes as well. In order to reduce their chances to contract an infection, individuals are recommended to maintain a good hygiene by washing their hands after every contact with questionable areas or bodily fluids and by disposing of garbage at regular intervals to prevent germs from growing.

Disinfection uses liquid chemicals on surfaces and at room temperature to kill disease causing microorganisms. Ultraviolet light has also been used to disinfect the rooms of
patients infected with Clostridium difficile after discharge.[7] Disinfection is less effective than sterilization because it does not kill bacterial endospores.[8]

**Personal Protective Equipment**

Personal protective equipment (PPE) is specialized clothing or equipment worn by a worker for protection against a hazard. The hazard in a health care setting is exposure to blood, saliva, or other bodily fluids or aerosols that may carry infectious materials such as Hepatitis C, HIV, or other blood borne or bodily fluid pathogen. PPE prevents contact with a potentially infectious material by creating a physical barrier between the potential infectious material and the healthcare worker.

The United States Occupational Safety and Health Administration (OSHA) requires the use of Personal protective equipment (PPE) by workers to guard against blood borne pathogens if there is a reasonably anticipated exposure to blood or other potentially infectious materials.[8]

Components of PPE include gloves, gowns, bonnets, shoe covers, face shields, CPR masks, goggles, surgical masks, and respirators. How many components are used and how the components are used is often determined by regulations or the infection control protocol of the facility in question. Many or most of these items are disposable to avoid carrying infectious materials from one patient to another patient and to avoid difficult or costly disinfection. In the US, OSHA requires the immediate removal and disinfection or disposal of a worker’s PPE prior to leaving the work area where exposure to infectious material took place.[9]

**Antimicrobial Surfaces**

Microorganisms are known to survive on non-antimicrobial inanimate ‘touch’ surfaces (e.g., bedrails, over-the-bed trays, call buttons, bathroom hardware, etc.) for extended periods of time.[10][11] This can be especially troublesome in hospital environments where patients with immunodeficiencies are at enhanced risk for contracting nosocomial infections. Products made with antimicrobial copper alloy (brasses, bronzes, cupronickel, copper-nickel-zinc, and others) surfaces destroy a wide range of microorganisms in a short period of time.[12]

The United States Environmental Protection Agency has approved the registration of 355 different antimicrobial copper alloys and one synthetic copper-infused hard surface that kill E.coli O157:H7, methicillin-resistant Staphylococcus aureus (MRSA), Staphylococcus, Enterobacter aerogenes, and Pseudomonas aeruginosa in less than 2 hours of contact. Other investigations have demonstrated the efficacy of antimicrobial copper alloys to destroy Clostridium difficile, influenza A virus, adenovirus, and fungi.[12] As a public hygienic measure in addition to regular cleaning, antimicrobial copper alloys are being installed in healthcare facilities in the U.K., Ireland, Japan, Korea, France, Denmark, and Brazil. The synthetic hard surface is being installed in the United States as well as in Israel.[13]

**Vaccination of Health Care Workers**

Health care workers may be exposed to certain infections in the course of their work. Vaccines are available to provide some protection to workers in a healthcare setting. Depending on regulation, recommendation, the specific work function, or personal preference, healthcare workers or first responders may receive vaccinations for hepatitis B; influenza; measles, mumps and rubella; Tetanus, diphtheria, pertussis; N. meningitidis; and varicella.[14]

**Post-exposure Prophylaxis**

In some cases where vaccines do not exist, post-exposure prophylaxis is another method of protecting the health care worker exposed to a life-threatening infectious disease. For example, the viral particles for HIV-AIDS can be precipitated out of the blood through the use of an antibody injection if given within four hours of a significant exposure.[15]

**Surveillance for Infections**

Surveillance is the act of infection investigation using the CDC definitions. Determining the presence of a hospital acquired infection requires an infection control practitioner (ICP) to review a patient’s chart and see if the patient had the signs and symptom of an infection. Surveillance definitions exist for infections of the bloodstream, urinary tract, pneumonia, surgical sites and gastroenteritis. Surveillance traditionally involved significant manual data assessment and entry in order to assess preventative actions.
such as isolation of patients with an infectious disease. Increasingly, computerized software solutions are becoming available that assess incoming risk messages from microbiology and other online sources. By reducing the need for data entry, software can reduce the data workload of ICPs, freeing them to concentrate on clinical surveillance.

As of 1998, approximately one third of healthcare acquired infections were preventable.\textsuperscript{[16]} Surveillance and preventative activities are increasingly a priority for hospital staff. The Study on the Efficacy of Nosocomial Infection Control (SENIC) project by the U.S. CDC found in the 1970s that hospitals reduced their nosocomial infection rates by approximately 32 per cent by focusing on surveillance activities and prevention efforts.\textsuperscript{[17]}

**Isolation and Quarantine**

In the health care context, medical isolation refers to various physical measures taken to interrupt nosocomial spread of contagious diseases. Various forms of isolation exist, and are applied depending on the type of infection and agent involved, to address the likelihood of spread via airborne particles or droplets, by direct skin contact, or via contact with body fluids. In cases where infection is merely suspected, individuals may be quarantined until the incubation period has passed and the disease manifests itself or the person remains healthy. Groups may undergo quarantine, or in the case of communities, a cordon sanitaire may be imposed to prevent infection from spreading beyond the community, or in the case of protective sequestration, into a community. Public health authorities may implement other forms of social distancing, such as school closings, to control an epidemic.\textsuperscript{[17]}

**Outbreak Investigation**

When an unusual cluster of illness is noted, infection control teams undertake an investigation to determine whether there is a true outbreak, a pseudo-outbreak (a result of contamination within the diagnostic testing process), or just random fluctuation in the frequency of illness. If a true outbreak is discovered, infection control practitioners try to determine what permitted the outbreak to occur, and to rearrange the conditions to prevent ongoing propagation of the infection. Often, breaches in good practice are responsible, although sometimes other factors (such as construction) may be the source of the problem. Outbreaks investigations have more than a single purpose. These investigations are carried out in order to prevent additional cases in the current outbreak, prevent future outbreaks, learn about a new disease or learn something new about an old disease. Reassuring the public, minimizing the economic and social disruption as well as teaching epidemiology are some other obvious objectives of outbreak investigations.\textsuperscript{[18]}

According to the WHO, outbreak investigations are meant to detect what is causing the outbreak, how the pathogenic agent is transmitted, where it all started from, what is the carrier, what is the population at risk of getting infected and what are the risk factors. The results of outbreak investigations are always made public in the means of a report in which the findings are communicated to the authorities, media, and scientific community and so on. These reports are commonly used as pedagogical tools.

**Training in Infection Control and Health Care Epidemiology**

Practitioners can come from several different educational streams. Many begin as nurses, some as medical technologists (particularly in clinical microbiology), and some as physicians (typically infectious disease specialists). Specialized training in infection control and health care epidemiology are offered by the professional organizations described below. Physicians who desire to become infection control practitioners often are trained in the context of an infectious disease fellowship. In the United States, Certification Board of Infection Control and Epidemiology is a private company that certifies infection control practitioners based on their educational background and professional experience, in conjunction with testing their knowledge base with standardized exams.

The credential awarded is CIC, Certification in Infection Control and Epidemiology. It is recommended that one has 2 years of Infection Control experience before applying for the exam. Certification must be renewed every five years.\textsuperscript{[19]} A course in hospital epidemiology (infection control in the hospital setting) is offered jointly each year by the
Centers for Disease Control and Prevention (CDC) and the Society for Healthcare Epidemiology of America.[19]

Result and Discussion

A nosocomial infection is contracted because of an infection or toxin that exists in a certain location, such as a hospital. People now use nosocomial infections interchangeably with the terms health-care associated infections (HAIs) and hospital-acquired infections. For a HAI, the infection must not be present before someone has been under medical care.

One of the most common wards where HAIs occur is the intensive care unit (ICU), where doctors treat serious diseases. About 1 in 10 of the people admitted to a hospital will contract a HAI. They’re also associated with significant morbidity, mortality, and hospital costs. As medical care becomes more complex and antibiotic resistance increases, the cases of HAIs will grow. The good news is that HAIs can be prevented in a lot of healthcare situations. Read on to learn more about HAIs and what they may mean for you.

Symptoms of Nosocomial Infections

For a HAI, the infection must occur

- up to 48 hours after hospital admission
- up to 3 days after discharge
- up to 30 days after an operation
- in a healthcare facility when someone was admitted for reasons other than the infection

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Infection type</th>
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<tbody>
<tr>
<td>Staphylococcus aureus (S. aureus)</td>
<td>Blood</td>
</tr>
<tr>
<td>Escherichia coli (E. coli)</td>
<td>UTI</td>
</tr>
<tr>
<td>Enterococci</td>
<td>blood, UTI, wound</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa (P. aeruginosa)</td>
<td>kidney, UTI, respiratory</td>
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</tbody>
</table>

Of the HAIs, P. aeruginosa accounts for 11 percent and has a high mortality and morbidity rate. Bacteria, fungi, and viruses spread mainly through person-to-person contact. This includes unclean hands, and medical instruments such as catheters, respiratory machines, and other hospital tools. HAI cases also increase when there’s excessive and improper use of antibiotics. This can lead to bacteria that are resistant to multiple antibiotics.

Nosocomial Infections Treated

Symptoms of HAIs Will Vary by Type.

The Most Common types of HAIs are

- urinary tract infections (UTIs)
- surgical site infections
- gastroenteritis
- meningitis
- pneumonia

The Symptoms for these Infections may include

- discharge from a wound
- fever
- cough, shortness of breathing
- burning with urination or difficulty urinating
- headache
- nausea, vomiting, diarrhea

People who develop new symptoms during their stay may also experience pain and irritation at the infection site. Many will experience visible symptoms.

Causes of Nosocomial Infections

Bacteria, fungus, and viruses can cause HAIs. Bacteria alone cause about 90 percent of these cases. Many people have compromised immune systems during their hospital stay, so they’re more likely to contract an infection. Some of the common bacteria that are responsible for HAIs are:

Treatments for these infections depend on the infection type. Your doctor will likely recommend antibiotics and bed rest. Also, they’ll remove any foreign devices such as catheters as soon as medically appropriate. To encourage a natural healing process and prevent dehydration, your doctor will encourage a healthy diet, fluid intake, and rest.

Infection Control

In 1966, a commission of the Dutch Health
Care Council published the first report on the control and prevention of infectious diseases. This report was revised in 1976 and again in 1991. Healthcare institutions were asked to install infection control committees (ICCs), to give advice to healthcare workers (HCWs).

These committees have the task of advising hospital directors with respect to infection control policies. In most hospitals, the ICCs were implemented and headed by medical microbiologists, who are the professionals mainly involved in the coordination of infection control and prevention activities in The Netherlands. Today, the control and prevention of nosocomial infection is a legal obligation for every Dutch hospital. Infection control and prevention activities in the hospitals formerly focused on patient care techniques, the hospital environment and the use of biomedical products. With the advent of infection control programs headed by physicians trained in medical microbiology, infectious diseases and/or hospital epidemiology in Europe and the USA, the activities became much more patient-oriented. Most non-teaching hospitals employ one or more, often part-time, infection control nurses.

All Dutch tertiary care centers and university hospitals have an infection control program, headed by a medical microbiologist or infectious disease specialist with experience in hospital epidemiology. The Health Care Council underlines the importance of infection control by strongly advising hospital administrators to employ a full-time medical microbiologist per 1000 hospital beds, in charge of the infection control program, and approximately one infection control nurse per 250 hospital beds. In view of the fact that these ratios are based on by now 15-year-old data from the SENIC study, and that during that time the patient population in our hospitals has changed significantly, it is argued that more manpower is needed in today's hospitals. A recent survey showed that some institutions are still below the current recommendations.

**Main Things about Hospital Acquired Infections**

- They can mean several extra days in hospital
- The old and the young at most at risk
- Hospital acquired infections can kill

Sir John commends the professionalism and dedication of NHS hospital infection control teams. He found many examples of good practice to prevent and minimise the problems of hospital acquired infection in individual NHS Trusts. He also recognised that the Department of Health has launched number initiatives recently to raise the profile of hospital acquired infection and improve its prevention and control.

But there is scope to do a lot more, particularly as part of efforts to tackle the growing problem of antibiotic resistance. Sir John also concludes that in many NHS Trusts there may be a growing mismatch between what is expected of infection control teams in controlling hospital infection and the staffing and other resources allocated to them. He also found a lack of evidence based guidelines on the cost effectiveness of measures to reduce hospital acquired infection and scope to improve dissemination of good practice.

Prioritisation of resources for dealing with hospital acquired infection is not helped by the general lack of basic, comparable information about rates of hospital acquired infection. He therefore welcomed the Nosocomial (hospital acquired)Infection National Surveillance Scheme and the Department's new Clinical Governance and Controls Assurance initiative which, among other things, focus attention on ways of improving the management and control of hospital acquired infection.

Sir John details 29 recommendations for improving the management and control of hospital acquired infection. These include, that the Department of Health should

- consider revising their 1995 guidance on infection control and ensure that NHS Trusts comply with this guidance, and with the controls assurance standards on infection control;
- consider commissioning research on appropriate staffing levels for the infection control team; and
• Encourage comprehensive participation in the Nosocomial Infection National Surveillance Scheme.

Also that NHS Trusts should

• ensure that there is appropriate feedback of surveillance data to clinicians and senior management who should be encouraged to accept greater ownership for the control of hospital infection; and

• Ensure that infection control considerations are an integral part of bed management policies and that the infection control function is resourced in line with Departmental guidance.

Conclusions and Recommendations

• We recommend through this study and previous studies to pay attention to the right ‘infrastructure’ to prevent nosocomial infections.

• The average nursing staff/patient ratio is as high as 1:5 in all university hospitals, patient rooms are spacious.

• Two to four beds maximum, and single and isolation rooms are available.

References