



Hospital Infections - How Far Can Good Practices Reduce Them?

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ABSTRACT

Indian public hospitals suffer from chronic overcrowding, underfunding, and working facilities that are permanently stretched to the limit. Hygiene and cleanliness are the casualties. Despite this there is considerable medical expertise ready to offer its services provided its efforts are not sabotaged by infectious complications. The SENIC project in USA in the 1970's established that hospitals that have active infection control programmes can achieve a 33% reduction in major hospital infections. To steer the programme an infection control committee consisting of a physician, a surgeon and a microbiologist is required together with staff from operation theatres, ICUs and dialysis and oncology units who can be consulted as necessary. An infection control sister co-ordinates activities. Direct access to administrators is essential to implement recommendations.

The function of the committee is three-fold. First, to gather data about microorganisms prevalent in different areas of the hospital and to define their antibiotic sensitivity pattern. Second, to establish baseline infection rates for standard procedures and practices and thereafter conduct targeted surveillance to check that breakdown of asepsis is not occurring. Third, to ensure good infection control practices such as hand washing, barrier nursing, and universal precautions. In addition, devising rational antibiotic, disinfectant, and waste disposal policies can save an institutions large sums of money. Despite these measures hospital infection rates vary from 5-10 per cent and incur a heavy financial burden. Infection control programmes are cost-effective and should be promoted.

INTRODUCTION

Man and microbes have been locked in conflict over thousands of years. Each at times has gained ascendancy over the other but outright victory has remained elusive. In the past 150 years hospitals have entered the scene to provide the arenas where these battles have been most intensely fought. Man has learnt from this experience and landmark events of the struggle provide the historical basis of modern day hospital infection control.

THE EVOLUTION OF THE INFECTION CONTROL SISTER

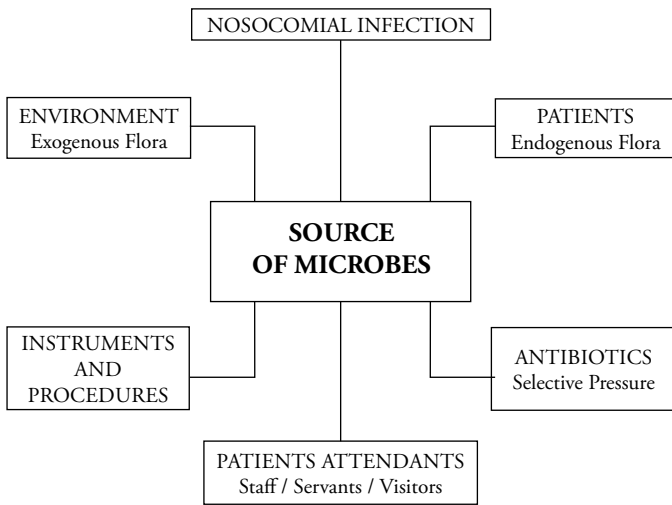
The early 1800s in the West saw large numbers of people migrate to the cities during the industrial revolution. Hospitals were built to cater to their needs but these unsanitary "pest houses" often hastened death. In the years that followed Nightingale, Semmelweis, Holmes and others established the principles of hygiene, Pasteur demonstrated microbes to be the cause of infection, and Lister showed the benefits of disinfectants and aseptic surgical technique. Hospitals were no longer to be feared.

The impact of antibiotics on healthcare in the 1940s was dramatic, and expectations of an infection-free society arose.

Within two decades these hopes were dashed. Penicillin-resistant staphylococci resulted in extensive hospital epidemics in the 1950s and 1960s. Newly built nurseries and surgical suites were closed, and healthcare workers (HCW) identified as carriers of epidemic strains of microorganisms were sent on leave. It was at this time that in the UK the concept of an Infection Control Sister was born to monitor these outbreaks and other infections within the hospital. Today, experience shows one sister is able to oversee approximately 250 beds.

INFECTION CONTROL COMMITTEES AND PROGRAMMES

The staphylococcal epidemics noted above came at a time when medicine was becoming more invasive and aggressive. ICUs were sprouting and cancer chemotherapy and transplantation involved dealing with immunocompromised patients who were more prone to infection. At this time in the United States in the 1970's the Centre for Disease Control (CDC) began a nationwide "Study of the efficacy of nosocomial infection control – the SENIC project". The project involved 638 hospitals and had two objectives : first, to measure the extent to which hospital infection programmes (infection surveillance and infection control) had been adopted by US hospitals; and second, to determine whether



these programmes led to lower nosocomial infection rates (i.e. were they cost-effective?). After a decade the study showed that indeed a majority of hospitals had programmes and that where these were active, an approximate 33% reduction was achieved in nosocomial urinary tract infections, surgical wound infections, pneumonias and bacteraemias. Another initiative, the National Nosocomial Infection Surveillance (NNIS) system, was started by CDC to help create a national database of nosocomial infections and improve surveillance methods in hospitals. Standard protocols and uniform definitions of nosocomial infections are used to monitor the patients. More than 235 US hospitals participate in the NNIS system.

HOSPITAL INFECTION CONTROL IN INDIA

India is a land of contrasts. On one hand we boast of brilliant doctors who practice state-of-the-art medicine and use the latest technology. On the other, we have in our hospitals and nursing homes ayahbais, ward boys, and servants who barely understand the rudiments of hygiene. Between these extremes, we can place a crucial nursing corps which now only after many years is gaining respect as a profession. This disparate group forms the healthcare workers (HCWs) of our institutions.

Our hospitals are overcrowded and work with facilities that are permanently stretched to the limit making hygiene and cleanliness the casualties. Our most sick patients are clustered into often ill-designed ICUs where we puncture their natural defenses with tubes and lines to understand the working of their organs. We pump antibiotics into them so that their normal flora is replaced by tougher more resistant microbes. On occasions, we purposely suppress their immune systems as a strategy to treat certain ailments, making them more vulnerable to secondary infection. At other times, hospital staff caring for such patients inadvertently transfers virulent organisms from one patient to another on their hands. In such a hazardous setting, hospital infections will certainly occur – how often they occur will depend on the priority given to their prevention (Fig. 1). With these thoughts in mind the Hospital Infection Society of India was founded in 1992 and has been holding national conference biannually since then.

PREVENTING THE PROBLEM

Prevention of hospital infection is essentially a big policing operation. First, one has to gather together people to perform this function, namely the infection control committee. The core committee consists of a physician, a surgeon, a senior nurse, and a microbiologist, and representatives from the operation theatres, CSSD, and ICUs. Inputs are also required from others such as housekeeping, laundry, food services, and engineering, who work as a team to maintain the hygiene and cleanliness of the institution. For committee members, the job of infection control is added on to their other commitments, so that a person working full time is required to coordinate activities, - this is usually the infection control sister. Finally, the committee has to ensure that its recommendations are implemented and so must have direct access to administrative heads of the institution.

The committee performs three principal functions:

- The first function is to gather data. Each institution needs to know the size and the nature of its problem, especially in high risk areas, such as operation theatres, ICUs, dialysis units and oncology services. A good microbiology laboratory is essential to isolate organisms and also to indicate to clinician's trends and changes in hospital flora. For instance methicillin-resistant *Staphylococcus aureus* (MRSA) has been a feared hospital pathogen in the past decade but is now being overtaken by organisms such as *E. coli* and *Klebsiella* that secrete extended spectrum beta-lactamases (ESBL). These organisms demonstrate resistance to cephalosporins but retain sensitivity to carbapenems. The laboratory is also best suited to identify outbreaks (three or more cases of infection with the same organism) and to alert concerned clinicians accordingly.
- The second function is to carry out surveillance. Protocols are laid down for the performance of most procedures and adherence to these is paramount particularly for certain device-related procedures in ICU such as the insertion of central venous catheters. Having established the baseline rates of infection for any procedure, surveillance is able to detect sudden increases in these rates so that remedial steps can immediately be taken. The method thus detects breakdowns in aseptic practices or sudden outbreaks of infection. Surveillance is a powerful tool in infection control but is time consuming and expensive. To justify itself it has to be a means to an end, and, that end is the reduction of nosocomial infection. Spot surveillance is sometimes a quicker and cheaper approach. For example, how many people in an ICU examined patients without first washing hands or using a waterless alcohol hand rub, or how many unnecessary people entered theatre during the course of an operation. In another critical area the Central Sterile Supply Depot (CSSD) one could ask if all items entering an autoclave emerged sterile; - simple test tapes tell us if desired temperatures and pressures are achieved inside the autoclave by showing a colour change. Such examples are endless, and the surveillance method simple to carry out and within the means of most Indian hospitals. They can alert one to a potential problem or alternatively build up a concept of quality assurance for an institution.

- The third function of the committee is to enforce good infection control practices. Two practices of importance are illustrated below :

Until recently, patients with infectious diseases were kept in isolation rooms to prevent the spread of infection. This method however did not permit use of intensive monitoring, should it be required. Most of these diseases, except say open tuberculosis, cholera, or childhood exanthemata, can now be nursed in an open ward. However, it requires a concept of barrier nursing to be instituted. The concept envisages no physical barriers, but a process of skilled nursing whereby the microbial flora of the index patient is prevented from spreading to neighbouring patients. Central to its success are hand washing, gowns to prevent infectious organisms from attaching to the clothes of the health care workers, and the efficient disposal of the excreta of patients.

What has been described relates to protection of the patient. Another concept, universal (now termed standard) precautions is designed to protect the healthcare worker. The word universal refers to all diseases spread by infected blood and body secretions, chief amongst which are the hepatitis B and C viruses and the human immuno-deficiency virus (HIV). The word "precautions" usually means gloves, but also at times gowns and head gear. As HIV positive cases increase, it is necessary for healthcare workers to practice precautions "universally" for all admissions to high risk areas such as Casualty or the Emergency Room until the patient's HIV status is known.

A good infection control committee can save its institution considerable sums of money by encouraging good practices and by abandoning worthless rituals. An example of the former is adhering to an antibiotic policy. Antibiotics are expensive and overuse of antibiotics is not only costly but the single most important factor for inducing antibiotic resistance in organisms. During surgery evidence-based guidelines clearly show that only three doses of antibiotic (usually a first-generation cephalosporin) are required perioperatively for prophylaxis. However, many surgeons misguidedly give antibiotics for several days. Educational seminars, literature references, and tactful talks can slowly change habits.

An example of the latter is the unnecessary disinfection of hospitals floors and walls. There is no evidence that this practice reduces infection, - indeed by making surfaces 'tacky' it invites microorganisms to adhere to them. Detergent, or soap and water are cheaper and more effective. Administrators listen to committees that save money.

Management of hospital waste is a major problem in India, compounded by the social problem of ragpickers and the potential

recycling of unsterile hospital material. Waste requires attention at each step from generation, segregation, collection, storage, transport and disposal. Incineration is no longer permitted in many parts of the country because of the production of toxic chemicals such as dioxin. An attempt should be made towards minimization of waste by following the slogan "Reduce, Reuse, and Recycle".

The health and education of health care workers (HCWs) is also the responsibility of the infection control committee. Experience shows that lower rung workers are more ready and enthusiastic for this than doctors. An 'infection prevention week' once a year can be used to galvanise the whole staff to prevention of hospital infections by emphasising the principles outlined in this article,

HOSPITAL INFECTION – THE BURDEN

Hospital infections cannot be eliminated, as already stated; they can only be controlled. It is the aggressive approach of modern medicine with its accent on invasive procedures that has created "a loophole" for infectious organisms to gain entry into the body. The incidence of hospital infections is on average 5-10%, with one percent mortality. This burden is only tolerable because the lives saved by today's intensive care are greater in number than they were earlier.

The expenses of treating hospital infections, together with the cost of prolonged hospitalisation and resultant loss of man-hours from work are a major economic burden. In the USA, the estimated cost has been put at 5 billion dollars. This amounts to more than the total Indian health budget. What then can we hope to achieve with our limited resources? The answer may be – quite a lot. We should remember that prevention is better than cure, and the invaluable lessons of the pioneers of yesteryear. In today's medical terminology, they are termed aseptic techniques, barrier nursing, universal precautions and the judicious use of antibiotics.

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